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party Study Of Cervical Mobilization And Chin Tuck Exercises In Managing Chronic Non-Specific Neck Pain In Young Adults

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ABSTRACT

Background and Objectives: Chronic Non-Specific Neck Pain (CNSNP) is a common musculoskeletal condition, particularly among college students, and has become increasingly prevalent due to poor posture and muscular imbalances associated with prolonged screen time and sedentary habits. This study aimed to evaluate and compare the effectiveness of cervical mobilization and active chin tuck exercises with isotonics as therapeutic interventions for managing CNSNP in young adults.

Methodology: A total of 39 college students aged 18 to 25 years with CNSNP were recruited for the study. Participants were randomly assigned to one of three groups using a simple random lottery method:

Group A (n = 13): Cervical mobilization combined with conventional therapy

Group B (n = 13): Active chin tuck with isotonics combined with conventional therapy

Group C (n = 13): Conventional therapy alone

The intervention lasted for six weeks, with three treatment sessions per week. Outcomes were assessed both before and after the intervention using the Numerical Pain Rating Scale (NPRS) and the Copenhagen Neck Functional Disability Scale (CNFDS).

Results: All three groups showed statistically significant improvements in NPRS and CNFDS scores from pre- to post-treatment ($p < 0.01$).Between-group analysis revealed a significant difference in pain intensity (NPRS) with a p-value of 0.001, and a significant difference in functional disability (CNFDS) scores with a p-value of 0.007.These results indicate that while all groups experienced improvement, the extent varied depending on the intervention.

Conclusion: Both cervical mobilization and active chin tuck with isotonics proved to be effective treatment options for managing chronic non-specific neck pain. However, cervical mobilization was more effective, particularly in reducing pain intensity and improving functional disability. While both interventions led to improvements in cervical function, cervical mobilization demonstrated superior outcomes in terms of pain relief.

Keywords: *Neck pain, cervical mobilization, college students*

1. INTRODUCTION

Epidemiology and burden of Chronic Non specific Neck pain Chronic non-specific neck pain (CNSNP) is a prevalent and costly musculoskeletal condition affecting a broad spectrum of the population. Lifetime prevalence rates range from 12% to 70%, and neck pain accounts for approximately 25% of all physiotherapy outpatient visits.[1]Despite various treatment approaches, 50% to 85% of individuals report recurrence of symptoms within 1 to 5 years, indicating that complete resolution is uncommon. The prevalence also varies geographically, affecting 1.5% of the urban population and up to 6.8% of the rural population.[3]

Etiology

CNSNP is characterized by persistent or recurrent neck pain lasting longer than three months, without a clearly identifiable pathological cause.[1]It is often attributed to muscle strain, postural dysfunction, and neuromuscular imbalances. Prolonged

static postures and sustained head positioning, especially in a forward or slouched alignment, lead to tightening of the posterior muscles and weakening of the deep neck flexors. This muscular imbalance contributes to altered sensorimotor control and cervical spine dysfunction.[11]

Risk Factors and Contributing Elements

Several factors increase the risk of developing CNSNP, especially among young adults. These include: Poor postural habits, such as slouching while reading or using electronic devices.

Prolonged screen time, when individuals increasingly rely on mobile phones, laptops, and gaming devices.[5] Inadequate ergonomics during academic or professional activities.

Musculoskeletal stressors, such as awkward sleeping positions, overuse injuries, and physical strain.

Degenerative changes, such as spinal stenosis or herniated discs, although more commonly associated with specific neck pain in older populations.[6]

Epidemiological data suggest that non-specific neck pain is most common in young adults aged 18–24 years, while neck pain with specific underlying causes is more prevalent in the elderly.[6] These findings underscore the growing need to address lifestyle, postural, and ergonomic factors particularly among students and young professionals to prevent chronicity.

Role of manual therapy and exercise

Addressing postural deviations—particularly restoring a neutral cervical alignment is a central focus of physical therapy interventions for patients with Chronic Non-Specific Neck Pain (CNSNP). Therapeutic strategies typically include a combination of strengthening, stretching, and sensorimotor training to correct muscle imbalances and improve postural control.[1]

Conventional physiotherapy for CNSNP often incorporates passive stretchingof the cervical and pectoral muscles, along with isometric exercises to strengthen weakened neck musculature.[8]These interventions aim to reduce muscle tension, improve range of motion, and restore cervical function.

Lagoutaris et al. (2020) conducted a pilot randomized controlled trial comparing various cervical spine mobilization techniques, highlighting their potential in reducing pain and improving function in individuals with neck pain.[2] Kim and Kim (2019) examined sensorimotor training through chin-tuck exercises versus therapeutic stretching in chronic non-specific neck pain patients, finding that both methods improved pain and mobility, with sensorimotor training showing particular benefits for motor control.[4] Chaibi, Stavem, and Russell (2021) performed a systematic review and meta-analysis of randomized controlled trials on spinal manipulative therapy for acute neck pain, concluding that it can provide short-term pain relief and functional improvement, though the overall evidence calls for further high-quality research.[5] Among manual therapy techniques, cervical mobilisation is widely used. This approach involves low-velocity, passive intervertebral movements performed within the patient's comfortable range of motion. Unlike cervical manipulation, mobilisation does not involve rapid thrusts or audible joint cavitation ('cracking'), making it a gentler alternative. Although evidence indicates that mobilisation may provide modest short-term pain relief, its long-term clinical effectiveness remains limited.[10]In addition to manual techniques, neck coordination exercises have shown promise in improving sensorimotor control, reducing radiating pain, and correcting postural imbalances.[12] These exercises target neuromuscular efficiency and enhance overall cervical spine stability. Recent studies support the role of cervical mobilisation in improving pain, range of motion, and functional outcomes in patients with CNSNP.[14] Furthermore, chin tuck exercises combined with isotonic strengthening have demonstrated significant benefits in reducing pain, increasing cervical range of motion, and improving functional performance.[15]The objective of this study is to compare the effectiveness of cervical mobilisation and chin tuck exercises with isotonics in managing chronic non-specific neck pain among college students aged 18–25 years. The study aims to evaluate and contrast their impact on pain relief, cervical range of motion, and functional improvement in this population.

2. OBJECTIVES OF THE STUDY

1. To evaluate the effect of cervical mobilization on reducing pain in individuals with Chronic Non-Specific Neck Pain (CNSNP).

2. To evaluate the effect of chin tuck exercises with isotonics on reducing pain in individuals with CNSNP.

3. To compare the effectiveness of cervical mobilization and chin tuck exercises with isotonics in decreasing pain among individuals with CNSNP.

4. To assess the impact of both interventions on functional disability and cervical range of motion in young adults with CNSNP.

Hypothesis

Null Hypothesis (H_0): There is no significant difference between cervical mobilization and chin tuck exercises with isotonics

in reducing pain and improving function in individuals with Chronic Non-Specific Neck Pain.

Alternative Hypothesis (H_1): Cervical mobilization is more effective than chin tuck exercises with isotonics in reducing pain and improving cervical function in individuals with Chronic Non-Specific Neck Pain.

3. METHODOLOGY

Study Design: Comparative experimental study

Study Duration: 4 months (April – August 2023)

Target Population: College students aged 18–25 years with clinically diagnosed Chronic Non-Specific Neck Pain (CNSNP)

Source of Data: Outpatient Physiotherapy Department, Alva's Physiotherapy College, Moodabidri.

Sampling Design: Probability sampling

Sampling Method: Simple random sampling (lottery method)

Sample Size Calculation

The calculations were based on detecting a mean difference of 4.21 points on the Neck Disability Index, assuming a standard deviation of 5.58 points, a two-tailed test, an alpha level of 0.05, a desired power of 80% and an estimated loss of follow-up of 15% [2].

These assumptions generated a sample size of a minimum of 32 participants per group. This sample size was calculated to detect clinically meaningful differences between the three intervention groups with adequate power. Only 39 participants completed the study due to challenges in recruitment, time constraints, and participant drop-out. This reduction in sample size is acknowledged as a limitation and may impact the generalizability and power of the findings.

Blinding Procedure

Due to the nature of the interventions, participant blinding was not feasible as cervical mobilization and active chin tuck exercises are physically distinguishable. However, blinding was maintained at the outcome assessment level: An independent, blinded assessor, who was unaware of group assignments, conducted pre- and post-treatment evaluations using the Numerical Pain Rating Scale (NPRS) and the Copenhagen Neck Functional Disability Scale (CNFDS).Participants were not informed of the study hypothesis or comparative expectations between interventions. The therapist administering the interventions was not involved in the assessment or analysis phases. Standardized instructions were used across all groups to minimize bias.

The inclusion criteria for the study comprised individuals aged between 18 and 25 years who had been experiencing neck pain for duration of three months or more and had not undergone any form of treatment for their neck pain in the preceding month. Both male and female participants were considered eligible. Conversely, individuals were excluded if they were above the age of 25 or if their neck pain was attributed to non-mechanical causes such as fractures, tumors, infections, or spondyloarthropathies. Participants presenting with progressive neurological deficits, myelopathy, or herniated nucleus pulposus were also excluded. Additionally, those with blood coagulation disorders or individuals currently using corticosteroids or anticoagulant medications were not considered for inclusion..

Procedure for Data Collection

Following ethical clearance from the Institutional Ethical Committee of Alva's College of Physiotherapy, Moodabidri, a total of 39 participants were selected based on the inclusion and exclusion criteria. Written informed consent was obtained from all participants prior to the start of the study.

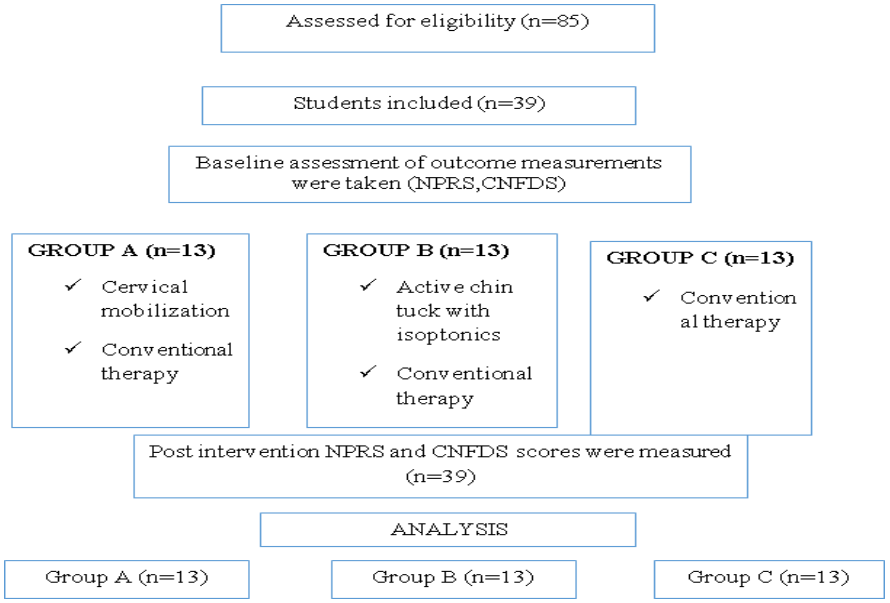
At baseline, participants completed assessments for the selected outcome measures:

Numerical Pain Rating Scale (NPRS)

Copenhagen Neck Functional Disability Scale (CNFDS)

Following baseline evaluation, participants were randomly assigned into three intervention groups using the simple random lottery method (illustrated in Figure 1). Although blinding participants was challenging due to the nature of the interventions, blinding at the assessment level was implemented to minimize bias.

Figure 1:Flow Chart

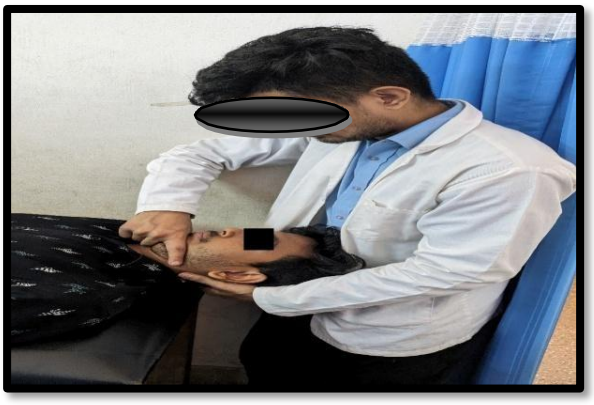


Intervention Protocols

Group A: Cervical Mobilization + Conventional Therapy

(Refer to Figure 2)

Figure 2: Application of cervical A-P mobilization



Participants in Group A received Grade 2 Anteroposterior (A–P) Maitland mobilization at 30 Hz frequency, along with conventional therapy. The subject was positioned in supine lying, with the head extending beyond the edge of the treatment table and the shoulders resting at the table's edge. The therapist supported the occiput with one hand and applied A–P force at the mandible with the other. Each mobilization cycle included a 30-second application, followed by 30 seconds of rest, repeated three times

Group B: Active Chin Tuck with Isotonics + Conventional Therapy

Group B received a combination of chin tuck exercises and isotonic strengthening, along with conventional therapy. Participants were seated in a high sitting position and provided with a resistance band placed behind the head to provide posterior resistance. The exercise involved active chin tucking against resistance for 30 seconds, followed by a 30-second rest, repeated three times.

Group C: Conventional Therapy Only

Conventional therapy included the following components:

- Passive Stretching of Neck Muscles (Refer to Figure 3)

Figure 3: **Application of passive stretching of neck muscles**

1 **2** **3**

Fig 3: Application of passive stretching for neck flexors (1), extensors (2) an d lateral flexors (3)

Participants were seated and asked to relax. Stretching exercises targeted cervical flexors, extensors, and lateral flexors on both sides. Each stretch was held for 30 seconds, with a 10-second rest, repeated three times.

- **Isometric Strengthening of Neck Muscles**

In a seated position, participants performed isometric contractions in flexion, extension, and lateral flexion against therapist-applied resistance. Each contraction was held for 30 seconds, followed by 10 seconds of rest.

- **Isotonic Neck Exercises (Refer to Figure 4)**

Participants actively performed neck flexion, extension, and lateral flexion, holding each movement at end range for 10 seconds, and returning to neutral. Each movement was repeated 10 times on both sides.

Figure 4: Application of isotonic neck exercises

All interventions were conducted three times per week over a six-week period. After completing the intervention phase, participants were reassessed using the same outcome measures. The collected data were then subjected to statistical analysis.

Outcome Measures

- **Numerical Pain Rating Scale (NPRS)**

A self-reported measure to evaluate the intensity of pain on a scale from 0 (no pain) to 10 (worst pain imaginable).

Minimal Clinically Important Difference (MCID): 1.3 – 2.5 points

Minimal Detectable Change (MDC): 2.1 – 4.3 points

- **Copenhagen Neck Functional Disability Scale (CNFDS)**

A 15-item patient-reported questionnaire assessing pain intensity and functional limitations in daily activities related to neck

pain.

MCID: 5 – 10.5 points

MDC: 4.2 – 10.5 points

Materials Used

Treatment table

Chairs

Resistance bands

Pens and data collection sheets

CNFDS forms

Statistical Analysis

Data were analyzed using SPSS version 23 for Windows. Descriptive statistics (mean and standard deviation) were computed for each group. Paired t-tests were used to determine within-group differences (pre- and post-intervention) for NPRS and CNFDS. One-way ANOVA followed by post hoc analysis was used to assess between-group differences in NPRS and CNFDS scores.

4. RESULTS

A total of 39 participants were recruited for the study and randomly assigned into three groups of 13 each (Table 1, Figure 5 and Figure 6). The participants' ages ranged from 18 to 25 years, with a mean age of 22.67 across all three groups .

Table 1: Gender and Age Distribution of Participants across groups

Gender	Males (20)	Females (19)	Mean age(years) ± SD
Group A(exp 1)	6	7	22.31 ± 1.251
Group B(exp 2)	7	6	22.62 ± 1.325
Group C(control)	7	6	23.08 ± 1.656

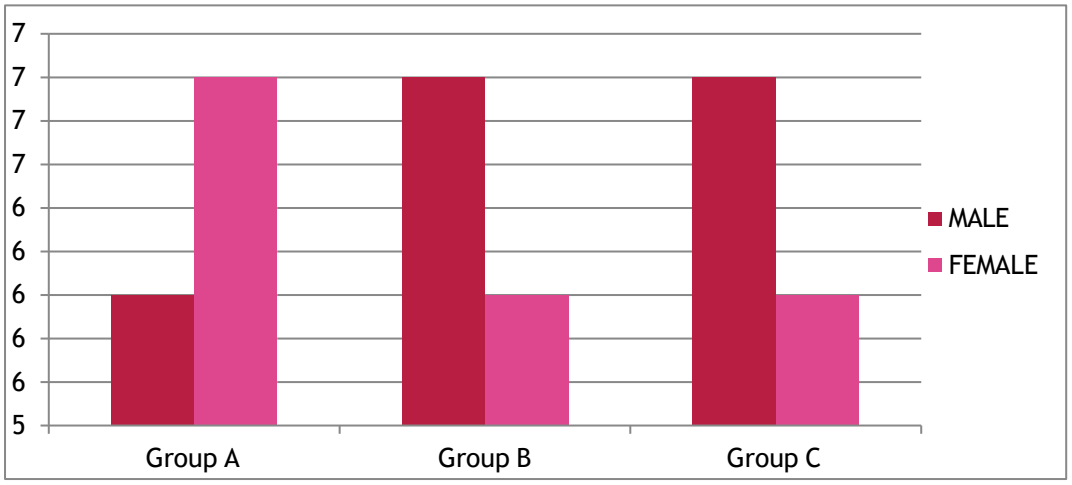


Figure 5: Gender distribution

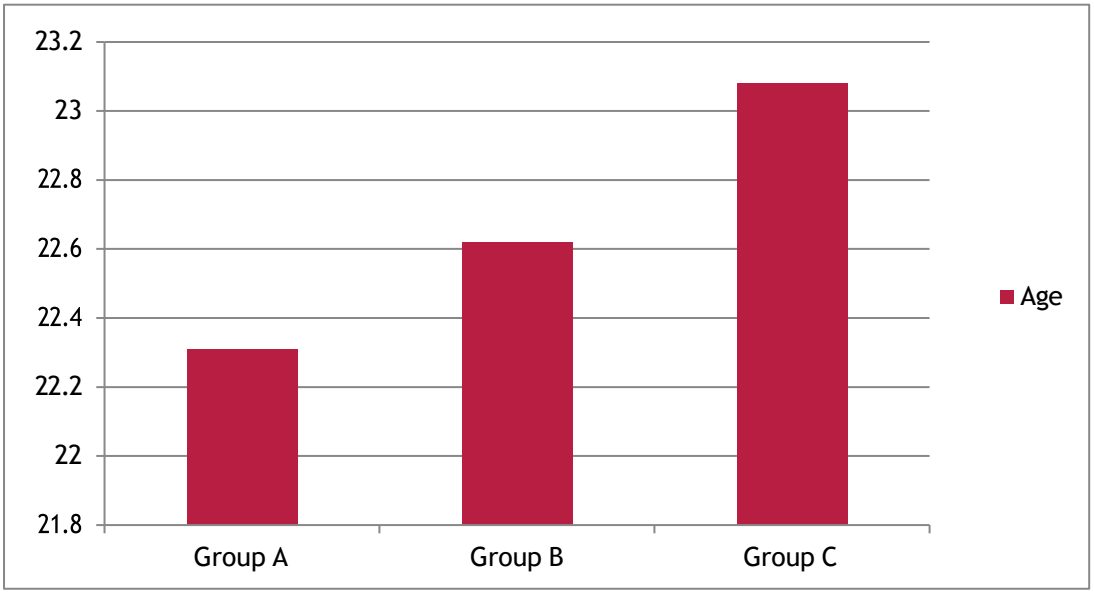


Figure6: Age distribution

Within-Group Comparison (Table 2)

Table 2: Within-group Comparison of NPRS and CNFDS scores using Paired t test

Groups	Pre intervention mean ± SD	Post intervention mean ± SD	P value	Pre intervention mean ± SD	Post intervention mean ± SD	P value
Group A	5.54 ± 1.13	3.15 ± 1.21	.001	14.69±2.87	8.08±1.66	<.001
Group B	5.46 ± 0.97	4 ± 1.08	.001	14.23±1.88	11±1.73	<.001
Group C	5.31 ± 1.18	4.31 ± 1.14	.001	16 ± 1.83	13.77 ± 2.01	0.007

- **Pain Intensity (NPRS):**

Figure 7:illustrate the mean and standard deviation of pre- and post-intervention NPRS values for all groups.

Group A: The mean NPRS score decreased from 5.54 ± 1.13 pre-intervention to 3.15 ± 1.21 post-intervention. This change was statistically significant ($p = 0.001$).

Group B: The mean score decreased from 5.46 ± 0.97 to 4 ± 1.08, also showing significant improvement ($p = 0.001$).

Group C: A reduction from 5.31 ± 1.18 to 4.31 ± 1.14 was observed, with a significant p-value of 0.001.

- **Functional Disability (CNFDS):**

Figure 8:shows the CNFDS scores also improved significantly post-intervention across all groups:

Group A: Reduced from 14.69 ± 2.87 to 8.08 ± 1.66 ($p < 0.001$).

Group B: Decreased from 14.23 ± 1.88 to 11 ± 1.73 ($p < 0.001$).

Group C: Dropped from 16 ± 1.83 to 13.77 ± 2.01 ($p = 0.007$).

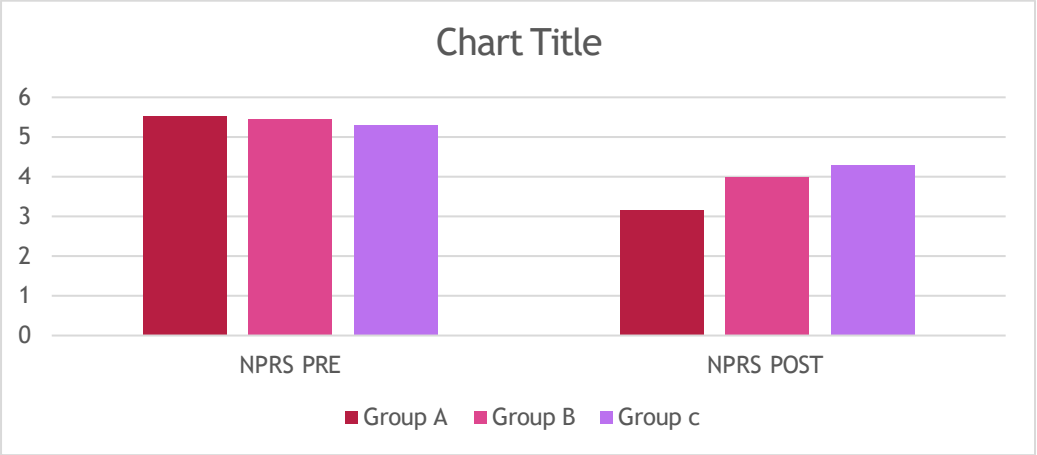


Figure 7: Paired t test for NPRS within group comparison

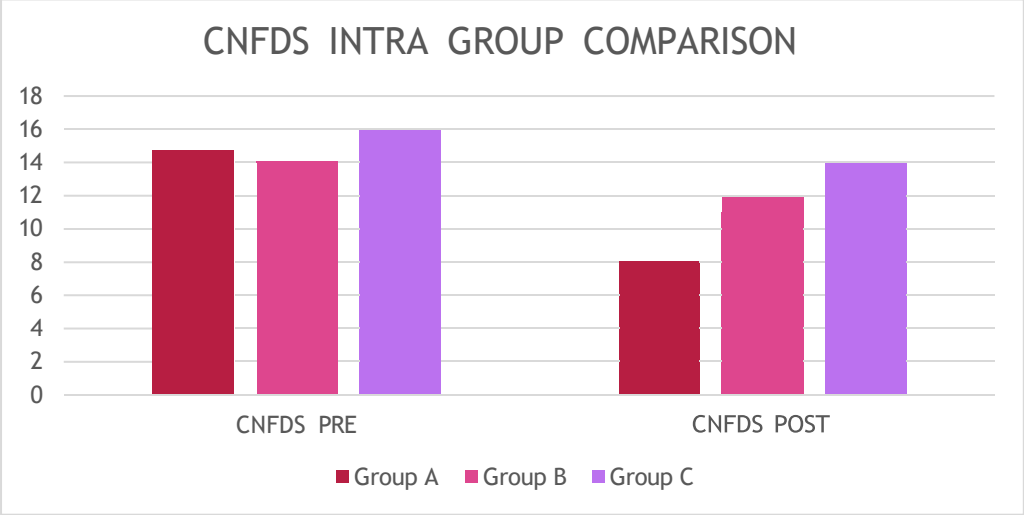


Figure 8: Paired t test for CNFDS within group comparison

Between-Group Comparison:

As shown in Table 3 and Figure 9, pre-intervention NPRS scores did not differ significantly among the groups (p= 1), indicating comparable baseline pain levels. However, post-intervention analysis revealed a statistically significant difference (p< 0.001), suggesting that the interventions had differential impacts on pain reduction across the groups. Likewise Figure 10 illustrate the comparison of CNFDS scores. While no significant differences were observed among groups prior to treatment (p= 1), post-treatment scores showed a marked and statistically significant variation (p < 0.001), indicating varying degrees of functional improvement resulting from the respective interventions.

Table 3 – Between-Group Comparisons of NPRS and CNFDS scores using One-Way ANOVA

Outcome measures	Groups	Tests	Mean	Mean difference	P value (pre treatment)	P value (post treatment)
NPRS	Group A	Pre test	5.54 ± 1.13	2.15	1	<.001
		Post test	3.15 ± 1.21			
	Group B	Pre test	5.46 ± 0.97	1.46		

		Post test	4 ± 1.08			
	Group C	Pre test	5.31 ± 1.18	1		
		Post test	4.31 ± 1.14			
CNFDS	Group A	Pre	16 ± 1.83	2.23	1	<.001
		Post	13.77 ± 2.01			
	Group B	Pre	14.69±2.87	6.62		
		Post	8.08±1.66			
	Group C	Pre	14.23±1.88	3.23		
		Post	11±1.73			

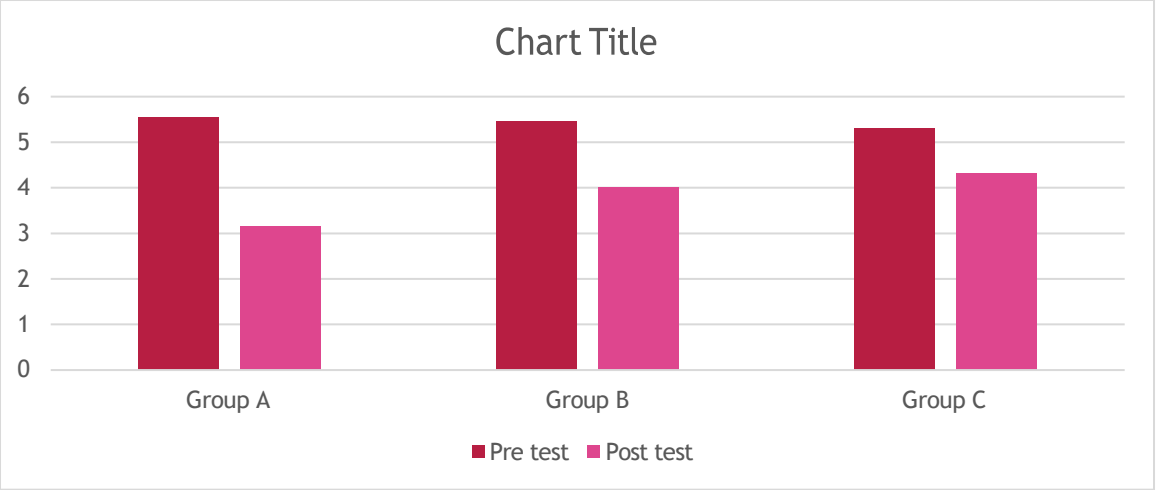


Figure 9: NPRS score between group comparison using one way ANOVA

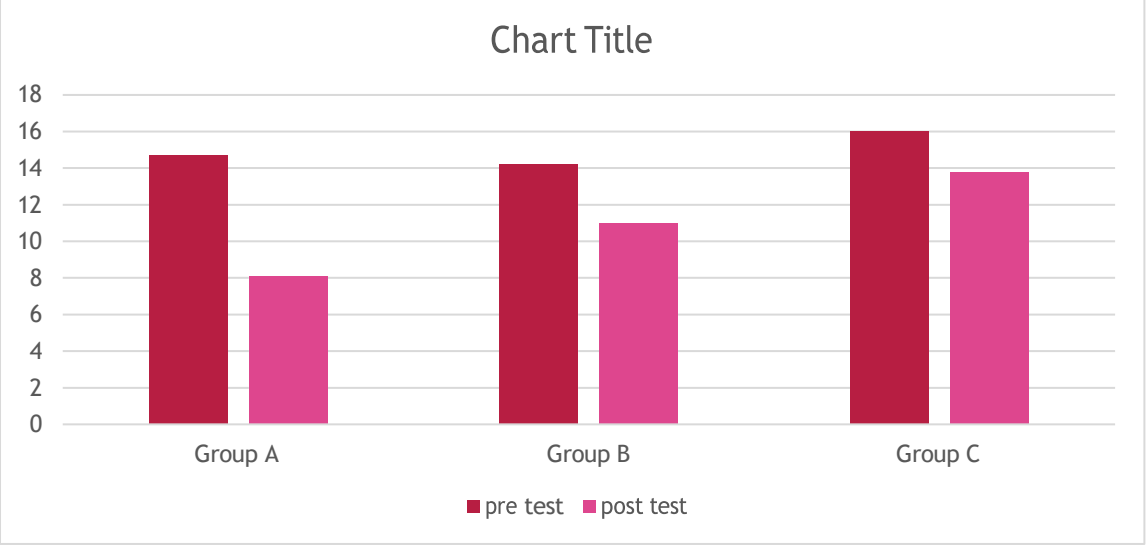


Figure 10: CNFDS score between group comparison using one way ANOVA

5. DISCUSSION

The demographic variables were comparable across all three groups, with no significant differences in age ($p = 0.298$), ensuring baseline homogeneity. Group A received cervical anterior-posterior mobilization along with conventional therapy; Group B was administered chin tuck exercises with isotonic strengthening in addition to conventional therapy; and Group C received only conventional therapy. All groups demonstrated statistically significant improvements in both NPRS and CNFDS scores following six weeks of intervention ($p < 0.001$, paired t-test).

The post-intervention comparison using one-way ANOVA revealed a statistically significant difference in NPRS scores among the groups ($p < 0.001$), indicating that the type of intervention had a measurable impact on pain reduction. Although CNFDS scores also improved significantly within groups, the between-group differences were less marked, suggesting that all interventions contributed positively to functional outcomes, but with varying degrees of effectiveness.

These results are consistent with previous findings. One study identified individuals aged 19–25 as particularly susceptible to chronic nonspecific neck pain (CNSNP), likely due to academic and postural stressors.[2] Manual therapy, as demonstrated in prior research, has consistently shown effectiveness in alleviating pain and enhancing function.[3] The current findings affirm that both cervical mobilization and active chin tuck exercises with isotonics are beneficial; however, cervical mobilization yielded superior improvements in NPRS scores, suggesting greater efficacy in pain modulation.

The greater effectiveness of cervical mobilization may be attributed to biomechanical and neurophysiological mechanisms. Mobilization techniques directly target hypomobile segments of the cervical spine, improving joint play, restoring normal arthrokinematics, and potentially reducing nociceptive input from dysfunctional joints. This can lead to immediate changes in pain perception through activation of descending inhibitory pathways and mechanoreceptor stimulation.[1]Cervical mobilization may be more effective than chin-tuck exercises in certain cases due to its broader impact on joint mechanics, neural input, and pain modulation.

In contrast, chin-tuck exercises primarily address deep cervical flexor endurance and postural control, which may require longer durations to translate into pain relief.[4]Additionally, mobilization can indirectly reduce muscle guarding and improve soft tissue extensibility, thereby enhancing cervical range of motion and creating a more favorable environment for subsequent motor control training. Further supporting this, Ghodrati et al.[1] proposed that joint mobilization improves segmental mobility and reduces local tissue strain, facilitating functional recovery. Similarly, Bhojan Kannabiran et al.[12] confirmed that active chin tuck exercises can improve postural alignment and neuromuscular control, contributing to pain reduction and functional enhancement over time.

Limitations

This study has several limitations. First, the small sample size ($n = 39$) limits the statistical power and generalizability of findings. Second, the study lacked long-term follow-up, making it difficult to determine the sustained impact of the interventions. Third, there was no assessor blinding, introducing potential observer bias. Additionally, the sample consisted solely of college students aged 18–25, which restricts the applicability of findings to broader populations, such as older adults or individuals with chronic comorbidities. Future studies should incorporate larger, more diverse samples and longitudinal follow-up to assess the durability of therapeutic effects.

6. CONCLUSION

This study concludes that both cervical mobilization and active chin tuck exercises with isotonics are effective manual therapy interventions for managing chronic non-specific neck pain (CNSNP) in college-aged individuals. While both approaches contributed significantly to functional improvement, cervical mobilization demonstrated superior effectiveness in alleviating pain intensity. Based on these findings, integrating cervical mobilization with conventional therapy is recommended for optimizing rehabilitation outcomes in young adults experiencing CNSNP.

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