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Effectiveness of Progressive Muscle Relaxation for Adults with Non-Specific Neck Pain: A Systematic Review

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Abstract

Background: Non-specific neck pain is a prevalent musculoskeletal disorder in adults, often associated with prolonged static posture and psychological stress. This condition can impair daily activities, productivity, and quality of life. Progressive Muscle Relaxation (PMR) has been proposed as a non-pharmacological intervention to reduce symptoms and improve function.

Methods: This systematic review followed PRISMA guidelines. A comprehensive search was conducted in PubMed, Semantic Scholar, and Google Scholar, identifying 642 articles. Five studies published between 2015 and 2025 met the inclusion criteria: randomized controlled trials or quasi-experimental designs involving adults aged 15–60 years diagnosed with non-specific neck pain, evaluating the effects of PMR on functional outcomes. Keywords used included ("Progressive Muscle Relaxation" OR "PMR") AND ("Neck Pain" OR "Nonspecific Neck Pain") AND ("Function" OR "Disability"). Methodological quality was assessed using the PEDro scale, and data were narratively synthesized due to heterogeneity in study designs and outcome measures.

Results: All five studies reported that PMR effectively reduced pain intensity and muscle tension while improving neck function. PEDro scores ranged from 5 to 6, indicating moderate to good quality. Several studies noted additional benefits when PMR was combined with exercise or educational interventions.

Conclusion: PMR is a safe, accessible, and cost-effective intervention that can improve functional outcomes in adults with non-specific neck pain, as measured by tools such as the Neck Disability Index. Further high-quality studies with standardized protocols are needed to strengthen current evidence.

Keywords: Progressive Muscle Relaxation, Neck Pain, Adults

Introduction

Non-specific neck pain (NSNP) is a prevalent musculoskeletal disorder among adults and is often associated with functional impairments.[1] In Indonesia, the prevalence of neck pain reaches 46.5% of the population, with up to 50% of individuals experiencing recurrent episodes without appropriate treatment.[2] One of the primary contributing factors is prolonged static posture, particularly non-ergonomic positions during daily activities such as working or prolonged screen use.[3,4] These factors can lead to muscular imbalances and tension in the cervical region.[5,6]

According to the Global Burden of Disease (GBD) report, the number of global neck pain cases is projected to increase by 32.5% from 2020 to 2025, with young adults aged 18–29 years experiencing a considerable share of years lived with disability (YLD).[7] Setyaningsih and Trisnowati also reported a significant association between prolonged smartphone use and increased neck pain among individuals aged 15–45 years.[8]

Activities involving a forward head posture and prolonged cervical flexion reduce neck muscle strength,[9] resulting in decreased physical comfort,[4] reduced quality of life, and impaired productivity in daily and occupational tasks.[10] Psychological stress is another key factor in the development and persistence of neck pain.[11] Chronic stress contributes to prolonged muscle tension in the neck area, exacerbating pain, delaying recovery, and diminishing quality of life.[12] Stress from academic, occupational, or social demands may lead to emotional strain with physiological consequences.[1,9] During stressful episodes, the neck muscles often contract excessively, causing pain and stiffness.[13] Stress is also associated with increased muscle tension in the shoulders, back, and neck.[3]

One promising non-pharmacological approach is the Jacobson Progressive Muscle Relaxation Technique (PMRT), introduced by Dr. Edmund Jacobson in the 1920s.[14] PMR emphasizes the systematic tensing and relaxing of specific muscle groups, thereby reducing both physiological and psychological tension and enhancing overall well-being.[15] By downregulating sympathetic nervous system activity heightened by psychological or physiological stressors, PMR may alleviate muscle tension and associated pain.[9,11] This aligns with findings by Metikaridis et al., who reported that PMR significantly reduced neck pain and stress by helping participants identify and relax tense muscles.[14] Similarly, Shah and Zala found that PMRT significantly reduced pain and improved functional outcomes, as measured by the Neck Disability Index (NDI), in individuals aged 18–24 years.[16] Alghadir et al. also confirmed the efficacy of relaxation techniques in improving range of motion and pain thresholds in individuals with neck pain. Supporting these findings,[17] Kaur and Kumar demonstrated that PMRT effectively reduced musculoskeletal discomfort among software engineers with work-related postural stress.[18]

While many studies have evaluated PMR's effect on stress and anxiety, fewer have investigated its impact on functional outcomes such as NDI scores, cervical range of motion, or daily performance in NSNP populations. Existing studies often suffer from small sample sizes and short intervention durations. Moreover, no comprehensive systematic review to date has evaluated the isolated effect of PMRT on functional improvements in adults with NSNP. Previous research typically compares PMRT with interventions like stretching, manual therapy, or exercise therapy, making it difficult to isolate its specific benefits.

Therefore, this review aims to fill that gap by focusing exclusively on the effectiveness of PMRT as a stand-alone intervention in improving function among adults with NSNP. PMR was selected for its dual impact on muscular relaxation and sympathetic nervous system modulation, which may contribute to enhanced functional ability and reduced pain. In this context, "function" refers to the individual's capacity to carry out daily activities without limitation from neck pain, along with improved cervical range of motion. Primary outcomes of interest include pain intensity, commonly measured using the Visual Analogue Scale (VAS) or Numerical Pain Rating Scale (NPRS), and functional disability, assessed using the NDI.

This review aims to provide stronger empirical evidence regarding the role of PMR in managing NSNP. Physiotherapists and healthcare providers are encouraged to consider integrated, holistic approaches that address both physical and psychological dimensions of neck pain. By conducting this systematic review titled *"Effectiveness of Progressive Muscle Relaxation for Improving Function in Adults with Non-Specific Neck Pain,"* we hope to enrich the existing literature and offer practical guidance for implementing evidence-based, non-invasive interventions in clinical physiotherapy practice.

Methods

This study employed a systematic review approach with a search period extending until April 25, 2025, targeting articles published between 2015 and 2025. The SLR methodology was chosen for its ability to synthesize evidence in a structured and transparent manner, thereby minimizing potential bias. Compared to meta-analysis, which requires data homogeneity, and narrative reviews, which often suffer from subjectivity, SLR offers greater flexibility and objectivity.

The literature search was conducted through electronic databases including PubMed, Semantic Scholar, and Google Scholar, utilizing a combination of keywords and Boolean operators (AND, OR, NOT). The review focused exclusively on full-text literature published in peer-reviewed journals and open-access sources available within the aforementioned databases. Risk of bias was assessed using the PEDro Scale.

Nevertheless, the potential for publication bias is acknowledged, as studies with significant or favorable results are more likely to be published and indexed in academic databases, potentially skewing overall conclusions. Additionally, systematic limitations in the existing literature—such as the predominance of studies conducted in specific regions (e.g., Asia and Europe)—may restrict the generalizability of the findings. Methodological weaknesses recurrently observed across studies, particularly the absence of blinding, allocation concealment, and intention-to-treat analysis, may also introduce bias and limit the strength of causal interpretations. The article selection process adhered to the PICO framework, outlined as follows (Table 1).

Table 1. PICO Framework

Framework	Keywords
Population	Adults with Neck Pain
Intervention	Progressive Muscle Relaxation (PMR)
Comparison	No intervention
Outcome	Pain Relief

The SLR process involved four key stages: identification, screening, data extraction, and analysis. Article identification and screening were conducted via systematic searches of PubMed, Google Scholar, and Semantic Scholar, following the PICO framework. The search string included keywords such as "Progressive Muscle Relaxation" AND "Adults" AND "Neck Pain" OR "Non-Specific Neck Pain." The final search, conducted on April 25, 2025, yielded a total of 642 articles. After title and abstract screening, 624 articles were excluded for not meeting the PICO-based criteria, leaving 18 articles for full-text evaluation. To refine the selection, inclusion and exclusion criteria were applied as filters. These are presented in the Table 2.

Table 2. Inclusion and Exclusion Criteria for Article Selection

No	Inclusion Criteria	Exclusion Criteria
1	Adults (>15 years) with non-specific neck pain	Subjects <15 or >60 years, or not diagnosed with non-specific or presenting radiating neck pain
2	Interventions involving Progressive Muscle Relaxation (PMR)	Studies not incorporating PMR interventions
3	Measurement of neck pain reduction and functional improvement	Studies lacking outcome measurements for pain or functional improvement
4	Articles published between 2015–2025	Articles published before 2015
5	Articles written in English or Indonesian	Articles written in other languages
6	Studies using PMR in combination with other techniques, provided PMR effects are isolable	Combined interventions where the effect of PMR could not be specifically isolated
7	Experimental study designs (RCTs, pretest-posttest), both qualitative and quantitative	Case reports and literature reviews
8	Articles with a PEDro Scale score ≥ 5	Articles with PEDro Scale scores ≤ 3

Based on these criteria, nine articles were deemed eligible. The selected articles specifically addressed the research topic, employed the Jacobson Progressive Muscle Relaxation (JPMR) method, and utilized validated functional outcomes, particularly the Neck Disability Index (NDI) and/or the Visual Analog Scale (VAS), to assess pain.

Quality appraisal was conducted using the PEDro Scale, tailored for evaluating clinical trials in physiotherapy and rehabilitation. The scale considers key methodological elements, including randomization, blinding, allocation concealment, and reporting completeness. A threshold score of ≥5 was established to ensure inclusion of studies with moderate to high methodological quality, as commonly applied in prior reviews.

The selected articles comprised diverse research designs, including three randomized controlled trials (RCTs) and two quasi-experimental studies, with sample sizes ranging from 20 to 80 participants. Following full-text assessment and quality appraisal, data were extracted through narrative synthesis. This method allowed for descriptive comparison and summary of study findings without pooling data statistically.

During synthesis, common patterns across studies were examined, such as PMR session duration, intervention frequency, type of functional outcome measurement (NDI, VAS), and participant characteristics (e.g., age, gender, musculoskeletal profile). Variations in supplementary interventions and timeframes between intervention and follow-up were also considered to evaluate the consistency of PMR's effects on functional outcomes in adults with nonspecific neck pain.

A meta-analysis was not performed due to considerable heterogeneity among the included studies, including differences in methodological designs (RCTs vs. quasi-experimental), PMR intervention duration and frequency, sample sizes, and the range of additional outcome measures. Hence, a narrative synthesis was considered the most suitable approach to preserve the contextual integrity of each study.

Data extraction was independently performed by the primary researcher through critical evaluation and manual review of study details such as characteristics, interventions, outcomes, and results. No specialized software (e.g., Covidence, Rayyan) or standardized data extraction forms were utilized; instead, manual tracking via spreadsheets and personal notes was employed, reflecting the scope and academic level of this review.

Article selection was conducted by two independent reviewers based on the established inclusion and exclusion criteria. In cases of disagreement, open discussions were held to resolve discrepancies and reaffirm adherence to selection standards. Articles with uncertain eligibility were documented in a tracking table and re-evaluated to ensure objective and consistent decision-making. This process was designed to minimize selection bias and uphold the integrity of the review.

Unaddressed selection bias may influence systematic review findings, leading to the inclusion of lower-quality or less relevant studies, which in turn can distort the perceived effectiveness of the intervention. Overrepresentation of positive results or inconsistent application of selection criteria may yield overly optimistic conclusions. Additionally, the predominance of studies from Asia and Europe introduces geographical bias, potentially limiting the generalizability of JPMR’s effectiveness across global populations with differing cultural, healthcare, and socio-economic contexts. Future studies should aim for broader geographical representation to enhance the external validity of findings.

Although a narrative synthesis was employed, outcome comparisons between PMR and control groups were supported by standardized assessment tools. Pain reduction was commonly evaluated using the VAS, enabling quantitative comparisons of pre- and post-intervention scores. Functional improvements were measured via the NDI, offering standardized data on neck-related disability.

The final synthesis was exclusively narrative, summarizing and comparing key findings from selected studies to identify consistent patterns and insights regarding PMR’s effectiveness in managing nonspecific neck pain among adults. No additional statistical analyses—such as dose-response relationships, gender-based comparisons, or session duration evaluations—were conducted. However, age stratification was implemented, with the adult population defined as individuals aged 15–60 years in accordance with the inclusion criteria.

This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to systematically document the study flow, encompassing the identification, screening, eligibility, and inclusion stages. The number of articles retrieved, screened, and excluded at each stage was recorded using a PRISMA flow diagram. Each inclusion or exclusion decision was also documented in detail, along with justifications for exclusion at the full-text stage. While this review adhered closely to PRISMA standards, it was not registered with PROSPERO or any similar registry, as it was conducted as an undergraduate thesis and protocol registration was not deemed mandatory.

Follow-up duration was also considered during inclusion to ensure that selected studies provided insights not only into short-term outcomes but also into the sustainability of intervention effects. Studies lacking sufficient post-intervention follow-up were excluded to maintain outcome consistency. Of the five articles included, two—Kaya & Celenay (2019) and Yoo et al. (2022)—reported follow-up assessments. Kaya & Celenay (2019) evaluated outcomes four weeks post-intervention, while Yoo et al. (2022) reported outcomes three weeks after treatment cessation. Both studies indicated sustained PMR benefits on pain reduction and functional improvement during follow-up, assessed via subjective parameters such as VAS and NDI, as well as stress and quality-of-life measures. However, most other studies were limited to immediate post-intervention outcomes, highlighting the need for further research involving longer follow-up durations to confirm the long-term efficacy of PMR.

Results

The PRISMA flow diagram is presented in Figure 1.

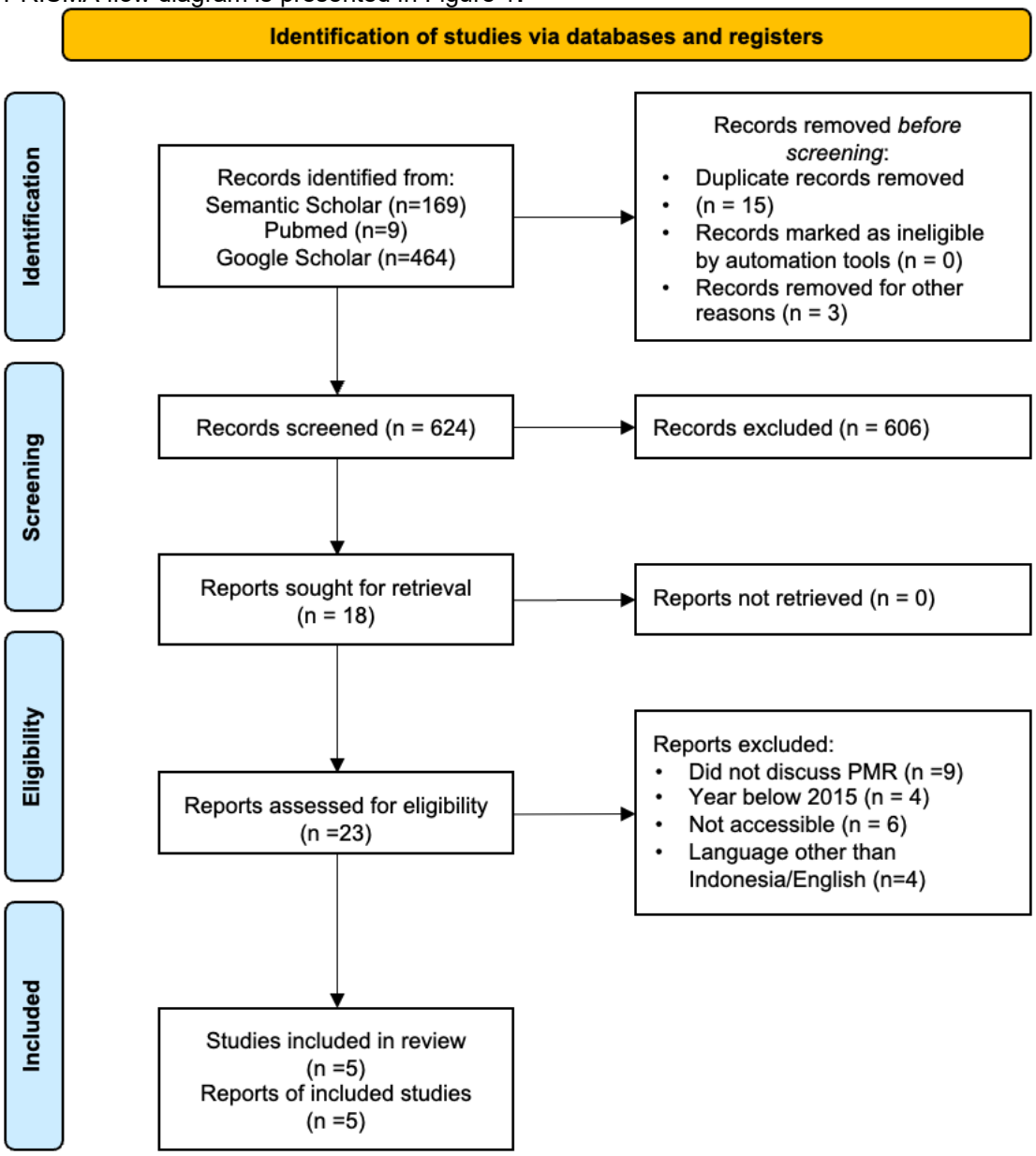

Figure 1. PRISMA Flow Diagram

The selected articles were assessed for methodological quality using the Physiotherapy Evidence Database (PEDro) Scale, which evaluates the rigor of clinical trials in physiotherapy and health sciences. Quality assessment is essential to minimize bias and enhance the reliability of research outcomes. The results of the PEDro evaluation are presented in Table 3.

Table 3. PEDro Scale Assessment Results

No	Study	Metikaridis et al. (2017)	Kaya & Celenay (2019)	Shah & Zala (2019)	Yoo et al. (2022)	Loh et al. (2022)
1	Eligibility criteria	Yes	Yes	Yes	Yes	Yes
2	Random allocation	1	1	1	1	1
3	Concealed allocation	0	1	0	0	0
4	Baseline comparability	1	1	1	1	1
5	Blinding of subjects	0	0	0	0	0
6	Blinding of therapists	0	0	0	0	0
7	Blinding of assessors	0	1	0	0	1
8	Adequate follow-up	1	0	1	1	1
9	Intention-to-treat analysis	0	0	0	0	0
10	Between-group comparisons	1	1	1	1	1
11	Point estimates and variability	1	1	1	1	1
	Total PEDro Score	5/10	6/10	5/10	5/10	5/10
	Quality	Average	Good	Average	Average	Average

Table 3 presents the results of the PEDro Scale assessment for the five included studies. Each row corresponds to one of the 11 evaluation criteria, encompassing elements such as randomization, blinding, and intergroup comparisons. A score of "1" indicates the criterion was met, while "0" indicates it was not fulfilled or not adequately

reported. The total PEDro score is calculated based on the first 10 criteria (excluding eligibility), which serves as the basis for classifying the methodological quality.

In this review, classifications such as “Good” and “Average” were adopted from commonly referenced thresholds in the literature, including Maher et al. [2003], who define scores of 6–8 as “good,” 4–5 as “average,” and below 4 as “poor” quality. This classification facilitates an overview of the degree to which studies adhere to rigorous clinical trial standards.

Based on the PEDro quality assessment summarized in Table 3, the studies indicate that Progressive Muscle Relaxation (PMR) is an effective intervention for reducing pain and stress while improving neck function in individuals with nonspecific neck pain. Despite some methodological variations, the majority of studies consistently demonstrated positive outcomes. Notably, Yoo et al. (2022) and Loh et al. (2022) reported significant reductions in both pain and stress following PMR intervention. Similarly, Kaya and Celenay (2019) found notable improvements in function and pain reduction in chronic neck pain patients. Metikaridis et al. (2017) and Shah & Zala (2019) also reported benefits, albeit with limitations in methodological controls.

However, a primary source of potential bias across studies stems from the absence of blinding and the lack of intention-to-treat analysis. This may weaken the strength of the evidence. The absence of blinding can introduce perception and reporting biases, particularly in studies involving non-pharmacological interventions that rely heavily on subjective outcomes. Furthermore, inadequate allocation concealment raises concerns about randomization integrity, while the exclusion of dropouts from the analysis (i.e., lack of intention-to-treat) can lead to skewed results. Future studies should therefore adopt more rigorous randomized controlled designs, incorporating blinding, allocation concealment, and intention-to-treat principles, alongside the inclusion of active control groups to improve internal validity.

Study Outcomes on the Effectiveness of Progressive Muscle Relaxation (PMR)

Analysis of the five included studies reveals that the Progressive Muscle Relaxation (PMR) technique consistently demonstrated effectiveness in alleviating nonspecific neck pain and improving functional ability in daily activities. The outcomes were evaluated using functional parameters such as the Neck Disability Index (NDI) and pain intensity via the Visual Analog Scale (VAS). These studies varied in intervention duration, session frequency, and participant characteristics. A summary of these findings is provided in Table 4**.**

Table 4. Summary of Study Results

No	Author	Methodology (Design, Sample, Duration)	Outcome Measures	Group	VAS	NDI	Pain (p-value)	Functional Improvement (p-value)
1	Metikaridis et al. (2017)	Pilot RCT; n=70; 6 weeks, 2x/week	VAS, NDI	Intervention	8.33	22.63	0.002	0.000
2	Kaya & Celenay (2019)	Quasi-RCT; n=30; 4 weeks, 3x/week	VAS, NDI	Intervention	6.31	19.62	0.008	0.001
3	Shah & Zala (2019)	Pretest-posttest control group; n=30; 2 weeks, 5x/week	VAS, NDI	Intervention	0.93	4.93	0.001	0.001
4	Yoo et al. (2022)	Pilot RCT; n=40; 8 weeks, 2x/week	VAS, NDI	Intervention	6.22	19.68	0.001	0.001
5	Loh et al. (2022)	Quasi-RCT; n=60; post-op 7 days	VAS	Intervention	3.38	–	0.003	–

Based on the synthesis of the five reviewed studies, non-pharmacological interventions—particularly PMR, stabilization exercises, and multimodal therapy—were effective in reducing pain and disability among patients with neck pain. All studies showed statistically significant improvements in the intervention groups, as evidenced by reduced VAS and NDI scores. VAS scores in the intervention groups ranged from 0.93 to 8.33, with an average of approximately 5.03. Shah & Zala (2019) demonstrated the most notable pain reduction (VAS = 0.93), whereas Metikaridis et al. (2017) reported the highest pain levels (VAS = 8.33), though still statistically significant ($p = 0.002$).

Regarding functional outcomes, NDI scores ranged from 4.93 to 22.63, averaging 16.71. Shah & Zala (2019) reported the lowest disability score (NDI = 4.93), while Metikaridis et al. (2017) showed the highest (NDI = 22.63). All studies yielded p-values < 0.01, suggesting that the interventions produced statistically significant changes.

Specifically, the studies by Metikaridis et al. (2017) and Kaya & Celenay (2019) demonstrated highly significant results in both pain reduction and functional improvement. Shah & Zala (2019) and Yoo et al. (2022) also showed consistent findings in both parameters (VAS and NDI), each with p-values of 0.001. While Loh et al. (2022) only evaluated pain using VAS and showed a significant improvement ($p = 0.003$), the absence of NDI data limited the assessment of functional gains.

Despite the positive findings, several limitations were observed. Some studies lacked comprehensive statistical reporting, including means, standard deviations, effect sizes, or heterogeneity indices (e.g., I^2), thus precluding robust quantitative meta-analysis. The possibility of publication bias also exists, as studies with positive outcomes are more likely to be published. Variability in methodological rigor—including differences in randomization, blinding, and sample sizes—could impact the generalizability of findings. Moreover, differences in inclusion/exclusion criteria among studies may introduce selection bias. Subgroup or sensitivity analyses were not feasible due to the limited number of studies and data.

The absence of adequate blinding procedures for participants and outcome assessors is another notable limitation, which may compromise measurement objectivity and inflate treatment effects. Nonetheless, this review

suggests that PMR is a promising non-invasive approach for managing nonspecific neck pain. Clinically, PMR can be implemented alongside conventional treatments to enhance outcomes, pending validation from rigorously designed trials.

In summary, relaxation and exercise-based interventions appear to provide substantial clinical benefits in the management of neck pain. These findings support the integration of non-pharmacological strategies within musculoskeletal pain treatment protocols. Future studies should utilize high-quality randomized controlled designs with larger samples and comprehensive reporting, facilitating more conclusive meta-analyses. Long-term follow-up is also warranted to evaluate the sustainability of intervention effects.

Discussion

After completing the screening process, five articles were selected and analyzed using a narrative synthesis approach. This method was employed to compare the findings across studies and identify factors contributing to divergent outcomes. The results from all five studies demonstrated the effectiveness of Progressive Muscle Relaxation (PMR) in alleviating neck pain in adults.

The study by Kaya and Celenay (2019) was the only one to combine PMR with neck stabilization exercises and received the highest PEDro score (6/10), indicating stronger methodological rigor compared to the others. The intervention group in this study exhibited a significant reduction in Neck Disability Index (NDI) scores, reflecting functional improvement. These findings suggest that PMR may serve as a valuable adjunct to active rehabilitation programs.[16]

Metikaridis et al. (2017) investigated the effects of a stress management program incorporating PMR in patients with chronic neck pain. Their results showed significant reductions in both stress and pain levels post-intervention. Although a pilot trial, the randomized design and multimodal approach support the notion that PMR can indirectly reduce neck pain intensity, particularly in individuals with psychosomatic stress.[14]

Shah and Zala (2019) compared PMR with another relaxation technique, the Mind Sound Resonance Technique (MSRT). While both interventions effectively reduced neck pain, PMR yielded slightly better outcomes, highlighting its comparable or superior efficacy relative to other relaxation methods. This underscores PMR's potential for broader clinical application.[13]

Yoo et al. (2022) studied a population with fibromyalgia who also experienced neck pain. Their findings revealed that PMR, when combined with home exercise programs, significantly decreased fatigue, stress, and pain compared to exercise alone. Although not focused exclusively on neck pain, the study reinforces the holistic benefits of PMR, particularly in chronic pain conditions that involve both psychological and neuromuscular factors.[17]

Loh et al. (2022) examined PMR's effects in postoperative patients with head and neck cancer. They reported reductions in pain and stabilization of physiological parameters such as blood pressure and heart rate. These findings suggest that PMR not only alleviates muscular tension but also contributes to systemic physiological regulation, making it a suitable complementary intervention for patients experiencing postoperative neck pain or stress-induced muscle tension.[18]

All five studies included in this review shared a common objective: to evaluate the effectiveness of PMR in alleviating physical symptoms—primarily pain, stress, and fatigue. Each employed a randomized controlled trial (RCT) design and relied on subjective outcome measures, such as the Visual Analogue Scale (VAS), Neck Disability Index (NDI), and stress or fatigue-related scales. Most studies reported significant reductions in pain intensity following PMR interventions, supporting its efficacy in managing musculoskeletal pain, including nonspecific neck pain.

Each study also contributed unique insights into the adaptability of PMR across various clinical scenarios. Kaya and Celenay's work stood out due to its robust methodology and integration of PMR into an active treatment regimen. Shah and Zala provided rare comparative data on PMR versus another relaxation technique. Yoo et al. expanded the applicability of PMR to complex chronic conditions, while Loh et al. illustrated its benefits in acute, postsurgical contexts. Metikaridis et al. emphasized PMR's role within a holistic, stress-reduction framework, offering a foundation for future multidimensional interventions.

These comparisons indicate that PMR is a flexible and effective technique for a variety of clinical conditions. The heterogeneity in study populations, intervention protocols, and outcome assessments makes these findings complementary and collectively strengthens the evidence base for PMR as a non-pharmacological intervention for neck pain.

Progressive Muscle Relaxation and Neck Pain Reduction

Progressive Muscle Relaxation (PMR), introduced by Edmund Jacobson in the early 1930s, involves systematically tensing and releasing specific muscle groups throughout the body to enhance awareness and reduce unconscious muscle tension.[19] Jacobson theorized that muscle tension is closely linked to psychological states such as anxiety and stress, which may trigger or exacerbate pain, including neck pain.[10,13,16]

PMR techniques train individuals to consciously tense muscles for 5–10 seconds followed by a 20–30 second release phase, focusing on the sensation of relaxation.[14,19] The exercises aim to foster awareness of the contrast between tension and relaxation, allowing individuals to achieve self-induced calmness over time.[17,19]

Electromyographic (EMG) studies show that chronic muscle tension is characterized by heightened resting muscle tone. Practicing PMR reduces this abnormal EMG activity, effectively interrupting the tension-pain cycle. Furthermore, PMR stimulates the parasympathetic nervous system, inducing peripheral vasodilation, lowering heart rate, and reducing blood pressure.[20] These physiological effects help relieve spasms, decrease soft tissue tension, and enhance circulation to areas such as the trapezius and sternocleidomastoid muscles, which are commonly involved in neck pain.[11,13,21]

Beyond musculoskeletal benefits, PMR reduces pain perception by shifting attention from discomfort to relaxation and alleviating anxiety and stress—key contributors to pain intensity.[19] Amaral (2018) demonstrated PMR's ability to lower blood pressure and pain in hypertensive patients, further supporting its effect on upper body muscle relaxation.[22] PMR induces parasympathetic activation and reduces sympathetic responses, lowering cortisol levels and improving heart rate variability (HRV), markers of recovery and stress reduction.[23,24] Ermayani et al. (2020) also reported significant improvements in blood pressure and anxiety following PMR training in hypertensive patients, among whom muscle pain was a frequent complaint.[2]

Most studies reviewed employed RCT designs, reflecting a relatively high level of methodological rigor. However, many were pilot studies with small sample sizes, limiting generalizability. Additionally, some lacked blinding and allocation concealment, increasing risk of performance and detection bias. To strengthen the empirical basis for PMR, future research should involve larger, multicenter trials with rigorous methodological controls, particularly regarding randomization and assessor blinding.

Objective physiological measures—such as EMG, HRV, and biomarkers like cortisol—should be included to validate PMR's mechanisms of action and bridge the gap between subjective and objective outcomes. Moreover, future studies should examine long-term PMR effects on musculoskeletal function and quality of life, and explore variations in technique (e.g., session length, frequency, or combination with other modalities like diaphragmatic breathing or mindfulness). These advancements will enhance the clinical utility of PMR in rehabilitation and integrative therapy contexts.

Nevertheless, current evidence consistently supports the relevance of Progressive Muscle Relaxation as a non-pharmacological intervention for adults experiencing neck pain due to various causes, including psychosomatic tension, postoperative complications, and chronic musculoskeletal disorders. These findings affirm PMR's broad applicability across clinical settings and reinforce its value in physiotherapeutic and pain management practices.

Limitations of the Review

This systematic review has several limitations. Most included studies were small-scale RCTs or pilot trials with short intervention durations, limiting the assessment of long-term outcomes and generalizability to the wider adult population with nonspecific neck pain (NSNP). Considerable heterogeneity was observed across intervention protocols (e.g., frequency and duration of PMR sessions) and outcome measures, making direct comparison difficult.

Most studies relied on subjective instruments such as the VAS for pain and the NDI for functional status. While these tools are clinically accepted, they are susceptible to individual biases and lack physiological validation. The absence of objective measures such as EMG, HRV, or biochemical stress markers limits the ability to confirm physiological changes induced by PMR.

Only five studies met the inclusion criteria, potentially limiting the comprehensiveness of this review. Due to heterogeneity in patient populations (e.g., chronic vs. postoperative neck pain) and outcomes, a meta-analysis was not feasible. Moreover, by restricting the review to RCTs, the possibility of publication bias increases, as studies with null results are less likely to be published. This methodological choice, though intended to ensure quality, may have excluded relevant observational or quasi-experimental studies that could offer additional insights.

Conclusion

This systematic literature review of five studies indicates that Progressive Muscle Relaxation (PMR) is effective in enhancing functional activity in adults with nonspecific neck pain by alleviating pain, reducing muscle tension, and decreasing psychological stress. These outcomes align with previous literature underscoring both the physiological and psychological benefits of PMR. Furthermore, PMR demonstrates a high degree of adaptability and efficacy across diverse clinical populations, including individuals with systemic conditions such as hypertension and cardiovascular disorders, complex chronic illnesses such as fibromyalgia and cancer, various types of chronic musculoskeletal pain, as well as patients suffering from anxiety disorders, insomnia, and post-traumatic stress disorder.

However, the current body of evidence remains limited due to small sample sizes and methodological heterogeneity among studies. To strengthen the validity and generalizability of these findings, future research should include large-scale, rigorously designed randomized controlled trials, particularly involving elderly and postoperative populations. Broader and more inclusive sampling is necessary to better reflect the diversity of clinical and demographic conditions.

It is recommended that future studies incorporate objective physiological assessments, such as electromyography (EMG) to evaluate muscle activity and heart rate variability (HRV) to measure autonomic nervous system responses. These objective indicators would complement subjective outcomes typically obtained through instruments like the Neck Disability Index (NDI) or Visual Analogue Scale (VAS), thereby providing a more comprehensive understanding of PMR's effectiveness. Additionally, investigating the cost-effectiveness of PMR as a standalone or adjunct therapy would offer valuable insights into its practical feasibility in routine clinical settings.

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