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A Protocol for a Network Meta-Analysis Comparing the Effectiveness of Neck Proprioceptive Exercise, Deep Cervical Muscle Training, and Conventional Exercise in Chronic Neck Pain Management

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ADMINISTRATIVE INFORMATION

Support - Taiwan Society of Ultrasound in Medicine.

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 October 2025 and was last updated on 17 October 2025.

INTRODUCTION

Review question / Objective To evaluate and rank the effectiveness of neck proprioception training, deep neck muscle training, and conventional exercise programs in reducing pain intensity and improving disability.

Rationale Neck pain affects up to 50% of adults annually, with many progressing to chronic, disabling conditions despite the absence of clear structural abnormalities. Chronic neck pain is defined as pain lasting more than three months and often shows limited response to pharmacological or surgical treatment, underscoring the need for effective conservative approaches. According to clinical guidelines, exercise therapy is recommended for reducing pain and disability, including neck proprioceptive training, deep neck muscle training, and conventional exercises such as stretching and strengthening. These modalities enhance sensorimotor control, improve segmental stability, and restore muscular balance, thereby alleviating symptoms.

Condition being studied Therefore, we would like to perform The PICO (population, intervention, comparison, outcome) setting of the current network meta-analysis included: (1) P: human participants with chronic neck pain; (2) I: examination using neck proprioception training, deep neck muscle exercises, and conventional neck exercises; (3) C: no intervention, sham therapy, or education; and (4) O: changes in pain intensity and disability.

METHODS

Search strategy Two reviewers across PubMed, the ClinicalTrials.gov, Web of Science Core Collection and Ovid Medline. Search terms included ("neck proprioception exercise" OR "neck sensorimotor control exercise" OR "deep neck

core muscle exercise" OR "neck motor control exercise" OR "neck stretch exercise" OR "neck muscle strength exercise" OR "neck range of motion exercise") AND ("chronic neck pain" OR "chronic cervical pain").

Participant or population Patients with chronic neck pain.

Intervention Neck proprioception training, deep neck muscle exercises, and conventional neck exercises.

Comparator No intervention, sham therapy, or education.

Study designs to be included Randomized controlled trials.

Eligibility criteria (1) randomized controlled trials that investigated pain intensity and disability; (2) studies involving adults diagnosed with CNP based on symptom duration; and (3) intervention groups receiving a single type of exercise treatment.

Information sources Two reviewers (L.-H.L. and T.-Y.L.) across PubMed, the ClinicalTrials.gov, Web of Science Core Collection and Ovid Medline. Search terms included ("neck proprioception exercise" OR "neck sensorimotor control exercise" OR "deep neck core muscle exercise" OR "neck motor control exercise" OR "neck stretch exercise" OR "neck muscle strength exercise" OR "neck range of motion exercise") AND ("chronic neck pain" OR "chronic cervical pain").

Main outcome(s) Pain intensity was the primary outcome, measured using the Visual Analog Scale (VAS) and Numeric Rating Scale (NRS), both validated tools for quantifying pain severity in clinical research.

Data management Two independent reviewers extracted study characteristics, interventions, and outcomes, resolving discrepancies by consensus or with a third reviewer. For studies with multiple data points, post-intervention outcomes were analyzed. Missing data were requested from authors, and non-parametric values were converted to means and standard deviations following Cochrane Handbook recommendations.

Quality assessment / Risk of bias analysis Methodological quality was assessed using the PEDro scale, which rates 10 methodological criteria excluding eligibility. Scores range from 0–10, with ≤3 indicating poor, 4–5 fair, 6–8 good, and 9–10 excellent quality.

Strategy of data synthesis Indirect comparisons in the network meta-analysis assumed transitivity, requiring similar distributions of effect modifiers across comparisons. Treatment duration was the primary modifier and showed overall overlap among interventions, supporting this assumption. A frequentist random-effects model (Stata 19, StataCorp) estimated standardized mean differences (SMDs) with 95% CIs, heterogeneity (Tau^2), and treatment ranking via SUCRA. Inconsistency was assessed using the side-splitting method, with $p < 0.05$ considered significant.

Subgroup analysis Not available.

Sensitivity analysis Not available.

Language restriction No language limit.

Country(ies) involved Taiwan.

Keywords Neck pain, proprioception, network meta-analysis, exercise therapy.

Contributions of each author

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