



EFFECT OF DEEP NECK FLEXORS ENDURANCE TRAINING ALONG WITH TENS ON PAIN, NECK FLEXORS ENDURANCE AND FORWARD HEAD POSTURE IN SUBJECTS WITH NONSPECIFIC NECKPAIN AMONG STUDENTS

Physiotherapy

N. Sushma	MPT(Orthopaedics), College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati 517501, Andhra Pradesh, India
Dr. K. Senthil Kumar	MPT(Orthopaedics), Ph.D., Assistant professor, College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati 517501, Andhra Pradesh, India
Dr. C. Shanthi	MPT(Orthopaedics), Ph.D., Assistant Professor, College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati 517501, Andhra Pradesh, India
Dr S. Raghava Krishna	MPT(Orthopaedics), Ph.D., Faculty, College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati 517501, Andhra Pradesh, India
Dr. K. Madhavi	MPT (Cardiovascular & Pulmonary), College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati 517501, Andhra Pradesh, India

ABSTRACT

Background: Nonspecific neck pain, prevalent among college students, often stems from poor posture and prolonged device use. It lacks clear pathology and is typically linked to muscular imbalance and mechanical stress. Weakness in deep cervical flexors (DCFs) contributes to pain and forward head posture (FHP). **Objective:** To find out the effect of deep neck flexors endurance training along with TENS on pain using VAS, neck flexors endurance using craniocervical flexion test and forward head posture using tragus wall test in subjects with nonspecific neck pain among students. **Methodology:** Forty college students (18–25 years) with nonspecific neck pain underwent a 4-week intervention of deep cervical flexor endurance training and TENS. Pain (VAS), endurance (sphygmomanometer), and posture (tragus-wall test) were assessed pre- and post-treatment. **Results:** Post-intervention analysis revealed statistically significant improvements in pain, neck flexor endurance, and FHP ($P < 0.00$). **Conclusion:** Deep neck flexors endurance training was more effective in reducing pain, improving deep neck flexors endurance and forward head posture in subjects with nonspecific neckpain among students.

KEYWORDS

Nonspecific Neck Pain, Deep Neck Flexors Endurance Training, forward Head Posture, craniocervical Flexor Endurance Test, V.A.S, T.E.N.S.

INTRODUCTION

Non-specific neck pain (NSNP) is discomfort between the superior nuchal line and T1 vertebra, without major structural or neurological issues.⁽¹⁾ It affects around 17.2% of adolescents and many adults, often due to poor posture and weak cervical muscles.⁽²⁾ Key stabilizers of the cervical spine include vertebrae, discs, ligaments, facet joints, and deep flexors like longus capitis and colli. Prolonged forward head posture from digital device use has led to a surge in NSNP, with 84.6% of users reporting symptoms⁽³⁾. Industrial workers facing repetitive neck flexion show high rates of chronic pain and reduced work efficiency.⁽⁴⁾ Cervical spine stress increases sharply with neck flexion, especially at 60°, highlighting posture's impact on spinal health.⁽⁵⁾ College students often suffer neck pain due to poor posture, excessive screen time, and lack of physical activity.⁽⁶⁾ A reduced craniocervical angle (CVA) is linked to muscle imbalance, pain, and sensory issues, though rarely neurological deficits.⁽⁷⁾ Conservative treatments like heat, traction, and deep cervical flexor exercises help relieve symptoms and improve alignment. TENS therapy aids pain relief through mechanisms like gate control, improved circulation, and muscle relaxation.^(8,9)

Materials

Materials used for this study: HighCouch, Stop watch, Modified Sphygmomanometer, Ruler, TENS.

Methods

This study was conducted at SVIMS college of physiotherapy, Tirupathi, over 6 months of period. The participants were selected through purposive sampling method and taken as single group. The study duration was four weeks.

Inclusion Criteria and Exclusion Criteria

Study comprised of female students with nonspecific neckpain with the age group of 18-25 years of age, Neck pain atleast 3 months, Pain intensity ranging from 3-7 on the Visual Analogue Scale, Likert scale indicating smartphone usage ranges 31-33/60. Students with history of neck or shoulder surgery, Cervical radiculopathy, myelopathy, Whiplash injury, Fractures, Rheumatoid arthritis, Ankylosing spondylitis were excluded.

Treatment Procedure

Study Design and Participant Details

Forty female participants aged 18–25 years, all presenting with nonspecific neck pain and meeting the inclusion criteria, were enrolled after providing informed consent. Forward Head Posture(FHP): Assessed using the tragus-to-wall method. Participants stood upright with heels and back against a wall, maintaining a neutral head position. A horizontal ruler was used to measure the distance from the wall to the tragus of the ear. Three trials were conducted, and the average distance (in millimetres) was recorded. Larger values indicated greater FHP severity⁽¹⁰⁾. Craniocervical Flexor Endurance: Evaluated using a modified sphygmomanometer. Participants lay supine with knees flexed and head in neutral alignment, supported if necessary. Endurance was scored based on pressure control across five progressive stages⁽¹¹⁾. Pain Intensity: Measured using the Visual Analogue Scale (VAS)⁽¹²⁾. Endurance Training Protocol⁽¹³⁾ Stage 1: One set of 12–15 repetitions without rest. Participants maintained 15 repetitions consistently for two weeks. Each session lasted 10–20 minutes. Stage 2: Three sets of 15 repetitions with one-minute rest between sets. Load was increased by 0.5 kg or incline as needed. Session duration remained 10–20 minutes.

Load Adjustment

Load was progressively increased using 0.5 kg sandbags until 15 reps were completed without strain. If reps couldn't be achieved, load was reduced by elevating the trunk and neck to lessen head weight.

Conventional Tens Protocol

Dual-channel portable TENS applied to neck with 4 electrodes delivers 150 μ s pulses at 80 Hz, set at 2–3 $\times$ sensory threshold for tingling sensation. Each session lasts 15 minutes, performed 4 times weekly for pain relief.⁽¹⁴⁾

Outcome Measures

Pain: Visual Analogue Scale, neck flexor muscle endurance: Craniocervical flexion test was performed using modified sphygmomanometer. forward head posture: Tragus wall test by ruler. After completing 4 weeks of treatment post test values measurement were taken in all the subjects and data was sent for statistical analysis.

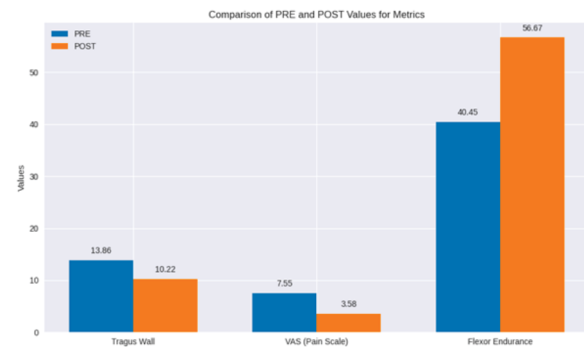
STATISTICAL ANALYSIS AND RESULTS

Statistical analysis was performed using SPSS 26, with data tabulated in Excel and evaluated using mean, standard deviation, and paired t-

tests. A P value < 0.00 was considered statistically significant for pre- and post-test comparisons.

Parameter	Phase	N	Mean	SD	t-test	p-value
VAS	Pre	40	7.55	1.13	13.932	<0.001
	Post	40	3.575	1.48	—	—
Tragus Wall Test	Pre	40	13.86	2.413	10.874	<0.001
	Post	40	10.225	1.56	—	—
Flexor Endurance	Pre	40	40.45	6.698	19.26	<0.001
	Post	40	56.675	7.083	—	—

All three parameters showed statistically significant improvements post-intervention. Pain levels (VAS) dropped, forward head posture improved (Tragus Wall Test), and cervical flexor endurance increased.



Deep Neck Flexor Endurance Training significantly reduced pain levels, as shown by the drop in VAS scores. It improved neck flexor endurance, with a notable increase in performance post-training. Forward head posture was corrected, indicated by the reduced tragus wall distance. Overall, the intervention proved effective in enhancing neck function and posture.

DISCUSSION

Nonspecific neck pain (NSNP) is commonly associated with poor posture and weak cervical muscles. A 4-week program combining Deep Neck Flexor (DNF) endurance training with TENS showed significant improvements in pain, posture, and endurance among female students. Participants followed a structured two-stage DNF protocol with regular TENS sessions. Post-intervention results revealed reduced pain and forward head posture, highlighting DNF's role in recovery. Supporting studies by Sikka et al. and Iqbal et al. affirm DNF training improves endurance and reduces pain, though postural effects may vary.

Gupta et al. and Kim et al. showed that four weeks of deep cervical flexor (DCF) training improved posture, pain, and disability in NSNP. Blomgren and Amiri Arimi found low-load DCF exercises enhanced motor control and proprioception, though less effective under high-load. Jull et al. emphasized DCF's role in cervical spine stability and reducing cervicogenic headaches, despite minimal FHP change. Rampazo et al. and Jie Hao et al. noted TENS offers short-term relief but lacks impact on deeper muscular dysfunctions.

CONCLUSION

The present study concluded that Neck flexor endurance training was found to be effective in reducing pain, improving endurance, and correcting forward head posture in individuals with nonspecific neck pain. By targeting the deep neck flexors, it enhanced spinal stability and served as a valuable component of rehabilitation programs.

Limitations

The Sample size was small, It was a short duration study , Longer follow-up periods are needed to confirm the effectiveness of deep neck flexor endurance training in managing Non specific neck pain.

Recommendations

Further studies with larger sample sizes, The future study is recommended for more than 4 weeks of duration, Future studies can be planned in other age groups, The study can also be conducted on various professions.

REFERENCES

1. Llamas-Ramos R, Pecos-Martin D, Gallego-Izquierdo T, Llamas-Ramos I, Plaza-Manzano G, Ortega-Santiago R, et al. Comparison of the short-term outcomes between trigger point dry needling and trigger point manual therapy for the management of chronic mechanical neck pain: a randomized clinical trial. *J Orthop Sports Phys Ther.* 2014;44(11):852–61.

2. Hoftun GB, Romundstad PR, Zwart JA, Rygg M. Chronic idiopathic pain in adolescence-high prevalence and disability: the young HUNT Study 2008. *Pain.* 2011;152(10):2259–66.
3. Straker LM, O'Sullivan PB, Smith AJ, et al. Relationships between prolonged neck/shoulder pain and sitting spinal posture in male and female adolescents. *Man Ther.* 2009;14:321–9.
4. Ariëns GA, van Mechelen W, Bongers PM, Bouter LM, van der Wal G. Physical risk factors for neck pain. *Scand J Work Environ Health.* 2001;27(1):7–19. doi:10.5271/sjweh.588
5. Dandumahanti BP, Subramaniyam M. Biomechanical analysis of cervical spine (C2–C7) at different flexed postures. *Int J Artif Organs.* 2024;47(3):205–11.
6. Falla D, Jull G, Hodges P. Patients with neck pain demonstrate reduced electromyographic activity of the deep cervical flexor muscles during performance of the craniocervical flexion test. *Spine (Phila Pa 1976).* 2004;29(19):2108–14.
7. Raine S, Twomey LT. Head and shoulder posture variations in 160 asymptomatic women and men. *Arch Phys Med Rehabil.* 1997;78(11):1215–23.
8. Gross AR, Aker PD, Goldsmith CH, Peloso P. Conservative management of mechanical neck disorders: a systematic overview and meta-analysis. *Online J Curr Clin Trials.* 1996;200-201:34457.
9. Shuka KA, Walsh D. Transcutaneous electrical nerve stimulation: basic science mechanisms and clinical effectiveness. *J Pain.* 2003;4(3):109–121.
10. Bohannon RW, Tudini F, Constantine D. Tragus-to-wall: A systematic review of procedures, measurements obtained, and clinimetric properties. *J Back Musculoskelet Rehabil.* 2019;32(2):179–189.
11. Jathania H, Akash A. Evaluation of head posture, deep cervical flexor muscle performance and disability in electricians with mechanical neck pain. *Int J Health Sci Res.* 2023;13(6):74–82
12. Begum MR, Hossain MA. Validity and reliability of Visual Analogue Scale (VAS) for pain measurement. *J Med Case Rep Rev.* 2019;2(11):1–6.
13. Gupta BD, Aggarwal S, Gupta B, Gupta M, Gupta N. Effect of deep cervical flexor training vs. conventional isometric training on forward head posture, pain, neck disability index in dentists suffering from chronic neck pain. *J Clin Diagn Res.* 2013
14. Rampazo EP, Martignago CC, de Noronha M, Liebano RE. Transcutaneous electrical stimulation in neck pain: a systematic review and meta-analysis. *Eur J Pain.* 2022 Jan;26(1):18–42.