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Effect of PNF Exercise on Mechanical Neck Pain in IT Professional

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ABSTRACT
Background: Mechanical neck pain is common among information technology professionals because prolonged computer use, sustained sitting, forward-head posture and repetitive occupational demands can contribute to muscular imbalance, altered motor control and neck-related disability. Proprioceptive Neuromuscular Facilitation (PNF) uses manual resistance, contract-relax, hold-relax, rhythmic stabilization, dynamic reversals and diagonal movement patterns to facilitate neuromuscular control and functional movement. Objective: To investigate the effectiveness of PNF exercises in reducing pain and neck-related disability in IT professionals with mechanical neck pain. Methods: Thirty IT professionals aged 25–45 years with chronic mechanical neck pain were allocated to two groups (n=15 each). The experimental group received PNF exercises with conventional physiotherapy, while the control group received a conventional physiotherapy/stretching programme. The detailed intervention protocol specifies supervised sessions three times weekly for four weeks (12 sessions), with approximately 45 minutes per experimental session. Pain was assessed using the Numeric Pain Rating Scale (NPRS), and functional disability using the Neck Disability Index (NDI). Paired and independent t-tests were described for statistical comparison. Results: In the experimental group, NPRS decreased from 7.0±0.85 to 2.93±0.80 and NDI decreased from 42.73±2.66 to 20.40±2.32; both changes were reported as statistically significant (p=0.001). The thesis reports significant post-treatment differences between the experimental and control groups, particularly for NDI. However, the control post-NPRS mean and several statistical labels are internally inconsistent across the source tables and require verification before journal submission. Conclusion: The reported findings support PNF exercises combined with conventional physiotherapy as a potentially effective approach for reducing pain and disability in IT professionals with mechanical neck pain, while the source statistical inconsistencies should be corrected before final publication.

Keywords: Proprioceptive Neuromuscular Facilitation; PNF; mechanical neck pain; IT professionals; NPRS; Neck Disability Index; physiotherapy

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1. INTRODUCTION

Mechanical neck pain is an important work-related musculoskeletal problem in computer-intensive occupations. IT professionals frequently work for prolonged periods in static sitting positions and may be exposed to forward-head posture, repetitive upper-limb activity and suboptimal workstation ergonomics. These occupational demands can increase mechanical loading of the cervical region and contribute to pain, stiffness and limitations in daily and work-related activities.

The source thesis describes mechanical neck pain as localized neck pain associated with musculoskeletal dysfunction without a specific pathological cause such as fracture, infection or malignancy. In IT professionals, prolonged fixed posture and repeated computer work may be associated with weakness of the deep cervical flexors, overactivity of superficial cervical muscles, reduced proprioception and altered movement control. Persistent symptoms may affect productivity, work attendance and quality of life.

Proprioceptive Neuromuscular Facilitation is a therapeutic approach based on proprioceptive, tactile and manual stimuli to facilitate neuromuscular responses. PNF incorporates diagonal and spiral movement patterns and techniques such as contract-relax, hold-relax, rhythmic stabilization and dynamic reversals. These methods are intended to address muscle tightness, impaired coordination, weakness and proprioceptive deficits. Recent studies included in the thesis review have reported reductions in pain and disability after PNF-based or related neuromuscular exercise programmes in people with mechanical or non-specific neck pain [1,2].

Evidence reviewed in the thesis also indicates that different active rehabilitation strategies—including motor-control training, cervical stabilization, scapular exercises, contract-relax stretching and postural interventions—can reduce pain and improve neck-related function [3–8]. For IT professionals, an intervention that can target both neuromuscular control and postural dysfunction may be particularly relevant because occupational exposure is repetitive and sustained.

Despite growing evidence for exercise-based management, the thesis identifies limited population-specific evidence for PNF among IT professionals with mechanical neck pain. The present study therefore evaluated a structured PNF programme combined with conventional physiotherapy and compared it with a conventional control programme using pain and disability outcomes.

1.1 Aim and Objectives

Aim: To investigate the effectiveness of Proprioceptive Neuromuscular Facilitation (PNF) exercises in reducing pain, improving cervical range of motion, and decreasing disability in Information Technology professionals with mechanical neck pain.

- To assess the effect of PNF exercises on pain intensity in IT professionals with mechanical neck pain, measured using VAS/NPRS.
- To determine the effectiveness of PNF exercises in reducing neck-related disability, measured using the Neck Disability Index.

- To compare clinical change between the PNF-based experimental group and the conventional control group.

1.2 Hypothesis

The source thesis states a null hypothesis of no significant effect of PNF exercises on mechanical neck pain in IT professionals and an alternative hypothesis that a significant effect is present.

2. MATERIALS AND METHODS

2.1 Study Design and Participants

The study is described as a randomized controlled trial. A total of 30 IT professionals were included and divided into two groups of 15 participants each. Eligible participants were 25–45 years old, of any gender, had at least two years of IT work experience, used a computer for at least six hours per day, had a diagnosis of mechanical neck pain and had pain for at least three months.

2.2 Inclusion and Exclusion Criteria

Major inclusion criteria were:

- Age 25–45 years and any gender.
- IT professional with a minimum of two years of work experience.
- Computer use of at least six hours per day.
- Mechanical neck pain of at least three months' duration.
- Willingness to participate and provide informed consent.

Major exclusion criteria were:

- Specific cervical pathology such as cervical radiculopathy, myelopathy, fracture or tumour.
- History of cervical spine surgery.
- Rheumatological conditions such as rheumatoid arthritis or ankylosing spondylitis.
- Neurological disorders affecting the cervical region.
- Vestibular disorder or dizziness.

2.3 Group Allocation

Participants were allocated to an Experimental Group and a Control Group. Group A received PNF exercises with conventional physiotherapy, while Group B received the conventional physiotherapy/stretching protocol. The thesis describes random allocation, although different sections describe the allocation method differently; this is highlighted in the verification note at the end of the article.

2.4 Outcome Measures

Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), a 0–10 scale. Neck-related functional disability was assessed using the Neck Disability Index (NDI). The thesis aim also mentions cervical range of motion, but no separate cervical range-of-motion result table is provided in the reported Results section.

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2.5 Experimental Intervention: PNF Exercises

The detailed protocol states that PNF treatment was delivered in individual supervised sessions three times per week for four weeks (12 sessions), with each session lasting approximately 45 minutes. A 5-minute warm-up included gentle active cervical movements, shoulder rolls and deep breathing. The main 30–35-minute PNF component included the following techniques:

- Contract-relax for the cervical extensors, including the upper trapezius and cervical paraspinals.
- Hold-relax for cervical rotators using isometric contraction followed by movement into the gained range.
- Rhythmic stabilization for the deep cervical flexors using alternating multidirectional resistance.
- Dynamic reversals using alternating concentric contractions of cervical flexors and extensors.
- Adapted diagonal D1 and D2 cervical patterns combining flexion/extension, rotation and lateral flexion.
- A 5-minute cool-down using gentle stretching, breathing and relaxation.

2.6 Control Intervention

The control programme comprised conventional exercises. It included a 5-minute warm-up with active cervical range of motion; upper trapezius, levator scapulae and sternocleidomastoid stretching; isometric neck strengthening in flexion, extension and lateral flexion; and postural correction using chin-tuck and scapular-retraction exercises.

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2.7 Statistical Analysis

The thesis describes descriptive statistics using mean and standard deviation. Within-group pre–post comparisons were analysed using paired t-tests, and between-group comparisons using unpaired/independent t-tests. The planned statistical section also mentions non-parametric alternatives depending on data distribution. Statistical significance was defined as $p<0.05$.

3. RESULTS

3.1 Within-Group Changes in the Experimental Group

The experimental group demonstrated a marked reduction in both pain and neck-related disability. NPRS decreased from 7.0±0.85 before treatment to 2.93±0.80 after treatment. NDI decreased from 42.73±2.66 to 20.40±2.32. The thesis reports paired t-values of 26.53 for NPRS and 34.63 for NDI, with p=0.001 for both outcomes.

Table 1. Pre–Post Comparison in the Experimental Group

Outcome	Pre-test Mean±SD	Post-test Mean±SD	Paired t	df	p-value	Source Result
NPRS	7.0±0.85	2.93±0.80	26.53	14	0.001	Significant
NDI	42.73±2.66	20.40±2.32	34.63	14	0.001	Significant

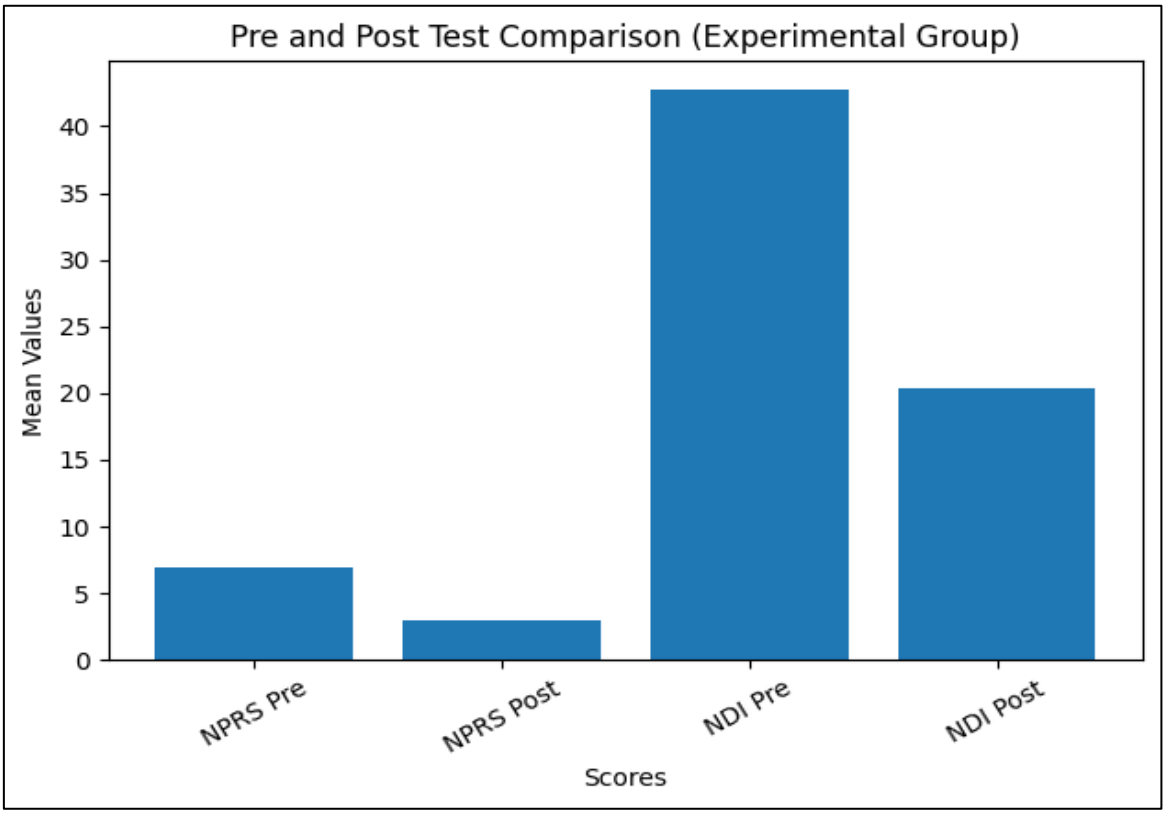

Figure 1. Comparison between pre test and post test of NPRS score; NDI score in Experimental group

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3.2 Within-Group Changes in the Control Group

The control-group table reports smaller numerical changes: NPRS from 7.07±0.80 to 6.87±0.74 and NDI from 41.93±2.79 to 41.27±2.46. The thesis labels these changes statistically significant and reports paired t-values of 1.8708 and 2.4672, respectively, with $p<0.001$. Because the reported t-statistics and p-values appear internally inconsistent, these inferential values should be verified against the original statistical output before publication.

Table 2. Pre–Post Comparison in the Control Group (As Reported in Thesis)

Outcome	Pre-test Mean±SD	Post-test Mean±SD	Paired t	df	Reported p-value
NPRS	7.07±0.80	6.87±0.74	1.8708	14	<0.001
NDI	41.93±2.79	41.27±2.46	2.4672	14	<0.001

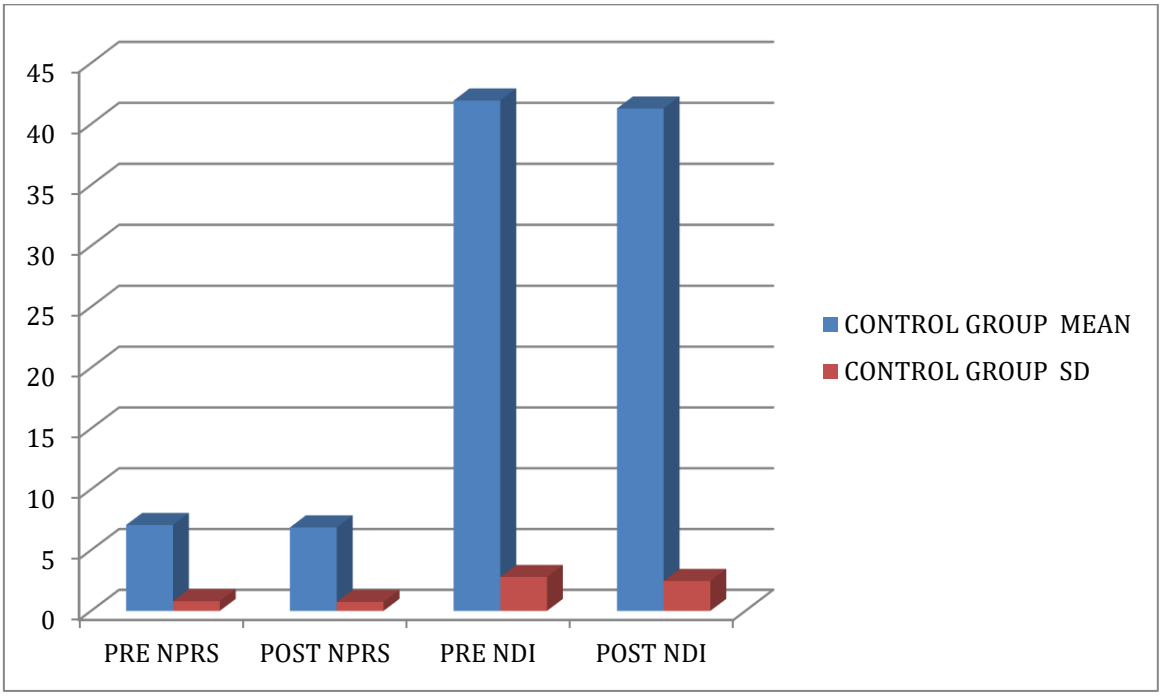

Figure 2. Comparison between pre test and post test of NPRS score; NDI score in Control group

3.3 Between-Group Comparison

At baseline, the groups were similar for NPRS according to the source table ($p=0.39$). The baseline NDI comparison was reported as $p=0.093$; although the thesis labels this row as significant, the reported p-value itself is above 0.05. Post-treatment NDI was 20.4±2.32 in the experimental group and 41.2±2.46 in the control group, with $p<0.001$. For post-treatment NPRS, the between-group table reports a significant difference ($p<0.001$), but the control mean is listed as 2.3±0.67 in that table while the separate control-group table lists 6.87±0.74. Therefore, the exact control post-NPRS value requires verification and is not silently corrected in this article.

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Table 3. Between-Group Comparison Reported in the Thesis

Score	Experimental Mean±SD	Control Mean±SD	Independent t	df	p-value	Verification
Pre NPRS	7.0±0.84	7.06±0.79	0.873	28	0.39	Consistent
Post NPRS	2.9±0.79	2.3±0.67 in Table 1; 6.87±0.74 in Table 3	13.92	28	<0.001	Control mean inconsistent
Pre NDI	42.7±2.65	41.0±2.7	1.740	28	0.093	Source labels significant; p>0.05
Post NDI	20.4±2.32	41.2±2.46	23.82	28	<0.001	Consistent with main narrative

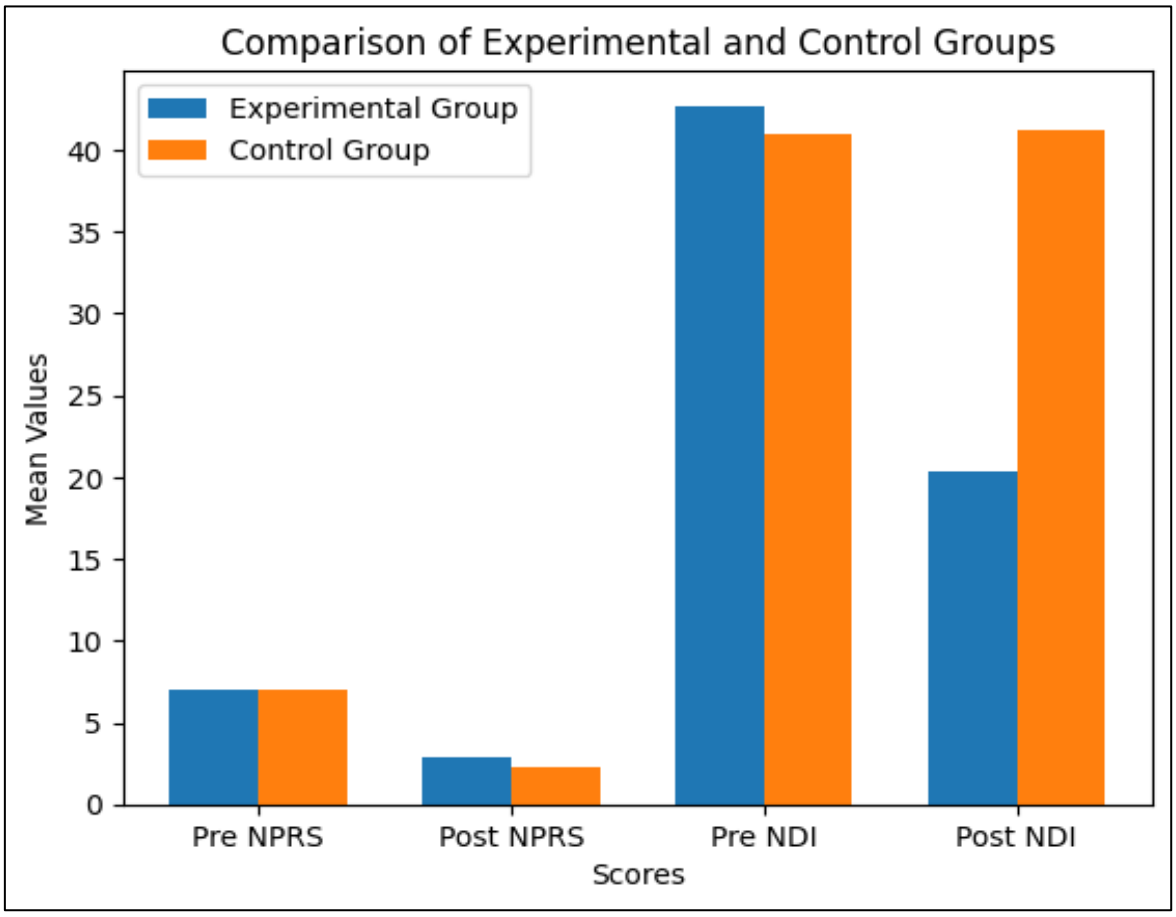

Figure 3. Comparison between Experimental and Control Group in different score

4. DISCUSSION

The principal finding reported in the thesis is that the PNF-based experimental programme produced substantial reductions in pain and neck-related disability. The experimental NPRS score decreased from approximately 7 to 2.93, while the NDI score decreased from 42.73 to 20.40. These findings support the clinical rationale for using PNF when mechanical neck pain is associated with impaired muscle flexibility, neuromuscular control and prolonged occupational loading.

The response may be explained by the combined mechanisms incorporated into the PNF protocol. Contract-relax and hold-relax techniques provide isometric contraction followed by relaxation and movement into a new range. Rhythmic stabilization requires alternating resistance and co-contraction, potentially improving cervical stability and proprioceptive awareness. Dynamic reversals and diagonal movement patterns add coordinated agonist-antagonist activity and functional multidirectional movement. Together, these components address more than isolated muscle flexibility.

The literature reviewed in the thesis is broadly compatible with this interpretation. A 2025 study of PNF combined with Kendall exercises in text-neck syndrome reported superior improvement in pain, disability and postural performance compared with Kendall exercises alone [1]. Kumar and Kanika reported that PNF and craniocervical flexor training both improved pain, disability and cervical range of motion in chronic mechanical neck pain [2]. Other recent studies reviewed in the thesis have similarly demonstrated benefits from motor-control exercises, scapular stabilization, contract-relax stretching and cervical mobilization strategies [3–7].

The findings are particularly relevant to IT professionals because computer-based work commonly involves sustained postures, repetitive tasks and prolonged sitting. Yaminisudha and Kumar reported that postural exercise combined with interferential therapy improved mechanical neck pain in IT professionals more than isometric exercise with interferential therapy [8]. This supports the broader concept that interventions addressing movement quality and postural control may be useful in this occupational group.

The present source, however, requires statistical verification before its results can be interpreted as a definitive comparative efficacy estimate. The post-treatment NPRS value for the control group differs across tables, and some reported p-values do not appear internally consistent with their corresponding t-statistics. The direction of the experimental-group improvement is clear in the main Results table, but final between-group effect estimates should be confirmed from the original dataset or SPSS output.

5. CLINICAL IMPLICATIONS

- PNF may be incorporated into physiotherapy programmes for IT professionals with chronic mechanical neck pain when pain and disability are important treatment targets.
- Contract-relax, hold-relax, rhythmic stabilization and dynamic reversal techniques permit a multimodal approach addressing flexibility, stability and neuromuscular control.

- Postural education and conventional cervical exercises remain relevant because occupational exposure to prolonged computer work continues outside therapy sessions.
- Workplace ergonomics and exercise adherence should be considered alongside supervised treatment to improve sustained occupational outcomes.
- The source data should be statistically verified before using the exact between-group estimates for clinical or publication claims.
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6. LIMITATIONS

- The sample comprised only 30 IT professionals, limiting generalizability.
- The intervention and follow-up were short, so long-term maintenance of improvement was not established.
- The study focused on a restricted occupational and age group.
- Broader outcomes such as work productivity, posture, muscle endurance and quality of life were not reported.
- The aim refers to cervical range of motion, but the Results section does not provide a separate cervical ROM analysis.
- Several internal inconsistencies are present in the study duration, randomization description and statistical tables.

7. CONCLUSION

The reported findings indicate that a PNF-based exercise programme combined with conventional physiotherapy can produce substantial reductions in pain intensity and neck-related disability in IT professionals with chronic mechanical neck pain. The experimental group showed marked pre–post improvement in both NPRS and NDI. The study therefore supports the clinical potential of PNF as part of an active rehabilitation programme for this occupational population. Nevertheless, the exact magnitude of between-group superiority should be finalized only after the original statistical output is checked, because the source document contains conflicting control-group NPRS values and inconsistent statistical labels.

8. DIRECTIONS FOR FUTURE RESEARCH

- Use larger and more diverse samples of IT professionals and other occupational groups.
- Include longer follow-up to determine whether pain and disability improvements are sustained.
- Evaluate combined PNF, ergonomic correction, strengthening, postural training and manual-therapy programmes.
- Include workplace productivity, posture, muscle endurance, quality of life and activity measures.
- Investigate neuromuscular mechanisms such as muscle activation, proprioception and motor-control adaptation.
- Compare PNF directly with other evidence-based exercise and manual-therapy approaches using verified statistical datasets.

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