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Effectiveness of psychological interventions delivered by physiotherapists in the management of neck pain: a systematic review with meta-analysis

Scott F. Farrell[a,*], Devon Edmunds[b], John Fletcher[b], Harry Martine[b], Hashem Mohamed[b], Jenna Liimatainen[a], Michele Sterling[a]

Abstract

Physiotherapists are increasingly using psychological treatments for musculoskeletal conditions. We assessed the effects of physiotherapist-delivered psychological interventions on pain, disability, and quality of life in neck pain. We evaluated quality of intervention reporting. We searched databases for randomized controlled trials (RCTs) comprising individuals with acute or chronic whiplash-associated disorder (WAD) or nontraumatic neck pain (NTNP), comparing physiotherapist-delivered psychological interventions to standard care or no treatment. Data were extracted regarding study characteristics and outcomes. Standardised mean difference (SMD) was calculated by random-effects meta-analysis. We evaluated certainty of evidence using Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) and intervention reporting using TIDieR. Fourteen RCTs (18 articles—4 detail additional outcome/follow-up data) were included comprising 2028 patients, examining acute WAD (n = 4), subacute/mixed NTNP (n = 3), chronic WAD (n = 2), and chronic NTNP (n = 5). Treatment effects on pain favoured psychological interventions in chronic NTNP at short-term (SMD −0.40 [95% CI −0.73, −0.07]), medium-term (SMD −0.29 [95% CI −0.57, 0.00]), and long-term (SMD −0.32 [95% CI −0.60, −0.05]) follow-up. For disability, effects favoured psychological interventions in acute WAD at short-term follow-up (SMD −0.39 [95% CI −0.72, −0.07]) and chronic NTNP at short-term (SMD −0.53 [95% CI −0.91, −0.15]), medium-term (SMD −0.49 [95% CI −0.77, −0.21]), and long-term (SMD −0.60 [95% CI −0.94, −0.26]) follow-up. GRADE ratings were typically moderate, and intervention reporting often lacked provision of trial materials and procedural descriptions. Psychological interventions delivered by physiotherapists were more effective than standard physiotherapy for chronic NTNP (small-to-medium effects) and, in the short term, acute WAD.

Keywords: Neck pain, Whiplash injuries, Chronic pain, Physical therapy modalities, Rehabilitation, Psychosocial intervention

1. Introduction

Neck pain is a highly prevalent condition and a leading cause of disability worldwide,[66] responsible for enormous economic burden attributable to both health care and indirect expenses.[42] For many people, neck pain resolves quickly, whereas others report recurrent flare-ups,[1] and at least 50% of people report pain and disability 1 year after the precipitating event.[14–16] Neck pain can arise after a traumatic injury (eg, a road traffic crash—whiplash-associated disorder [WAD]) or can be insidious in onset (nontraumatic neck pain [NTNP]). Current guideline-recommended treatments for neck pain, such as education, advice, and exercise, demonstrate only modest effects.[22,30,78]

Psychological factors such as low pain self-efficacy, stress, pain catastrophising, depression, and anxiety are associated with

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D. Edmunds, J. Fletcher, H. Martine, and H. Mohamed contributed equally.

[a] RECOVER Injury Research Centre and NHMRC Centre for Research Excellence: Better Health Outcomes for Compensable Injury, The University of Queensland, Herston, Australia, [b] School of Health and Rehabilitation Sciences, The University of Queensland, St Lucia, Australia

**Corresponding author. Address: RECOVER Injury Research Centre and NHMRC Centre for Research Excellence: Better Health Outcomes for Compensable Injury, The University of Queensland, STARS Building, 296 Herston Rd, Herston 4006, QLD, Australia. E-mail address: scott.farrell@uq.edu.au (S.F. Farrell).*

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poorer health outcomes in patients with neck pain of both traumatic and nontraumatic onset.[10,79] Clinical guidelines recommend the evaluation and treatment of psychological factors in the management of patients with neck pain.[9,21,77] Consequently, psychological interventions, such as cognitive behavioural therapy (CBT), are commonly used for neck pain and musculoskeletal pain conditions more broadly.[54]

Although psychological interventions can benefit patients with musculoskeletal pain conditions,[91] barriers exist for implementation of such treatments. There can be challenges associated with limited availability of pain psychology services in some settings,[5,40] as well as potential financial[5,26] and time costs[24] to the patient. Nonetheless, the need to address both psychological and physical factors in the management of musculoskeletal pain is recognised and valued by patients[41,72] and clinicians.[43] To mitigate these barriers, nonpsychologist practitioners (eg, physiotherapists) have been used to deliver psychological interventions for patients with musculoskeletal pain conditions.[11,19,71,80] Physiotherapists are well-placed to deliver integrated psychological and physical interventions as they commonly provide care to patients with neck pain in community primary care and hospital outpatient settings.[65]

Previous systematic reviews have evaluated the effectiveness of physiotherapist-delivered psychological interventions for musculoskeletal pain,[71,93] post spine, hip, or knee surgery,[20] and low back pain.[35,38,84] Meta-analyses revealed mostly small-to-moderate effects[35,71] on pain and disability in favour of psychological interventions compared with physiotherapy alone (typically exercise, advice, or manual therapy). One review included a WAD/neck pain subgroup[71] and found no effects on pain and disability. However, their meta-analysis did not distinguish between acute and chronic neck pain nor consider the aetiology of neck pain. Patients with WAD report higher pain and disability,[62] more psychological distress,[62] greater hyperalgesia[70] and hypoesthesia,[17] and poorer outcomes at follow-up compared with those with nontraumatic neck pain,[4] suggesting that they may respond differently to psychological interventions. Similarly, there may be a differential effect of psychological interventions depending on the stage of the condition, acute vs chronic. Consequently, nuanced evaluation of effectiveness of psychological interventions incorporating these critical clinical distinctions is necessary.

Physiotherapists do not commonly receive training in psychological care at the preprofessional level,[29] making implementation of this approach problematic.[6] Authors of recent reviews have argued that descriptions of interventions in the reports of trial results in low back pain are inadequate to achieve adequate training and replication in the clinical setting.[35,73] Whether this is also the case for neck pain is not known.

The aims of this systematic review are to (1) determine the effectiveness of psychological interventions delivered by physiotherapists on neck pain, disability, and quality of life in people with acute or chronic WAD or NTNP; (2) determine if interventions are described sufficiently to enable replication by physiotherapists in the clinical setting.

2. Materials and methods

2.1. Protocol registration and study design

The protocol for this systematic review was registered on International Prospective Register of Systematic Reviews (PROSPERO) database (CRD42021242180) and is available at https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021242180. We report the following deviations from the original protocol: We used amended definitions of short-, medium-, and long-term follow-up to more effectively represent the follow-up time points reported in the included studies. We also added quality of life outcomes and assessed the description of trial interventions as relevant for replication in a clinical setting. This systematic review is reported in accordance with the guidelines detailed in the PRISMA statement.[57]

2.2. Eligibility criteria

Randomized controlled trials (RCTs) published in English were considered for inclusion, comprising participants (aged ≥18 years) with a diagnosis of acute (<3-month duration) or chronic (≥3-month duration)[83] WAD (grades 1, 2 or 3)[76] or nontraumatic neck pain. Participants could not have a specific cervical spine pathology, such as bony injury (fracture or dislocation [WAD 4]) or rheumatoid arthritis. Included RCTs must have investigated effectiveness of a psychological intervention delivered by physiotherapists only, compared with physiotherapy alone or no treatment. Physiotherapists delivering the psychological interventions must have undergone training by a psychologist or other relevant health professional with expertise in psychological interventions. When such training was not reported, details were sought by correspondence with the authors. Psychological interventions were defined as any approach that incorporated the following: cognitive behavioural strategies, acceptance-based interventions, relaxation, mindfulness, hypnosis, coping skills, problem-solving, stress management, and depression interventions or similar,[71] in combination with physiotherapy. Studies of treatment delivery in individual or group settings were eligible. Studies were ineligible if the psychological treatment was delivered by other health professionals.

2.3. Search strategy and information sources

A search strategy was developed for the following databases: CINAHL, EMBASE, PubMed, Cochrane. Search terms were related to physiotherapy, neck pain, and psychological interventions, based on previous relevant systematic reviews[23,28,71] (Supplementary File 1, available at http://links.lww.com/PR9/A191). Databases were searched up to November 4, 2021. Identified studies were exported to EndNote 20 (Clarivate Analytics, New York City, NY) and uploaded to Covidence. Duplicates were removed using the "remove duplicates" function in Endnote and then again in Covidence. Forward citation searching was carried out on the included studies using Web of Science and reference lists of included studies were hand searched for potentially eligible studies.

2.4. Selection of studies

Using Covidence, titles and abstracts were initially screened, followed by the full texts, by 2 independent reviewers (D.E., J.F., H. Martine, and H. Mohamed—randomly allocated between review team). Any disagreements were settled by consensus discussion or inclusion of a third reviewer (S.F.F.) if needed.

2.5. Data items sought

The primary outcomes were pain (eg, intensity rated on a visual analogue scale [VAS]) and disability (eg, Neck Disability Index [NDI]). Secondary outcomes were quality of life measures (eg, Short-Form 36 [SF-36]). Outcomes were collected at the

following time points: short term (immediately posttreatment), medium term (3–6 months postbaseline), and long term (≥12 months postbaseline).

2.6. Data extraction

Data were extracted from each included study by one author (S.F.F.) and checked by another author (J.L.), using a standard form (Excel; Microsoft, Redmond, WA) prepared by the research team. Descriptive data were extracted regarding study design and setting, sample size, demographics of participants, details of the psychological and control interventions, follow-up time points, clinical outcome measures and main results, and limitations and conclusions as presented in the published articles. Supplementary materials and published protocols or other studies were accessed for additional details as required. If data were missing or not clear, authors were emailed to request data, or if applicable, data were used from an earlier related systematic review with meta-analysis undertaken by our research team.[71] If authors did not respond to our request for data, their article was not excluded from the review. Rather, findings were reported descriptively for outcomes with missing or unclear summary data. The Template for Intervention Description and Replication (TIDieR)[39] checklist was used to assess descriptions of psychological interventions (such as name, rationale, materials, delivery, providers, training, dosage, and fidelity). Where a study contained more than one group receiving an eligible psychological intervention, data from these groups were pooled to create one psychological intervention group using Review Manager 5.4 (The Nordic Cochrane Centre, Copenhagen, Denmark). If group summary statistics were presented as median (IQR), these data were converted to mean (SD) using the calculator tool provided by Wan et al.,[87] as described in the Cochrane Handbook.[36] If group SD for an outcome at a follow-up time point could not be calculated or acquired for a study, SD was imputed using the baseline SD for that group.

2.7. Risk of bias of individual studies

Methodologic quality of included studies was assessed using the Cochrane Risk of Bias Tool 2.0.[81] Each included study was independently assessed for bias by 2 reviewers (S.F.F., J.L.). Briefly, the Tool assesses risk of bias of an individual study with respect to 5 domains: (1) the randomization process; (2) deviations from the intended interventions (effect of assignment to intervention); (3) missing outcome data; (4) measurement of the outcome; and (5) selection of the reported result. Bias assessments were considered specific to each outcome of interest reported in the study[81]—that is, pain, disability, and quality of life. Ratings of overall methodological quality were considered as "low risk," "some concerns," or "high risk" of bias. Disagreements were resolved through consensus discussion.

2.8. Effect measures and synthesis of results

Random-effects meta-analysis was performed for studies reporting data appropriate to be pooled, using Review Manager 5.4. Effect measures were calculated as standardised mean difference (SMD) for continuous data (eg, pain intensity VAS, NDI, SF-36), with SMD = 0.2, 0.5, and 0.8 considered small, medium, and large effects, respectively.[18] The minimum number of studies reporting comparable data for meta-analysis was 2.[25] Meta-analysis findings were presented using forest plots. Statistical significance was set at $P < 0.05$.

2.9. Risk of bias across studies and certainty assessment

For each meta-analysis comparison at each time point for pain, disability, and quality of life outcomes, overall certainty of evidence was assessed using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) approach. Briefly, certainty of evidence began as "high" for each meta-analysis comparison comprising RCTs (ie, all comparisons). Each comparison was then considered with respect to 5 domains[7]: risk of bias, inconsistency of results, indirectness, imprecision, and other applicable factors (eg, publication/reporting bias). The certainty of evidence rating was then reduced by one classification level for each domain not met (ie, if one or more of the following criteria are applicable)[67,69]: (1) >25% of participants were from studies with high risk of bias; (2) there was substantial heterogeneity ($I^2 > 50\%$[7]); (3) >50% of participants fell outside target group (ie, a general population with neck pain); (4) total sample comprised <400 participants for continuous variables and <300 events for binary variable; (5) other (eg, publication/reporting bias, assessed using funnel plots when ≥10 studies formed a comparison[56]). Conversely, certainty of evidence was raised one classification level in the case of a large effect size (ie, ≥0.8[18]).[7] Subsequently, a rating of overall certainty of evidence was determined as high, moderate, low, or very low, interpreted as per the study by Balshem et al.[7]

3. Results

3.1. Study selection

The electronic search identified 932 records. After removal of duplicates (n = 298), 634 records were screened at the title and abstract stage, 47 of which were then screened as full texts (**Fig. 1**). Of the full-text articles assessed for eligibility, 29 were excluded. The most common reasons for exclusion were that the psychological treatment was not delivered by a physiotherapist (n = 6) and articles describing secondary analyses of included trials (n = 6). The remaining 18 articles[8,12,31,32,34,45,47–49,51–53,59,75,80,82,86,89] (detailing 14 RCTs[8,12,31,45,49,51–53,59,75,80,82,86,89]) fulfilled the eligibility criteria and were included in the review. Neither forward citation searching nor hand searching reference lists of included studies yielded additional articles. Agreement between reviewers was 85% to 97% for title and abstract screening and 60% to 100% for full-text screening. One RCT was reported in 2 separate published articles,[8,47] containing pain[47] and disability[8] results for slightly different samples (10 of 47 patients differed). We therefore use the article by Beltran-Alacreu et al.[8] as the primary citation for this RCT and cite López-de-Uralde-Villanueva et al.[47] when referring to results specific to that published report.

3.2. Study characteristics

Characteristics of the included RCTs can be found in **Table 1**. Four trials included patients with acute WAD,[12,45,80,89] 2 patients with chronic WAD,[49,75] and 5 included patients with chronic non-traumatic neck pain.[8,31,53,82,86] Three trials included patients with subacute[59] or mixed[51,52] duration neck pain, so we report these results separately to the trials in acute and chronic neck pain. Sample sizes ranged from 28[89] to 599,[45] with a total of 2028 patients comprising the review. Psychological treatments are detailed in **Table 1**. All trials used cognitive behavioural techniques in some form, such as assessing and challenging unhelpful thoughts and beliefs,[8,12,31,45,49,51–53,59,75,80,82,86,89] problem-solving,[51,80,82] goal setting,[12,45,49,51,59,75,82] relaxation,[8,31,45,49,75,80,89] or graded activity.[8,12,53,59,86] Control treatments included

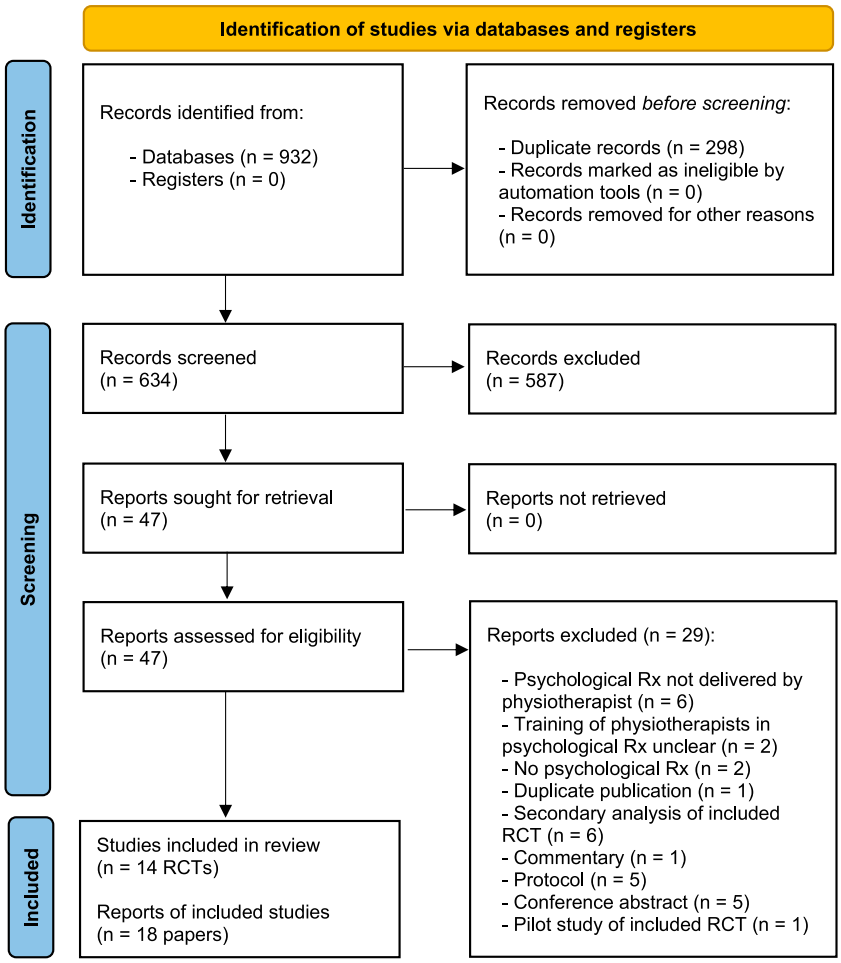

Figure 1. Flowchart of studies through review. RCT, randomized controlled trial; Rx, intervention.

advice,[12,45,51–53,59,80,82,89] exercise,[31,49,51–53,59,75,80,82,86,89] manual therapy,[8,31,52,53,59,89] and electrophysical agents.[31,52,75,89]

Pain was assessed by a VAS or numerical rating scale (NRS) in 11 trials.[12,31,47,49,53,59,75,80,82,86,89] Disability was assessed by the NDI,[8,31,45,49,59,80,86,89] Pain Disability Index (PDI),[12,75] Northwick Park Neck Pain Questionnaire (NPQ),[51,52,82] or Neck Pain and Disability Scale (NPDS)[53] in 14 trials. Quality of life was assessed in 8 trials using the SF-36,[52,53,59,80] SF-12,[45,51] or EQ-5D.[86,89] Ten trials[8,12,31,49,51,53,59,75,80,86] included short-term follow-up (immediately posttreatment), 12 trials[8,12,31,45,49,51,52,75,80,82,86,89] featured medium-term follow-up (3–6 months), and 10 trials[12,31,45,49,51–53,59,80,86] reported long-term follow up (≥12 months).

3.3. Risk of bias of individual studies

Details of risk of bias assessment of individual studies are presented in **Figure 2**. One study[89] was assessed overall as high risk of bias across all outcomes, whereas 3 trials were assessed as high risk of bias for certain outcome measures—disability[49] and quality of life[59,86]—because of incomplete reporting of multiple planned measures. The remaining trials were assessed as having "some concerns" overall. The primary reason for assessing studies as "some concerns" was because of inability to blind participants or treating physiotherapists to participant group allocations, meaning that the outcome assessors were not blinded (ie, pain and disability outcomes were self-reported and participants were typically not [able to be] blinded to treatment allocation). Agreement between reviewers in risk of bias assessment items was 91%. Disagreements were mostly related to domain 2 (risk of bias due to deviations from the intended interventions [effect of assignment to intervention]) and domain 3 (missing outcome data). All disagreements were resolved through consensus.

3.4. Results of syntheses

Two trials[8,12] featured 2 experimental groups with eligible psychological interventions, so data for the 2 experimental groups were pooled. For 3 studies,[8,12,89] data were converted from median (IQR) to mean (SD) using the tool provided by Wan et al.[87] The author of one study provided follow-up SD for pain and disability data,[82] and in 2 trials,[49,59] study data were sourced from our centre's previously published systematic review with meta-analysis.[71] Summary data were requested from the corresponding author of one study for SF-36 but no response was received—this study did, however, have summary data available for pain and disability. In 2 older studies,[51,52] group SD at follow-up for disability was not presented and could not be calculated, so SD was imputed from baseline data.

3.5. Acute whiplash-associated disorder

We found low-quality evidence of no difference between physiotherapist-delivered psychological interventions and other

Table 1

Characteristics of included studies.

Study Country	Sample size (experimental/ control)	Age of participants (y, experimental/ control)	Sex of participants (n female, experimental/ Control)	Duration of symptoms and type of neck pain	Pain outcome measure	Disability outcome measure	Quality of life outcome measure	Follow up time points	Type of psychological intervention	Intervention duration (number of sessions)	Type of control intervention	Author listed study limitations	Main findings
Beltran-Alacreu et al.[8] Spain	Experimental 1: 15/experimental 2: 15/control: 15	Mean (SD) Experimental 1: 40.9 (16.2)/ experimental 2: 39.8 (13.4)/control: 43.5 (15.9)	Experimental 1: 13/ experimental 2: 10/ control: 12	Chronic NTNP, >12 wk	N/A	NDI	N/A	1, 2, and 4 mo after baseline	Experimental 1: Therapeutic patient education and manual therapy Experimental 2: Therapeutic patient education and manual therapy and exercise	1 mo (8 sessions)	Manual therapy	Wide inclusion criteria; no information about previous "failed" treatments; lack of long-term follow-up	Reduced disability in experimental groups vs control at 2 and 4 mo
Trial is also reported in: López-de-Uralde-Villanueva et al.[47] Spain	Experimental 1: 16/experimental 2: 16/control: 15	Mean (SD) Experimental 1: 38.6 (16.6)/ experimental 2: 40.9 (13.8)/control: 43.5 (15.9)	Experimental 1: 13/ experimental 2: 11/ control: 12	Chronic NTNP, >12 wk	VAS (100 mm)	N/A	N/A	1 and 4 mo after baseline	Experimental 1: Therapeutic patient education and manual therapy Experimental 2: Therapeutic patient education and manual therapy and exercise Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy and self-management Graded activity Relaxation/ diaphragmatic breathing	1 mo (8 sessions)	Manual therapy	Wide inclusion criteria; patients and physiotherapists not blinded; manual therapy treatment time in experimental 2 half of that used in experimental 1 and control groups	Reduced pain in experimental 2 vs control group at 1 mo and experimental 2 vs experimental 1 and control groups at 4 mo
Bring et al.[12] Sweden	Experimental 1: 18/experimental 2: 18/control: 19	Mean (SD) Experimental 1: 35.7 (11.4)/ experimental 2: 35.3 (11.3)/control: 36.0 (8.8)	Experimental 1: 14/ experimental 2: 12/ control: 11	Acute WAD I and II, <2 wk	NRS (0–10)	PDI	N/A	Posttreatment, 3, 6, and 12 mo after treatment	Experimental 1: Internet-delivered behavioural medicine treatment Experimental 2: Face-to-face behavioural medicine treatment Psychological intervention included: Goal setting Promoting self-efficacy and self-management Addressing beliefs and thoughts Graded activity	5–10 wk (7 modules)	Self-care instructions	Small sample size	Reduced disability in experimental 1 and experimental 2 groups vs control group; no group difference in pain

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Table 1 (*continued*)

Characteristics of included studies.

Study Country	Sample size (experimental/ control)	Age of participants (y, experimental/ control)	Sex of participants (n female, experimental/ Control)	Duration of symptoms and type of neck pain	Pain outcome measure	Disability outcome measure	Quality of life outcome measure	Follow up time points	Type of psychological intervention	Intervention duration (number of sessions)	Type of control intervention	Author listed study limitations	Main findings
Gustavsson et al.[31,32,34] Sweden	77/79	Median (IQR) 45.7 (11.5)/45.7 (11.6)	69/70	Chronic tension-type neck pain, >3 mo	NRS (0–10)	NDI	N/A	10 and 20 wk; 1 and 2 y; 9 y after baseline	Multicomponent pain and stress self-management group intervention Psychological intervention included: Promoting self-management Relaxation Body awareness exercises Addressing beliefs and thoughts	7 wk with booster at 20 wk (7 + 1 sessions)	Individually administered physical therapy (mostly exercise, manual therapy, electrophysical agents)	Results applicable to people without depression (exclusion criterion); control was nonstandardised; contamination risk (experimental and control treatments delivered at the same clinic); withdrawal/loss to follow-up; physiotherapists delivering psychological intervention somewhat inexperienced in it	10 and 20 wk: lower disability in experimental groups; no group difference in pain 1 and 2 y: lower disability in experimental groups; no group difference in pain 9 y: lower disability in experimental groups; no group difference in pain
Lamb et al.[45] United Kingdom	300/299	Mean (SD) 40 (13)/ 40 (13)	194/184	Acute WAD I–III, <6 wk	N/A	NDI	SF-12 physical and mental health component scores	4, 8, and 12 mo after baseline	Intensive physiotherapy intervention comprising manual therapy, exercise and psychological strategies and self-management advice Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy and self-management Goal setting Relaxation	8 wk (6 sessions)	Single advice session	Some group differences at baseline (demographic and NDI)	No group differences in disability or quality of life across time points
Ludvigsson et al.[48,49] Sweden	Experimental: 71/control 1: 76/ control 2: 69	Mean (SD) Experimental: 40.0 (11.6)/control 1: 38.0 (11.3)/control 2: 43.0 (10.7)	Experimental: 47/ control 1: 57/ control 2: 38	Chronic WAD II and III, 6–36 mo	VAS (100 mm)	NDI	N/A	3 and 6 mo; 1 and 2 y after baseline	Neck-specific exercise with a behavioural approach Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy and self-management Goal setting Relaxation Body awareness exercises	12 wk (24 sessions)	Control 1: neck-specific exercise Control 2: prescribed physical activity	Multicentre study with multiple physiotherapists may compromise intervention performance; imputation of data not performed in analysis (possible selection bias); group differences in age and sex; control 2 had fewer treatment sessions	3 and 6 mo: lower disability in experimental vs control 2 group; no group differences in pain 1 and 2 y: lower disability in experimental and control 1 vs control 2 group at 1 y, at 2 y lower disability in experimental vs control 2 group; no group differences in pain

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Table 1 (*continued*)

Characteristics of included studies.

Study Country	Sample size (experimental/ control)	Age of participants (y, experimental/ control)	Sex of participants (n female, experimental/ Control)	Duration of symptoms and type of neck pain	Pain outcome measure	Disability outcome measure	Quality of life outcome measure	Follow up time points	Type of psychological intervention	Intervention duration (number of sessions)	Type of control intervention	Author listed study limitations	Main findings
Moffet et al.[52] United Kingdom	139/129	Mean (SD) 48.8 (16.6)/47.8 (16.6)	86/82	Mixed acute and chronic neck pain, >2 wk	N/A	NPQ	SF-36 8 domains	3 and 12 mo after baseline	Brief intervention incorporating cognitive behavioural therapy principles, including: Addressing beliefs and thoughts Promoting self-management	1 session (3 maximum)	Usual care physiotherapy (mostly exercise, manual therapy, electrophysical agents, and advice)	Contamination effect (same physiotherapists delivered both interventions)	No group difference in disability at 3 mo, but greater reduction in disability in control group at 12 mo; quality of life measures tended to favour control group
Moffet et al.[51] United Kingdom	47/49	Mean (SD) 47.3 (14.3)/46.6 (16.3)	32/28	Mixed acute and chronic neck pain, >2 wk	N/A	NPQ	SF-12 physical and mental health component scores	6 wk, 6 and 12 mo after baseline	Solution finding approach, including: Problem solving Goal setting Addressing beliefs and thoughts	Mean 3.2 sessions	McKenzie approach	Contamination effect (same physiotherapists delivered both interventions); some physiotherapists lacked confidence delivering psychological intervention	No group differences in disability across time points; no group differences in quality of life across time points (SF-12 data pooled neck and back pain groups)
Monticone et al.[53] Italy	40/40	Mean (SD) 55.0 (13.8)/44.2 (11.4)	30/30	Chronic NTNP, >3 mo	NRS (0–10)	NPDS	SF-36 eight domains	2–3 mo (post-treatment) and 12 mo later	Multimodal physiotherapy plus cognitive behavioural therapy Psychological intervention included: Addressing beliefs and thoughts Graded activity Promoting self-efficacy	3 mo (up to 12 sessions)	Multimodal physiotherapy (exercise, manual therapy, advice)	Some group differences (demographic); participants did not attend same number of sessions; psychosocial variables were not measured; sample size calculation based on large effect	Group differences in pain and disability at each time point, favouring experimental group; greater improvement in SF-36 physical activity domain in the experimental group
Pool et al.[59] The Netherlands	71/75	Mean (SD) 44.5 (12.0)/45.6 (11.1)	42/47	Subacute mixed WAD/NTNP, 4–12 wk	NRS (0–10)	NDI	SF-36	13 wk and 12 mo after baseline	Behavioural-graded activity program Psychological intervention included: Addressing beliefs and thoughts Graded activity Goal setting	Maximum 18 sessions	Manual therapy, exercise, advice	Did not reach desired sample size	Group differences in disability and pain at 12 mo favouring experimental group; no group differences in quality of life across time points
Söderlund et al.[75] Sweden	16/17	Mean 37.7/43.5	9/10	Chronic WAD I–III, >3 mo	NRS (0–10)	PDI	N/A	Posttreatment, 3 mo after treatment	Physiotherapy with cognitive behavioural components Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy Goal setting Relaxation	Maximum 12 sessions	Usual care physiotherapy (exercise, electrophysical agents, relaxation)	Small sample size; varied number of treatment sessions in both groups	No group differences in disability or pain across time points

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Table 1 (*continued*)

Characteristics of included studies.

Study Country	Sample size (experimental/ control)	Age of participants (y, experimental/ control)	Sex of participants (n female, experimental/ Control)	Duration of symptoms and type of neck pain	Pain outcome measure	Disability outcome measure	Quality of life outcome measure	Follow up time points	Type of psychological intervention	Intervention duration (number of sessions)	Type of control intervention	Author listed study limitations	Main findings
Sterling et al.[80] Australia	53/55	Mean (SD) 43.4 (14.3)/39.3 (13.9)	36/31	Acute WAD II and III, <4 wk	NRS (0–10)	NDI	SF-36 physical and mental health component scores	6 wk, 6 and 12 mo after baseline	Stress inoculation training integrated with exercise Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy and self-management Problem solving Relaxation	6 wk (10 sessions)	Guideline-based exercise and advice	Unable to blind patients and physiotherapists; participants with history of mental health conditions excluded	Group differences in pain and disability at each time point, favouring experimental group; group differences favouring experimental group for SF-36 mental health component score across time points
Thompson et al.[82] United Kingdom	29/28	Mean (SD) 49.2 (14.5)/45.8 (12.6)	12/14	Chronic neck pain, >3 mo	NRS (0–10)	NPQ	N/A	6 mo after baseline	Interactive behavioural modification therapy Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy Goal setting Problem solving	4 wk (4 sessions)	Progressive neck exercise programme and advice	Sample was small portion of target population; high loss-to-follow up; no "no treatment" group; only one follow-up point	No group difference at 6 mo for disability, but lower pain in the experimental group
Vonk et al.[86] The Netherlands	68/71	Mean (SD) 45.7 (12.1)/45.7 (12.7)	43/43	Chronic neck pain, >3 mo	NRS (0–10)	NDI	EQ-5D total	4 wk (mid-treatment), 9 wk (posttreatment), 26 and 52 wk after baseline	Behavioural-graded activity Psychological intervention included: Addressing beliefs and thoughts Promoting self-management Graded activity	9 wk (up to 18 sessions)	Conventional exercise and manual therapy	High loss-to-follow-up	No group differences in disability, pain or quality of life across time points
Wiangkham et al.[89] United Kingdom	20/8	Median (IQR) 34.0 (16.0)/50.5 (18.8)	3/6	Acute WAD II, <4 wk	VAS (100 mm)	NDI	EQ-5D total and subscales	3 mo after baseline	Active behavioural physiotherapy intervention Psychological intervention included: Addressing beliefs and thoughts Promoting self-efficacy and self-management Relaxation	6–8 sessions	Standard physiotherapy care (exercise, manual therapy, electrophysical agents, advice)	Did not reach desired sample size; high loss-to-follow up; demographic differences between groups (age and sex)	Feasibility trial, effect of intervention not quantified; however, disability, pain and overall quality-of-life data seem to favour experimental group

IQR, interquartile range; N/A, not applicable; NDI, Neck Disability Index; NDPS, Neck Pain and Disability Scale; NPQ, Northwick Park Neck Pain Questionnaire; NRS, numerical rating scale; NTNP, nontraumatic neck pain; PDI, Pain Disability Index; SF-12, Short-Form 12; SF-36, Short-Form 36; VAS, visual analogue scale; WAD, whiplash-associated disorder.

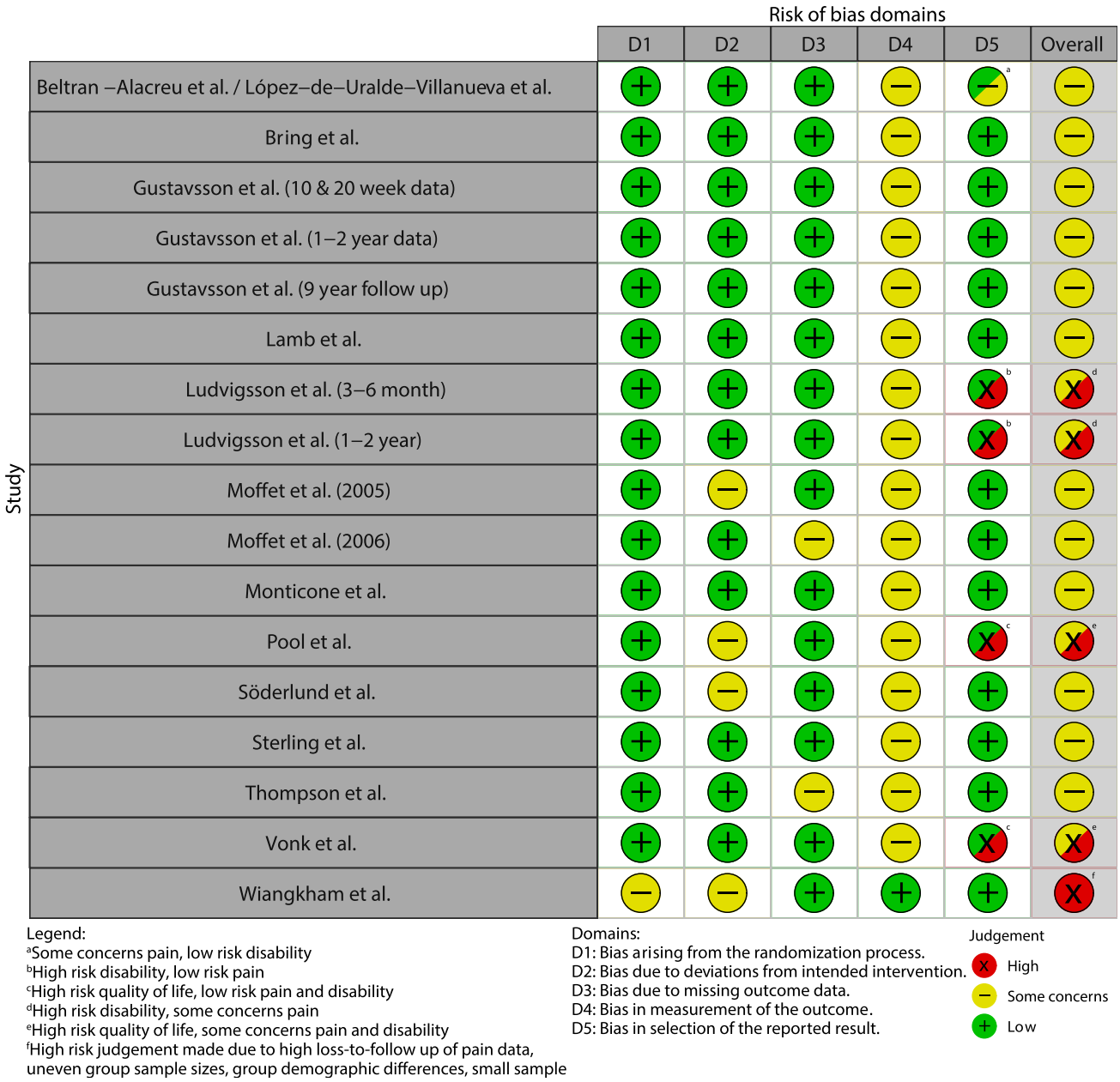

Figure 2. Risk of bias of individual studies, assessed using the Cochrane Risk of Bias 2 tool. Traffic-light plot prepared using the *robvis* tool.[50]

active treatments on pain at short-term follow-up (SMD −0.22 [95% confidence interval (CI) −0.87, 0.42], $P = 0.50$, $I^2 = 71\%$, 2 studies[12,80]) (**Fig. 3**). At medium-term (SMD −0.20 [95% CI −0.61, 0.20], $P = 0.32$, $I^2 = 24\%$, 3 studies[12,80,89]) and long-term follow-up (SMD −0.22 [95% CI −0.55, 0.11], $P = 0.19$, $I^2 = 0\%$, 2 studies[12,80]), we also found no effect with moderate-quality evidence (**Fig. 3**).

For disability, we found moderate-quality evidence in favour of the psychological intervention at short-term follow-up (SMD −0.39 [95% CI −0.72, −0.07], $P = 0.02$, $I^2 = 0\%$, 2 studies[12,80]), but not at medium-term (SMD −0.43 [95% CI −0.91, 0.05], $P = 0.08$, $I^2 = 78\%$, 4 studies[12,45,80,89]) or long-term follow-up (SMD −0.16 [95% CI −0.56, 0.24], $P = 0.43$, $I^2 = 70\%$, 3 studies[12,45,80]) (**Fig. 3**).

For quality of life, we found high-quality evidence of no difference between physiotherapist-delivered psychological interventions and other active treatments for the physical health subscale at medium-term (SMD −0.16 [95% CI −0.34, 0.02], $P = 0.08$, $I^2 = 0\%$, 2 studies[45,80]) or long-term follow-up (SMD −0.05 [95% CI −0.24, 0.14], $P = 0.57$, $I^2 = 0\%$, 2 studies[45,80]) (**Fig. 4**). A similar pattern was found for the mental health subscale at medium-term (SMD 0.07 [95% CI −0.11, 0.25], $P = 0.46$, $I^2 = 0\%$, 2 studies[45,80]) and long-term follow-up (SMD −0.07 [95% CI −0.26, 0.12], $P = 0.47$, $I^2 = 0\%$, 2 studies[45,80]) (**Fig. 4**).

3.6. Chronic whiplash-associated disorder

We found moderate-quality evidence of no difference between the psychological interventions and other active physiotherapy treatments on pain at short-term (SMD 0.30 [95% CI −0.01, 0.61], $P = 0.06$, $I^2 = 0\%$, 2 studies[49,75]) or medium-term follow-up (SMD 0.16 [95% CI −0.16, 0.48], $P = 0.33$, $I^2 = 0\%$, 2 studies[49,75]) (**Fig. 5**).

Similarly, we found low-quality evidence of no difference on disability at short-term (SMD 0.16 [95% CI −0.15, 0.46],

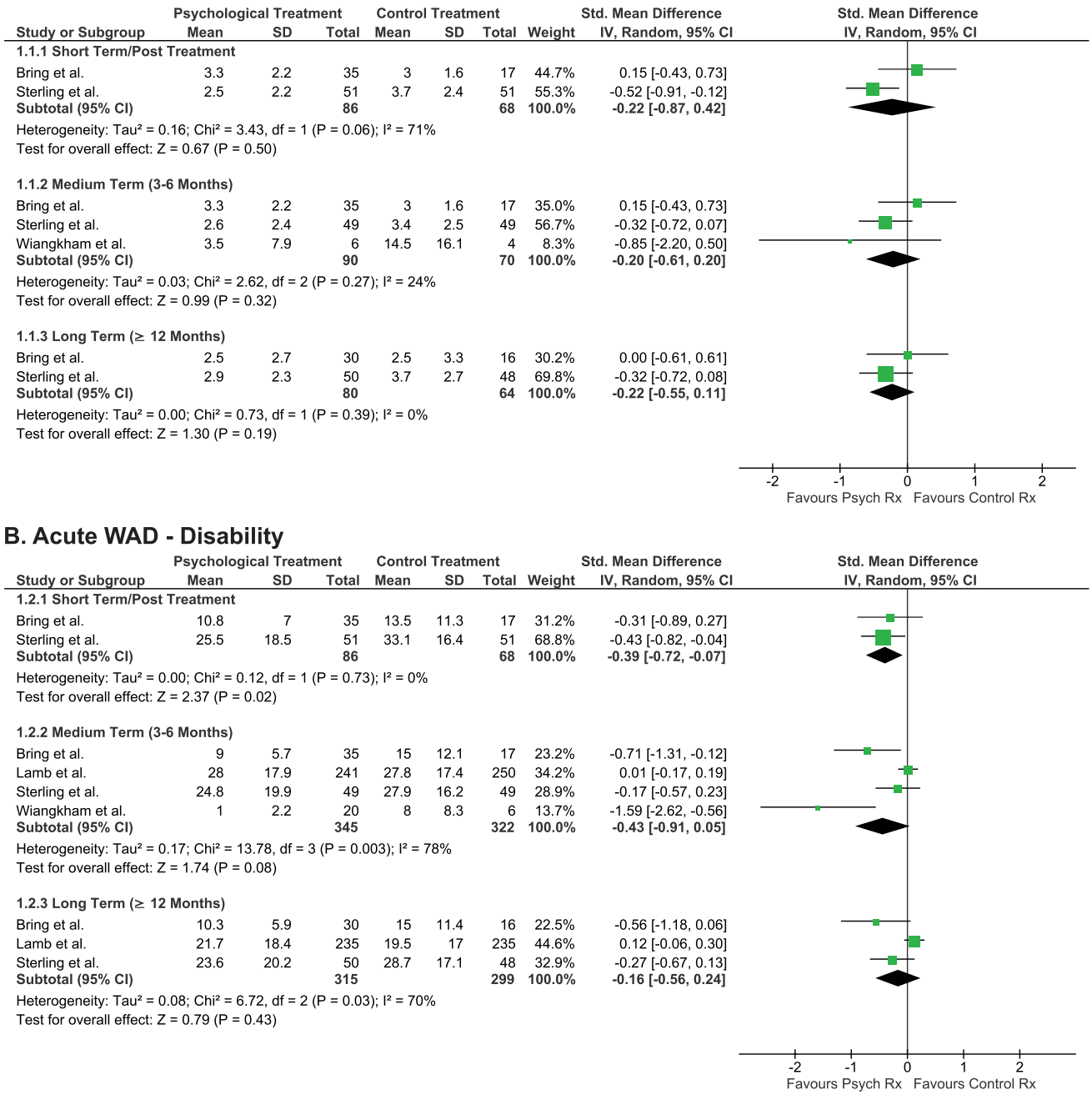

Figure 3. Meta-analysis of (A) pain and (B) disability in acute whiplash-associated disorder (WAD). 95% CI, 95% confidence interval.

$P = 0.32$, $I^2 = 0\%$, 2 studies[49,75]) or medium-term follow-up (SMD 0.07 [95% CI −0.24, 0.38], $P = 0.66$, $I^2 = 0\%$, 2 studies[49,75]) (**Fig. 5**). Meta-analysis was not possible at long-term follow-up because only one trial[48] reported applicable data. No RCT of chronic WAD included quality of life as an outcome measure.

3.7. Chronic nontraumatic neck pain

We found low-quality evidence that psychological treatments were more effective than other physiotherapy treatments on pain at short-term follow-up (SMD −0.40 [95% CI −0.73, −0.07], $P = 0.02$, $I^2 = 55\%$, 4 studies[31,47,53,86]) and moderate-quality evidence at medium-term (SMD −0.29 [95% CI −0.57, 0.00], $P = 0.05$, $I^2 = 31\%$, 4 studies[31,47,82,86]) and long-term follow-up (SMD −0.32 [95% CI −0.60, −0.05], $P = 0.02$, $I^2 = 25\%$, 3 studies[31,53,86]) (**Fig. 6**).

For disability, there was low-quality evidence that the psychological intervention showed greater benefit at short-term follow-up (SMD −0.53 [95% CI −0.91, −0.15], $P < 0.01$, $I^2 = 65\%$, 4 studies[8,31,53,86]) and moderate-quality evidence at medium-term (SMD −0.49 [95% CI −0.77, −0.21], $P < 0.01$, $I^2 = 29\%$, 4 studies[8,31,82,86]) and long-term follow-up (SMD −0.60 [95% CI −0.94, −0.26], $P < 0.01$, $I^2 = 49\%$, 3 studies[31,53,86]) (**Fig. 6**).

For quality of life, meta-analysis was not possible because of different outcomes reported. Monticone et al.[53] reported greater improvement in the physical activity domain of the SF-36 in the psychological intervention group at long-term follow-up.

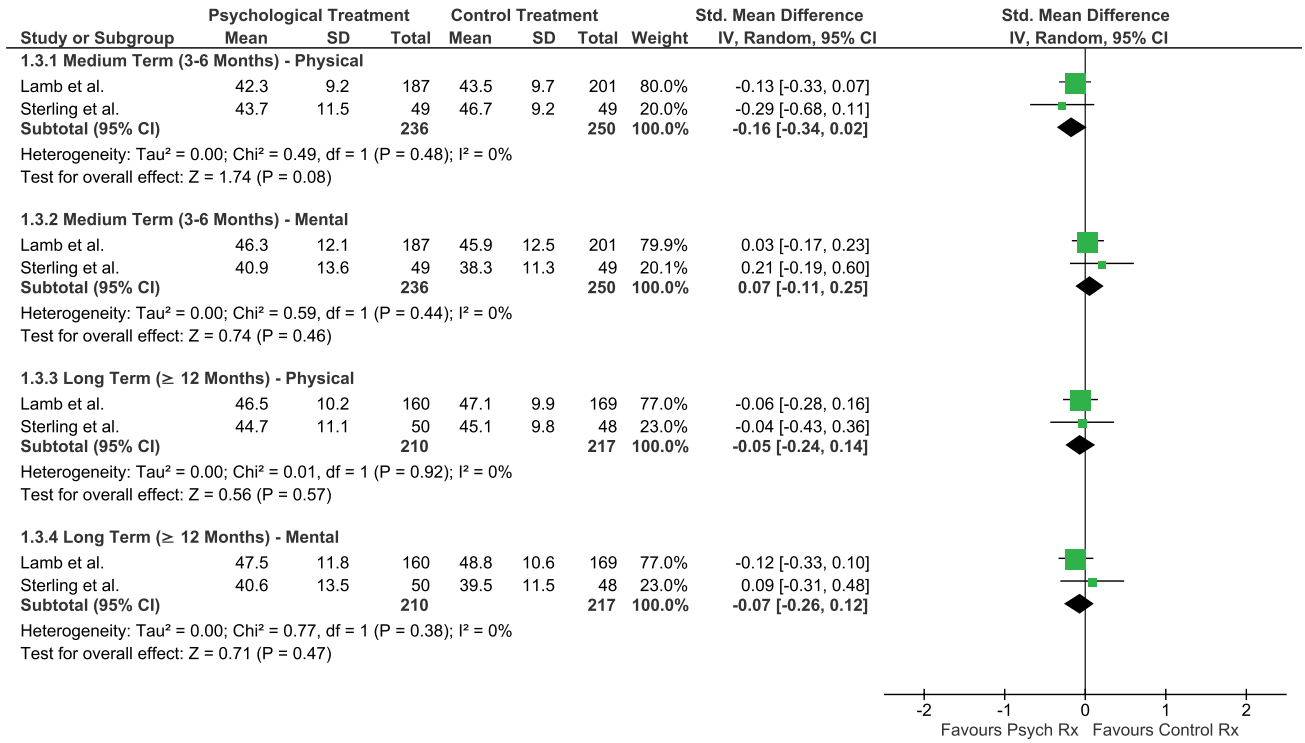

Figure 4. Meta-analysis of quality of life in acute whiplash-associated disorder (WAD). 95% CI, 95% confidence interval.

Whereas Vonk et al.[86] reported no group differences in EQ-5D at short- or long-term follow-up.

3.8. Subacute or mixed duration neck pain

For RCTs of patients with subacute or mixed duration neck pain, meta-analysis was undertaken for disability. We found moderate-quality evidence of no group differences at short-term (SMD −0.15 [95% CI −0.40, 0.10], $P = 0.24$, $I^2 = 0\%$, 2 studies[51,59]), medium-term (SMD 0.01 [95% CI −0.22, 0.25], $P = 0.91$, $I^2 = 10\%$, 2 studies[51,52]), or long-term follow-up (SMD 0.03 [95% CI − 0.43, 0.49], $P = 0.90$, $I^2 = 83\%$, 3 studies[51,52,59]) (**Fig. 7**). Meta-analysis could not be undertaken for pain because only one trial measured pain intensity,[59] which reported group differences favouring psychological treatment at 12 months.

For quality of life, meta-analysis was not possible because of the different outcomes used and nature of data reporting (ie, data not presented[59] or pooled with back pain data[51]). One trial[59] observed no group differences in the SF-36 and another trial[51] reported no differences in SF-12 mental and physical health component scores (back and neck pain patients combined). Moffet et al.[52] compared usual care physiotherapy with a brief cognitive behavioural intervention, with findings indicating greater improvement in the usual care physiotherapy group across various domains of the SF-36 at 3-month (mental health, energy, and fatigue) and 12-month follow-up (role physical, role emotional, mental health, energy and fatigue, pain, and general health perception).

3.9. Certainty of evidence and reporting biases

Full details of the GRADE assessment for each meta-analysis comparison can be found in Supplementary Table S1 (available at http://links.lww.com/PR9/A192). The reasons for downgrading certainty of evidence were mainly because of imprecision (small total sample size) and inconsistency of results (heterogeneity).

3.10. Quality of intervention description in included randomized controlled trials

Treatment methods were detailed in the published reports of 6 trials,[8,51–53,75,82] whereas published protocols[44,58,60,64,74,85,88,92] or a pilot study[33] that included descriptions of treatment methods were noted for the other 8 trials.[12,31,45,49,59,80,86,89] Five trials provided supplementary content detailing intervention methods[8,12,45,52,80]; although in one[8] of these trials, supplemental materials provided were related to manual therapy and exercise rather than the psychological intervention. Across the items on the TIDieR checklist (**Table 2** and Supplementary Table S2, available at http://links.lww.com/PR9/A192), all studies reported details of intervention name, rationale, procedures, provider and schedule, and most specified details of delivery mode and setting. However, although all studies mentioned trial materials such as a trial manual, training content, or patient diaries, only 3 trials provided access to such materials,[45,52,80] with one trial[80] providing the complete trial manual and treatment materials as supplementary content, one trial[45] providing online access to some trial materials (requiring log in), and another trial providing the assessment proforma for psychological treatment fidelity as supplementary content.[52] Procedural or operational details regarding intervention performance were general, limited, or unclear in 5 RCTs.[51–53,75,82] Ten trials[12,31,45,51,52,75,80,82,86,89] described methods to assess psychological treatment fidelity, whereas the actual treatment fidelity was reported in 8 trials.[12,45,51,52,59,80,82,86]

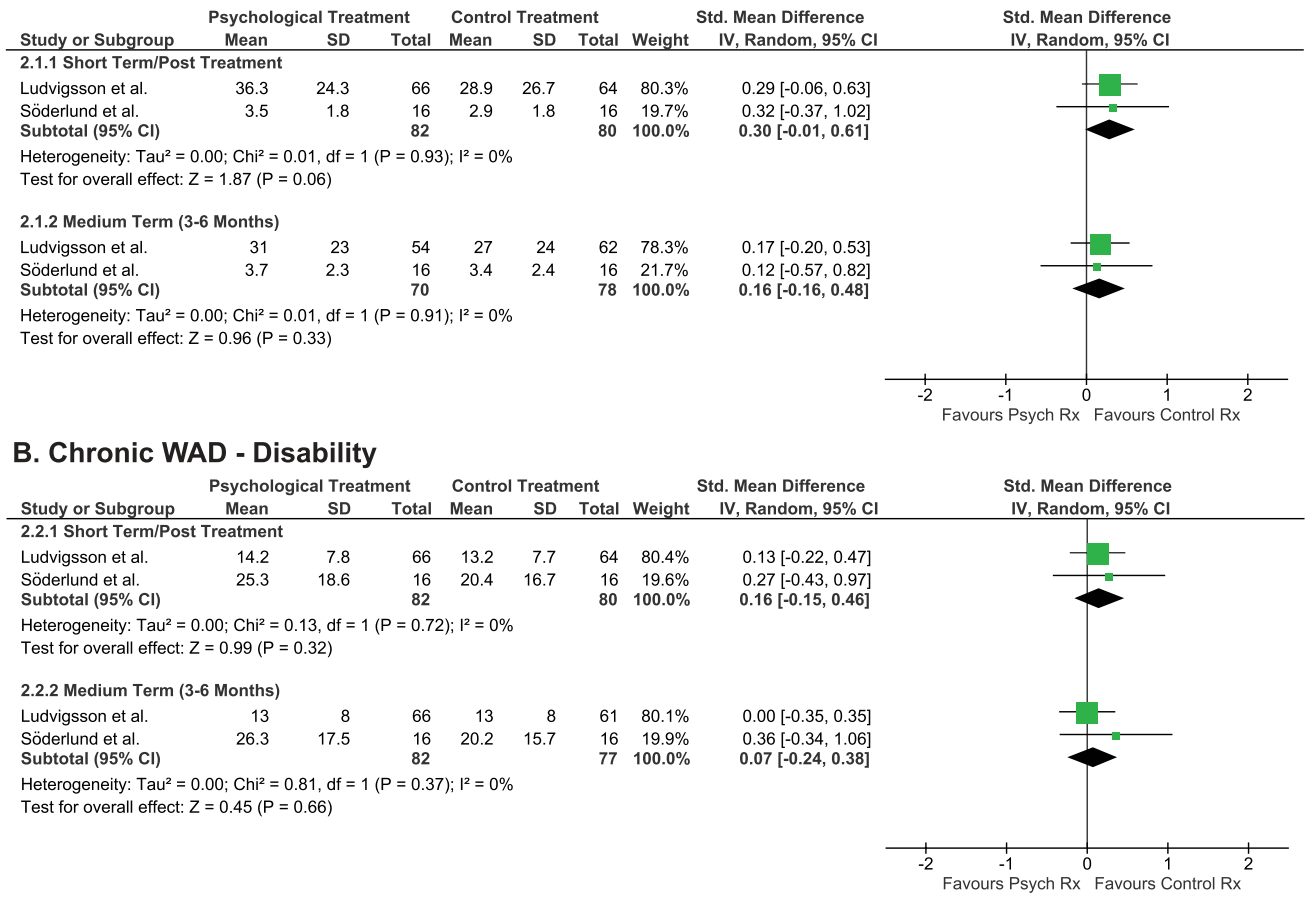

Figure 5. Meta-analysis of (A) pain and (B) disability in chronic whiplash-associated disorder (WAD). 95% CI, 95% confidence interval.

4. Discussion

This is the first systematic review to evaluate the effectiveness of physiotherapist-delivered psychological treatments for neck pain, differentiating for traumatic and nontraumatic neck pain and for acute and chronic stages. Physiotherapist-delivered psychological treatments improved pain and disability (small to medium effects) in chronic NTNP compared with exercise or manual therapy. In acute WAD, psychological treatments improved disability at short-term follow-up (small to medium effect) compared with guideline-based exercise or advice. No effect was found for chronic WAD, and no RCTs were found that included patients with acute nontraumatic neck pain. The quality of evidence was mostly moderate.

Previous systematic reviews have investigated effectiveness of physiotherapist-delivered psychological interventions for a range of pain conditions, including back pain,[11,35,84] postoperative pain,[20] and chronic musculoskeletal pain,[71,93] with outcomes spanning pain,[11,20,35,71,84] disability,[11,20,35,71,84,93] and psychological outcomes.[20,71,84] Of those reviews that performed meta-analysis, effects favoured physiotherapist-delivered psychological interventions for pain[35,71] and disability[35,71,93] compared with usual care interventions (typically exercise, manual therapy or advice). Reported effects were predominantly small to moderate, and our results are consistent with these findings. Our results build upon the findings of Silva Guerrero et al.,[71] who found no significant effects of psychological interventions on pain and disability for their combined WAD and neck pain subgroup. This difference may be attributed to our subgrouping based on symptom duration and aetiology of neck pain (critical distinctions from a clinical perspective), as well as the additional 4 RCTs conducted since the previous review.[47,80,82,89]

No significant effects were found for chronic WAD, which may be a consequence of only 2 RCTs comprising 80 participants being conducted.[49,75] This low number of RCTs/participants is surprising considering the greater levels of pain, disability, and psychological distress[62] reported by patients with chronic WAD compared with those with nontraumatic neck pain. These patients may require more specialised skills from a mental health care provider that are beyond the scope of physiotherapists. Support for this proposal comes from recent RCTs. In one trial, psychologist-delivered trauma-focussed CBT improved disability compared with a wait-list control for patients with chronic WAD and posttraumatic stress disorder (PTSD).[27] In another RCT in similar patients, psychologists provided the psychological intervention (trauma-focussed CBT or supported counselling) followed by physiotherapy exercise. Both groups showed improved pain and disability, although the patients remained moderately disabled.[2] Findings of other RCTs in patients with chronic WAD (without co-morbid PTSD) also revealed beneficial effects of psychologist-provided CBT on disability[3,90] and pain[3] compared with wait-list controls. In view of the burden and complexity of chronic WAD, further trials of psychological interventions with and without physiotherapy are needed.

Some RCTs specifically targeted psychological interventions to relevant psychological factors and at-risk patients, and these consistently showed beneficial effects. In people with chronic

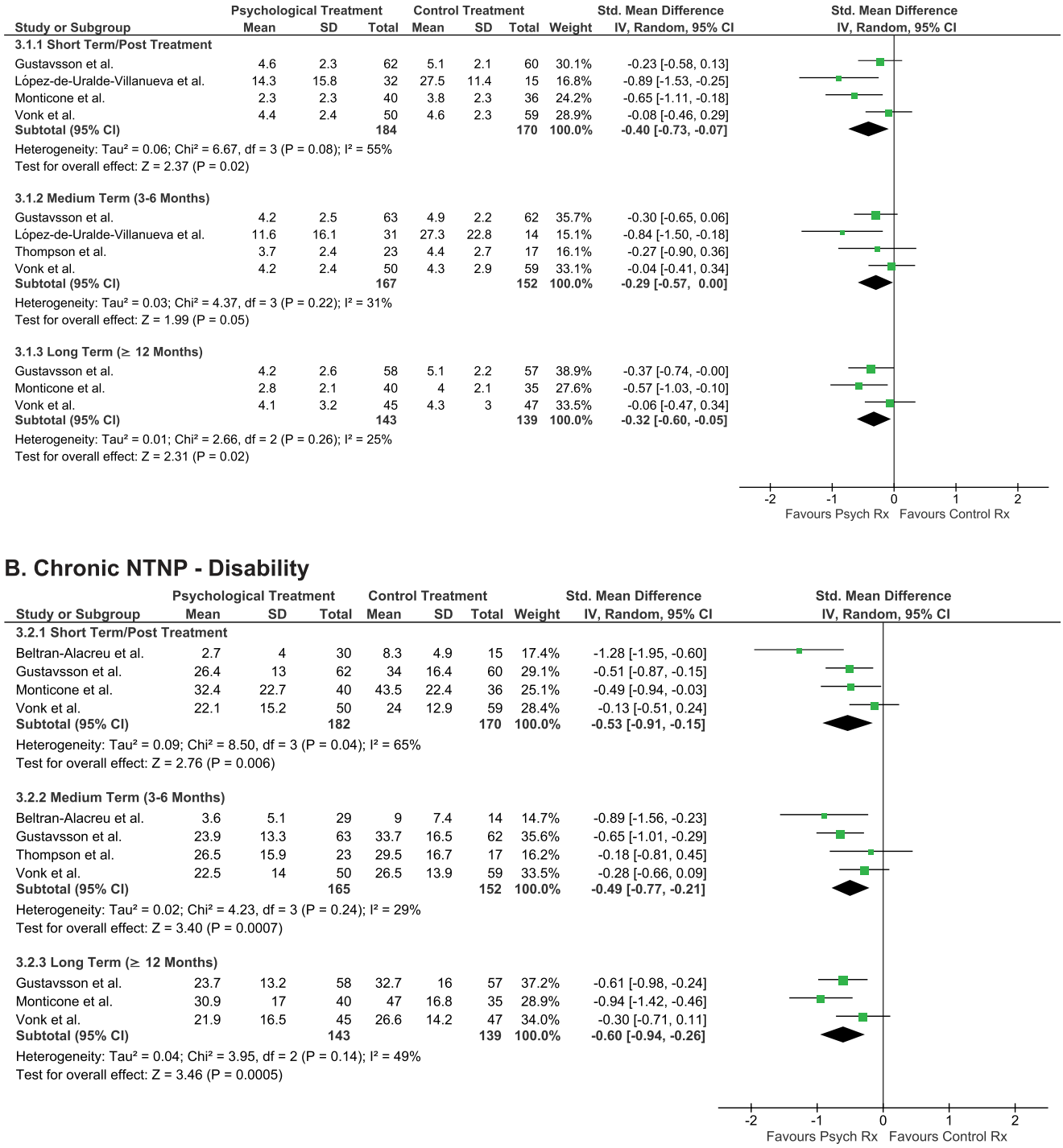

Figure 6. Meta-analysis of (A) pain and (B) disability in chronic non-traumatic neck pain (NTNP). 95% CI, 95% confidence interval.

NTNP, targeting patients' maladaptive beliefs, negative automatic thoughts, and behaviours using a cognitive behavioural approach had beneficial effects on pain and disability.[53] Maladaptive pain beliefs are predictive of poor outcome in musculoskeletal pain.[94] Similarly, a trial in patients with acute WAD and at-risk of poor recovery[80] targeted stress symptoms—a consistent predictor of poor recovery—and demonstrated effects on pain and disability.[13,61,68] Gustavsson et al.[31] also explicitly targeted stress in patients with chronic NTNP. Although the RCT by Ludvigsson et al.[49] did not demonstrate group differences in pain or disability favouring psychological intervention in chronic WAD, a secondary analysis[46] of the cohort using Bayesian Network modelling revealed a causal pathway spanning anxiety, depression, kinesiophobia, catastrophising, and self-efficacy leading to pain, implicating each of these psychological factors as potential treatment targets. Strategies to improve pain self-efficacy and self-management and promote positive coping strategies were also included in studies demonstrating effects favouring psychological interventions,[12,31,80,89] including 3 RCTs for acute WAD[12,80,89] in line with evidence that passive coping is a

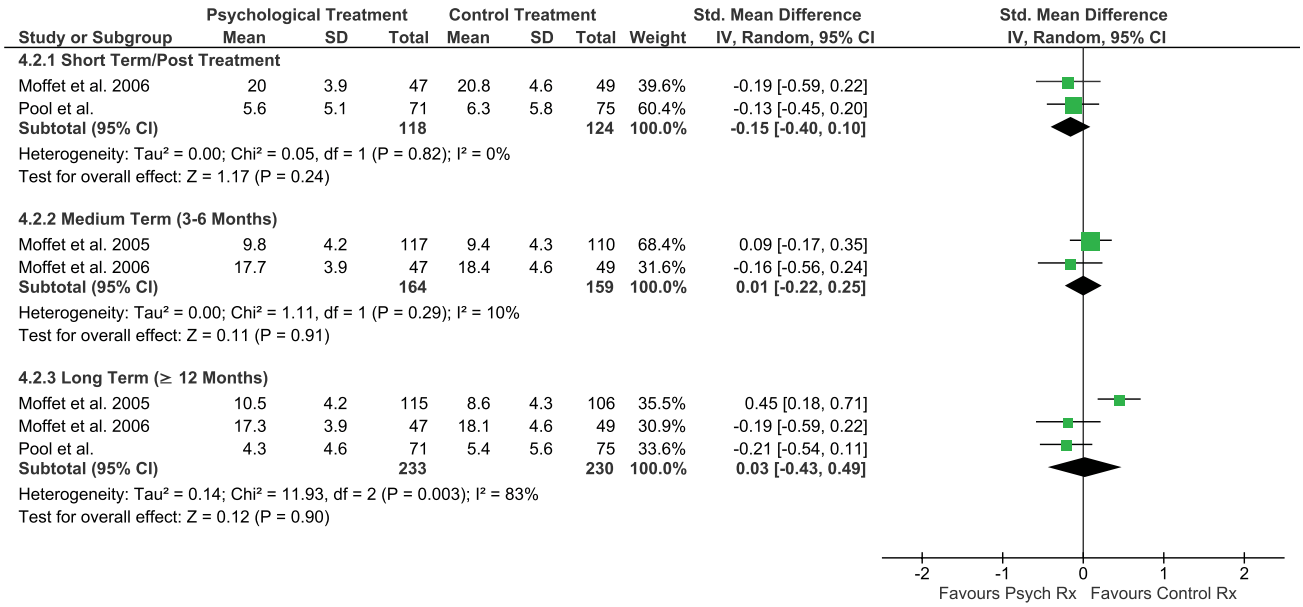

Figure 7. Meta-analysis of disability in subacute or mixed duration neck pain. 95% CI, 95% confidence interval.

prognostic factor for the development of chronic WAD.[13] Finally, although only used in one trial included in the present review,[80] the use of a risk stratification tool[63] to explicitly target treatment to patients at risk of poor recovery may be a promising direction for clinical and research applications of psychological interventions by physiotherapists, in line with similar approaches used in low back pain trials.[37]

Our findings indicate that physiotherapist-delivered psychological interventions, typically combined with exercise or other physiotherapy management, are more effective than standard physiotherapy approaches (such as exercise, manual therapy, or advice) for chronic NTNP and acute WAD—in agreement with reviews of other musculoskeletal pain conditions.[35,38,71,93] Together, these findings indicate that implementation in broader clinical physiotherapy settings is a priority to benefit patients with musculoskeletal pain. A barrier to implementation is the need to deliver large-scale training for physiotherapists. A first step in this process is the capacity to replicate the successful interventions identified in RCTs through adequate descriptions of interventions, including training manuals and detailed treatment protocols.[35] Many of the trials[51,53,75,82] in the present review described the interventions being evaluated in the reporting article only, whereas the other trials[8,12,31,45,49,52,59,80,86,89] had previously published protocols/pilot studies or provided additional documentation detailing the interventions—in one instance, a comprehensive treatment manual.[80] Although most items on the TIDieR[39] checklist were reported by the included trials, access to the trial materials was rarely provided and details of treatment fidelity were often not reported. Further, consistent with the findings of Hall et al.[35] in low back pain, descriptions of the specific practical or operational details of the interventions—that would permit reproduction in a clinical setting—were limited in some studies.[51–53,75,82] Additionally, because most trials did not provide access to trial materials (eg, treatment manual), our ability to examine the nature, amount, and quality of the psychological content delivered is limited. It should be noted that many of the included trials[31,45,51–53,59,75,86] were conducted and reported before the publication of the TIDieR[39] guidelines and checklist in 2014. Future studies should provide detailed treatment protocols, trial manuals, and materials and adhere to the TIDieR[39] guidelines and checklist for reporting interventions (including assessing and reporting treatment fidelity) to provide suitable descriptions of treatment procedures and facilitate replication of treatments in clinical practice.

This systematic review with meta-analysis was undertaken in accordance with the PRISMA guidelines. When interpreting the findings of our study, it is important to note the considerable heterogeneity of the psychological interventions (eg, 9 weeks of behavioural graded activity,[86] 1–3 brief cognitive behavioural sessions,[52] 3 months of multimodal physiotherapy and CBT[53]) and standard physiotherapy/usual care comparators (eg, single advice session,[45] 3 months of neck-specific exercise[49]) used in the RCTs. There was also variability in training received by the physiotherapists delivering the psychological interventions, which ranged from half a day[82] to weeks in duration,[12,89] delivered by a range of professionals including psychologists,[12,51–53,59,75,80,86] behavioural therapists,[45,59] a rehabilitation physician,[80] and physiotherapists with applicable expertise.[31,45,47,49,52,82,86,89] These factors may have contributed to the substantial statistical heterogeneity ($I^2 > 50\%$)[7] noted in some meta-analysis comparisons. This heterogeneity, as well as the limited number of RCTs and often small sample sizes, led to reductions in GRADE quality of evidence ratings.

We note that recent concerns have been raised regarding the veracity of data reported for RCTs published by a particular research group (see O'Connell et al.[55]). One trial from this research group[53] was included in our review and investigated a physiotherapist-delivered psychological intervention compared with a standard physiotherapy intervention in chronic NTNP. This trial was not one of the RCTs reporting results divergent from the evidence base in the evaluation by O'Connell et al.[55] It demonstrates comparable effect sizes to other RCTs included in our review, so we did not exclude this trial from our meta-analysis.

Future research on physiotherapist delivery of psychological interventions in musculoskeletal pain conditions (including neck

Table 2

Reporting of interventions in included studies across items of the template for intervention description and replication (TIDieR)[39] checklist.

	Beltran-Alacreu et al.[8]/López-de-Uralde-Villanueva et al.[47]	Bring et al.[12]	Gustavsson et al.[31]	Lamb et al.[45]	Ludvigsson et al.[49]	Moffet et al.[52]	Moffet et al.[51]	Monticone et al.[53]	Pool et al.[59]	Söderlund et al.[75]	Sterling et al.[80]	Thompson et al.[82]	Vonk et al.[86]	Wiangkham et al.[89]
Name	Therapeutic patient education intervention (biobehavioral approach)	Individually tailored behavioural medicine intervention	Pain and stress self-management group intervention (PASS)	Managing injuries of the neck trial (MINT) intervention	Neck-specific exercise with behavioural intervention	Brief intervention	Solution finding approach	Physiotherapy plus cognitive behavioural therapy	Behavioural graded activity	Physiotherapy with cognitive behavioural components	Stress inoculation training with exercise (StressModex)	Interactive behavioural modification therapy (IBMT)	Behavioural graded activity	Active behavioural physiotherapy intervention (ABPI)
Rationale	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Materials	Mentioned but not provided (specific to psych Rx)	Mentioned but not provided	Mentioned but not provided	Weblink for some materials	Mentioned but not provided	Fidelity assessment provided	Mentioned but not provided	Mentioned but not provided	Mentioned but not provided	Mentioned but not provided	All trial materials provided	Mentioned but not provided	Mentioned but not provided	Mentioned but not provided
Procedures	✓	✓	✓	✓	✓	?✓	?✓	?✓	✓	?✓	✓	?✓	✓	✓
Provider & training	Physio Trained by physio with formal training in psychological Rx*	Physio 2 × 5-wk training, including by psych*	Physio 4 × 0.5-d training by physio expert in behavioural Rx*	Physio 1- to 1.5-d training by physio expert in CBT	Physio 1-d training by physio with formal training/ expert in psychological Rx*	Physio 1-d training by psych and physio	Physio 2-d training led by psych	Physio Trained by psych	Physio 2-d training by psych and behavioural therapist	Physio Trained by psych*	Physio 1.5-d training by psych and rehab physician; 1-d booster midway through RCT	Physio 0.5-d training by physio expert in psychological Rx*	Physio 2-d training by psych and physio*	Physio Trained by physio expert in psych Rx, in group and then individual sessions*
Delivery	F2F, individual	Internet or F2F, individual	F2F, groups	F2F, individual	Unclear (likely F2F, individual)	Unclear (likely F2F, individual)	F2F, individual	F2F, individual	Unclear (likely F2F, individual)	F2F, individual	F2F, individual	Small groups, likely F2F (not stated)	Individual, likely F2F (not stated)	F2F, individual
Setting	Not clear (likely physio clinic)	Internet or physio clinic	Primary care	Physio depts	Primary care	Physio depts	Physio depts	Hospital outpatient dept	Primary care	Orthopaedic clinic	Private physio clinics	Physio depts	Outpatient setting	Private physio clinics
Dosage & schedule	8 sessions, 2/wk, over 1 mo (2 × 20-min therapeutic patient education sessions)	Internet: 7 modules, 1/wk, over 5–10 wk; F2F: 7 modules, 1/wk, 1 × 1-h session/wk	7 × 1.5-h sessions, over 7 wk, booster session at 20 wk	Assessment session and ≤6 treatment sessions over 8 wk; more if necessary	24 sessions over 12 wk	1–3 sessions	Plan: 1–3 sessions; mean 3.2 sessions	≤12 × 45- to 50-min session, 1–2/wk, over 2–3 mo	≤18 × 30-min sessions	≤12 sessions (median 11)	≤16 × 50-min sessions over 6 wk (10 × exercise, 6 × psychological Rx)	4 × 90-min sessions/wk over 4 wk	≤18 × 30-min sessions, over 9 wk	6–8 × 30-min sessions, 1/wk
Tailoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Modifications	N/A	X	N/A	✓	N/A	N/A	?✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fidelity (planned)	X	✓	✓	✓	X	✓	✓	X	X	✓	✓	✓	✓	✓
Fidelity (reported)	X	✓	X	✓	X	✓	✓	X	✓	X	✓	✓	✓	X

Further details are provided in Supplementary Table S2, available at http://links.lww.com/PR9/A192.

Details of physiotherapist training were confirmed by authors via email for 8 studies (7/8 provided the requested information for this review, and one author[31] provided details for our centre's prior review[71]).

* Confirmed by email contact with authors.

?✓, unclear or limited details; ✓, described in paper or published protocol/pilot study; CBT, cognitive behavioural therapy; F2F, face to face; N/A, not applicable; Physio, physiotherapist; Psych, psychologist; Rx, intervention; X, not reported.

pain) should (1) develop and evaluate more effective treatments for chronic WAD, (2) undertake further RCTs in acute WAD and NTNP, (3) further evaluate risk stratification, as well as subgrouping based on psychological factors, to guide and assess delivery of targeted interventions, and (4) explore barriers and facilitators to training and implementation of physiotherapist delivery of psychological interventions in clinical practice.

5. Conclusions

Psychological interventions delivered by physiotherapists were more effective than standard physiotherapy (including exercise, advice, manual therapy, and electrophysical agents) for chronic NTNP and—in the short term—acute WAD. Such treatment approaches should be considered in the management of these patient groups with adequate training for clinicians. Effect sizes were small or medium with mostly moderate quality evidence from a limited number of RCTs. Further high-quality RCTs would increase confidence in these conclusions.

Disclosures

The authors have no conflict of interest to declare.

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Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at http://links.lww.com/PR9/A191 and http://links.lww.com/PR9/A192.

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