

Comparative Study of Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation in Acute Text Neck Syndrome

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ABSTRACT

BACKGROUND- Text neck syndrome has become evident as a prevalent musculoskeletal disorder among young adults, primarily due to pronged use of smartphones and other gadgets. It is associated with postural impairment, reduced craniovertebral angle and functional impairments and it leads to severe neuromuscular complications. Although MET and PNF are widely used in physiotherapeutic interventions, to highlights this syndrome yet comparative evidences assessing their effectiveness in acute cases are still limited.so in this study comparison was given between the MET and PNF.

Aim- To compare effect of Muscle Energy Technique and Proprioceptive neuromuscular facilitation in acute text neck syndrome.

Procedure - Ethical clearance will be obtaining from the institution ethical committee. In total subjects with Acute Text Neck Syndrome were 80 included according to inclusion criteria and exclusion criteria and explain about the study and taken consent form. subjects divided into two group.i.e. Group A and Group B by randomized method. The procedure will be explained to the subjects. A written consent will take from subjects who are willing to participate. Group A included 40 participants (Muscle Energy Technique) Group B included 40 participants (Proprioceptive Neuromuscular Facilitation) for 4 days in a week for 4 weeks.

Outcome measures- Numerical Pain Rating Scale (NPRS), Neck Disability Index (NDI), Cranio-vertebral Angle (CVA).

Result- Both groups showed statistically significant improvements across all outcome measures. However, the MET group A showed a more pronounced and faster reduction in pain, greater improvement in functional disability and correction of craniovertebral angle compared to the PNF group.

Conclusion- Muscle Energy Technique combined with conventional physiotherapy is superior to Proprioceptive Neuromuscular Facilitation in managing acute text neck syndrome. Its ability to produce faster and more significant clinical improvements in managing acute text neck syndrome.

Keyword's – Acute Text Neck Syndrome, Text Neck, Muscle Energy Technique, Proprioceptive Neuromuscular Facilitation, cervical spine, Craniovertebral angle.

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INTRODUCTION

Text Neck Syndrome is defined as neck pain and injury brought on by prolonged staring on gadgets such as cell phones, tablets or other wireless devices¹.while looking downward too frequently and long- duration cervical flexion is occurring. It potentially affects many people worldwide¹.

According to recent research, 79% of people between the ages of 18 to 44 have their cell phones with them practically all the time, with only two hours of the day spent without them¹. In people who use smartphones spend about two to four hours per day while texting messages, reading e-mails or checking social media. It leads to neck discomfort and tenderness.

Additionally, it is referred to as 'Turtle Neck' when

describing repetitive stress injuries². Where individual flexes his neck forward and bent downward looking prolonged at his mobile or other electronic device. Text Neck is becoming more prevalent among young adults in today's generation, who are always flexing over their gadgets, even when performing basic daily tasks like eating or walking. Additionally, excessive smartphone staring might cause upper back pain and muscular spasm². The Neck is a crucial structure that joins our head and body. It is made up of sensitive muscles on four sides of the neck.

DR. Dean. L. Fishman is credited with coining the term 'Text Neck'². When a person flexes his head forward while he or she is staring at a phone or other electronic devices². While flexing the head forward,

the text neck directly affects the spine, to various extents. When standing erect, your ears should be in line with the center of your shoulders and your neck muscle weight is about 10 -12 lbs¹.

The text neck syndrome should be viewed as a 'Present – Day Pain'³. The cervical spine starts to put more strain on the neck while it bends forward and downward. The Weight is 27 pounds at 15 degrees and so on, increasing at 60 degrees almost 60- pound d weight on the neck, Ultimately, the results showed that neck pain, upper back pain and shoulder pain⁴.

'Text Neck' as you twist or bend your neck leads to wear and tear of the spine and also degeneration⁴. As repetitive stress occurs, leads to repeatedly pulling and stretching muscles around the neck which results in Muscle strain (mainly trapezius, levator scapulae, sternocleidomastoid) is the main factor which exacerbate this clinical condition⁴. If text neck is remains untreated, it causes permanent change in Neck ligaments, curvature of spine and changes in muscle. It may also result in nerve damage, stiff neck, Inflammation of neck ligaments, sharp pain, radiating pain, weakness and numbness².

SYMPTOMS

Stiff Neck- difficulty to turn head side to side after long use of electronic devices.

Soreness- localised painful area especially, trapezius region.

Radiating Pain- Due to excessive bending pain may radiating to shoulder with nerve involvement.

Weakness and Numbness- mainly Sternocleidomastoid, trapezius goes into weakness.

Headache- Due to muscle tightness, irritation occurs to muscles and nerves it leads to headaches.

ANATOMY OF NECK – ⁵

Structure of neck is 'Quadrilateral and it is bounded ⁵, 'Anteriorly' by posterior border of sternocleidomastoid 'superiorly' by base of mandible.

'inferiorly' by the clavicle.

Muscle involved in Text Neck Syndrome mainly is⁶ Trapezius

Levator scapulae

Sternocleidomastoid

Text neck syndrome includes all this muscle tightness and due to weight put on neck muscle leads to muscle leads to forward head posture and leads to overworking of upper back muscles to counterbalance the pull of gravity lifestyle changes greatly help in reducing pain and muscle tightness of text neck³.

Text Neck Syndrome divided into two parts¹,

Most of the people who are using gadgets for longer duration they are suffering from acute neck pain due to do not get primary attention or ignorance and it may lead to worsen effects on neck and head region⁷.

Complications-

Frequent prolonged forward flexion leads to neck

changes in natural curvature of cervical spine due changes in ligaments, tendons and bony segments and potentially leading to early spinal arthritis, disc degeneration, headache, nerve damage etc. complications¹⁵.

As there is complications of Text Neck Syndrome also impair Biomechanics of cervical spine.

Forward flexion of cervical area while using gadgets that increases the mechanical stress on cervical vertebrae, intervertebral discs, ligaments and surrounding muscles.¹⁶ also various studies show that there is increasing flexion angle of cervical spine by activation and postural adaptation¹⁶.

That contributes to muscle strain and weakness of posterior neck muscles.¹⁶ Neck stabilization with corrected posture helps to elongate shorten muscle and strengthen Weakness of muscles.**MUSCLE ENERGY TECHNIQUE –**

A type of manual therapy called Muscle Energy Technique that uses the body's own energy to stretch and relax tense muscles. It has been used extensively to treat musculoskeletal disorders. Its goal is to mobilize the joint by either strengthening weak muscle with isometric contractions or by extending tight muscles⁸ In Muscle Energy Technique, the individual can voluntarily contract the muscle from a controlled position in a precise direction opposite to the delivered force.²¹

The two primary principles of MET are followings⁴,

Post-Isometric relaxation- which relaxes same muscles on contraction of agonist muscles.

Reciprocal-Inhibition- which relaxes antagonist muscles on contraction of agonist muscles.

Muscles can be gently lengthened during 'Post-isometric relaxation' by contracting isometric for a while then relaxing for latent period. Chaitow claims that, MET is an active isometric contraction technique that aids in pain relief. Because of the 'Viscoelastic' change in muscles, MET with PIR assisting in relieving muscle tension and promote muscle flexibility¹².

During PIR, patient's muscle moves in a certain direction against the therapist counterforce. The golgi tendon organ activate and responds to inhibition and contraction of antagonist muscle. Rhythmic muscular contraction increases blood flow rate and lymph flow rate and produce

mechanical stress acting on fibroblast causes changes in interstitial connective tissue and

increase blood flow¹². During reciprocal inhibition, usually agonist muscles contract against therapist counterforce to relax antagonist muscles.

PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION -

The Proprioceptive neuromuscular facilitation (PNF) is a treatment that treats neuromuscular and structural

dysfunction by activating the proprioceptive sense through muscles and nerves. It is primarily based on the principles of neurophysiology that is the 'Autogenic Inhibition'. The patterns of the technique are distinguished by diagonal and three-dimensional in nature movements brought about by synergistic contraction of muscles.¹³ Every aspect of muscle training, pain, functional pattern and muscular stability and co-ordination are addressed by the PNF technique.¹⁴ It acts by stretching technique combining passive stretch with isometric muscle action designed by using response of Golgi tendon organ.¹⁴ It is very effective in improving flexibility, strength and range of motion by using sensory proprioceptive.¹

PNF stretching encompasses many approaches that involve alternating phases of contraction and relaxation of both agonist and antagonist muscles.²³ In PNF techniques most widely used technique is 'Hold-Relax' (HR) that uses an isometric contraction to relax tensioned or shortened muscles.²¹ and another two techniques are seen more in researches are,

Contract-Relax method (CR)²⁵

Contract-relax-antagonist-contract (CRAC)

In CR method target muscle is lengthened by holding same position while individual contract muscle isometrically for short period of time it also known as 'Hold-Relax' technique after period of contraction short period of stretching can be given to targeted muscle²⁵. And CRAC also performed in same way only individual participant is contracting antagonist muscle for short period of time.

MATERIAL AND METHODOLOGY

An Interventional, Comparative clinical study conducted on Individual with Acute text neck syndrome -Excessive Electronic Device Users at D.Y. Patil College of Physiotherapy, Musculoskeletal OPD for a duration of 6 Months. Participant fulfilling inclusion criteria and exclusion criteria were selected for study. simple random sampling method was used. Sample size – n= 80 (40 each group).

Material-

Physio Master app, Data collection sheet, Consent form
Inclusion Criteria- Both male and female subjects aged between 18 -28 years, Subjects use electronic device more than 4 hours per day neck pain for less than 6 weeks are included in this study.

Exclusion Criteria-

Subjects with other known medical conditions such as Spinal cord injuries, Congenital cervical conditions, Pathological condition of cervical spine prior to study are excluded from the study.

PROCEDURE

Ethical clearance is achieved from the institution ethical committee. In total subjects with Acute Text Neck Syndrome are included after consent. subjects were divided into two group i.e. Group A and Group

B according to inclusion criteria and exclusion criteria and explain about the study.

The procedure was explained to the subjects. A written consent was taken from subjects who are willing to participate.

Group A was treated by Muscle Energy Technique – PIR for 5 repetitions for 2 set every day for first 2 weeks and in 3 and 4 weeks 3 sets of 5 repetitions. MET were performed mainly on Upper Trapezius, Levator scapulae and sternocleidomastoid. Single Contraction performed for 10 sec. followed by relaxation Total 4 session performed in one week. follow up taken after 3 weeks to check progressions. Group B was treated by Proprioceptive neuromuscular facilitation -HR for 5 repetitions for 2 set every day for first 2 weeks and in 3 and 4 weeks 5 repetitions of 3 sets. It consists of 4 patterns of exercise to Neck and Upper extremity. Total 4 session performed in one week follow up taken after 3 weeks to check progression.

Before treatment pre assessment was done by using NPRS to assessed pain, NDI scale for disability of neck and to check CVA here we used Photogrammetry method in Physio-Master app. While checking CVA instructed to individual take position for photogrammetry method after click photo on physio-master app adjust the anatomical areas such – "outer canthus, tragus, c7 vertebrae, acromion process."

After adjusting on photogrammetry, it was show CVA that suggested Forward head posture.

Group A

Receiving Muscle energy technique¹²

Upper Trapezius

Patient position - Patient in Supine position, neck is fully side-bent contralaterally, arms alongside the trunk.

Therapist position - Therapist stand at head side stabilizes the affected side shoulder using palm of one hand, while other hand used to support at occiput.

Line of movement- Neck flexion, contralateral followed by same side rotation towards side being treatment. instruct patient to move head back towards table and to shrug the stabilized shoulder with equal force against the therapist resistance to maintain isometric -contraction for 10 seconds and hold breath. then ask to patient exhale while relax. Then stretch is applied for 10 sec. with same passive movement to reach a new muscle range.

Repetition - PIR repeated 10 times on Trapezius Levator scapulae

Patient position – Patient in Supine position, arms are alongside of body. Neck is neutral.

Therapist position – Therapist stand at head side of patient and place one hand over shoulder to stabilize same side. And other hand supported over occiput.

Line of movement – Neck moves into full flexion,

lateral flexion and rotation on contralateral side. instruct to patient to move the head back to table while at the same time slightly shrugging the shoulder with equal force against to it. Therapist apply against counterforce to movement of head, and maintain the isometric contraction for 10 sec. after contraction hold breath, then ask to patient exhale while relaxing, then apply gentle stretch for 10 sec. then with same passive movement reaches to new muscle range.

Repetition – PIR repeated 10 times on levator scapulae.

Sternocleidomastoid -

Patient position- Patient in Supine position, head in a neutral position. Contralateral hand rest on the upper aspect of sternum to act as cushion when stretch phase. Head is contralateral rotated.

Therapist position - Therapist stand at head of the patient and place one hand over patient hand to stabilize over sternum and other hand over same side of face.

Line of movement – Ask to patient lift the fully rotated head towards ceiling and hold breath while contracting for 10 sec and exhale while relaxation. Then same passive movement reaches to new range.

Repetitions - PIR repeated 10 times on sternocleidomastoid. **Group B** –

Receiving Proprioceptive Neuromuscular facilitation (H-R method)

Head and Neck Flexion with rotation to Right side (same as to left side)-Patient position- Sitting on stool with arms in relax position.

Starting position – extension of head and neck with rotation to left.

Therapist position – Standing, one hand on forehead and other on the mandible.

Command and line of movement – Command ‘pull your chin down towards the sternum’. And ask to perform flexion of head and neck with rotation to the right with normal timing. Facilitation through verbal command and manual contact

Head and Neck Extension with Rotation to Right side (same as to left side)-Patient position- Sitting on stool with arms in relax position.

Starting position –flexion of head and neck with rotation to left.

Therapist position – Standing, one hand on forehead and other on the mandible.

Command and line of movement –Command ‘push chin and look to right’ and ask to perform extension of head and neck with rotation to right with normal timing facilitation through appropriate verbal command and manual contact.

RESULT

Comparative study of Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation technique shown that Acute Text Neck Syndrome symptoms such as pain measured by Numerical Pain Rating

Scale, functional ability by Neck Disability Index and postural changes assess by PhysioMaster app. This finding suggested that both techniques i.e. MET and PNF are effective to treat Acute Text Neck Syndrome. But Muscle Energy Technique is shown that more improvement

by reducing pain, improving functional ability as well as increasing cranio-vertebral angle (decreasing forward head posture).

GENDER DISTRIBUTION –

Table 1A presents the **Group A** -gender distribution of the total participants. Among the 40 - participants, 27 were male and 13 were female.

Table 1B presents the **Group B** – gender distribution of the total participants. Among the 40 - participants,26 were male and 14 were female.

Table No.1A Gender distribution

GENDER DISTRIBUTION-Group A		
Gender	Frequency	Percentage
Male	27	67.50%
Female	13	32.50%
Total	40	100.00%

GENDER DISTRIBUTION-GROUP B		
Gender	Frequency	Percentage
Male	26	65.00%
Female	14	35.00%
Total	40	100.00%

Table No.1B Gender distribution

Graph 1 illustrates the percentage distribution, Group A showing that Males are accounted for 67.50% of the total, while females comprised 32.50%. and Group B showing that Males are accounted for 65.00% of the total, while females comprised 35.00%.

Graph No.1 Gender distribution

AGE WISE DISTRIBUTION

Table 2 presents the age-wise distribution of participants in **Group A** (Muscle Energy Technique) and **Group B** (Proprioceptive Neuromuscular Facilitation). The mean age for Group A was 22.40 years (S.D. 1.57), while Group B had a mean age of 22.20 years (S.D. 1.73).

Graph 2 illustrates graphical representation of the mean ages, showing a similar distribution across both

the groups indicating that age is evenly distributed among participants within the two exercise groups, as illustrated in the graphical comparison.

Table No. 2 Age Distribution

Group	Age	
	Mean	Std. Deviation
A	22.42	1.57
B	22.20	1.73

Graph No. 2 Age wise Distribution

PRE & POST ON REST PAIN AND ON MOVEMENT PAIN NPRS SCORE IN GROUP A



Table 3 presents the pre- and post-intervention values of **ON REST PAIN** and **ON MOVEMENT PAIN** for **Group A** (Muscle Energy Technique). The results show a significant improvement, with **ON REST PAIN** decreasing from a mean of 4.08 to 0.50 (P-value: <0.001*), and **ON MOVEMENT PAIN** reducing from 6.98 to 2.05 (P-value: <0.001*).

Graphs 3 visually depict the pre- and post-intervention mean values of **ON REST PAIN** and **ON MOVEMENT PAIN** for Group A.

Group A- NPRS				
Parameters	Assessment Period	Mean	Std. Deviation	p-value
NPRS On Rest	Pre	4.08	0.76	<0.001*
	Post	0.50	0.60	
NPRS On Move	Pre	6.98	0.89	<0.001*
	Post	2.05	0.85	

Table No. 3 Pre-Post Intervention of ON REST

PAIN and ON MOVEMENT PAIN in Group A 8.00

Graph No. 3 Pre-Post Intervention of ON REST PAIN & ON MOVEMENT PAIN in Group A

Related-Samples Paired-t-Test Summary	
Total N	40
Test Statistic	13.64
Standard Error	1.19
Standardized Test Statistic	13.64
Asymptotic Sig. (2-sided test)	<0.001*

D. PRE & POST SCORES OF NECK DISABILITY INDEX IN GROUP A

Tables 4a, 4b and 4c represent the pre- and post-intervention Neck Disability Index for **Group A**. The results indicate that the mean difference between pre- and post-intervention scores is 16.23, with a significance level of 0.050, leading to the rejection of null hypothesis. So, there is significant difference in pre and post values of NDI after treatment of Muscle Energy Technique.

Graphs 4 visually represent the Neck Disability Index before and after the intervention, demonstrating a significant reduction of scores following the intervention.

GROUP A -NDI	Mean	St. Deviation	p-values
Pre	39.08	7.52	<0.001*
Post	22.85	2.62	

Summary of Hypothesis Test –

Table No. 4b

Table No. 4c Pre-Post Intervention of Neck Disability Index in Group A

Graph 4 – Pre and Post Score of Neck Disability Index

PRE-POST INTERVENTION OF CRANIO-VERTEBRAL ANGLE IN GROUP A-

Table 5 represents pre and post intervention values of cranio-vertebral angle which is assessed by smartphone app i.e. PhysioMaster app. Before treatment mean was 45.68 and post treatment means is 51.33 and p- value is <0.001*. So, it is shown that CVA angle is significantly improved after treatment.

Graphs 5 visually represent the Cranio-vertebral Angle before and after the intervention, demonstrating a significant rising of scores following the intervention. i.e. greater changes occurs, in posture or in forward head posture.

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GROUP A -CVA	Mean	St. Deviation	p-values
Pre	45.68	1.85	<0.001*
Post	51.33	1.70	

Table 4 Pre and Post Score of CVA Measurement

Graph 5 – Pre and Post Score of Cranio-vertebral Angle

E. PRE & POST ON REST PAIN AND ON MOVEMENT PAIN IN GROUP B

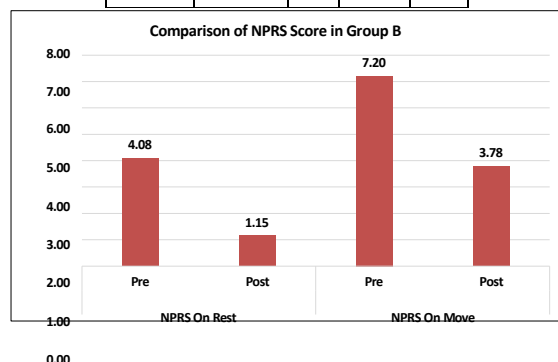
Table 6 represents the pre- and post-intervention values of **ON REST PAIN** and **ON MOVEMENT PAIN** for **Group B** (Proprioceptive Neuromuscular Facilitation). The results show a significant improvement, with **ON REST PAIN** decreasing from a mean of **4.08** to **1.15** (P-value: <0.001*), and **ON MOVEMENT PAIN** reducing from **7.20** to **3.07** (P-value: <0.001*).

Graphs 6 visually depict the pre- and post-intervention mean values of **ON REST PAIN** and **ON MOVEMENT PAIN** for Group B.

Table No. 6 Pre-Post Intervention of ON REST PAIN and ON MOVEMENT PAIN in Group B

Group B

Parameters	Assessment Period	Mean	Std. Deviation	p-value
NPRS On Rest	Pre	4.08	1.02	<0.001*
	Post	1.15	1.03	
NPRS On Move	Pre	7.20	0.85	<0.001*
	Post	3.78	1.19	



Graph No. 6 Pre-Post Intervention of ON REST PAIN & ON MOVEMENT PAIN in Group B

F. PRE & POST SCORES OF NECK DISABILITY INDEX IN GROUP B

Tables 7a, 7b and 7c represent the pre- and post-intervention Neck Disability Index for **Group B**. The

results indicate that the mean difference between pre- and post-intervention scores is **12.83**, with a significance level of **<0.001***, leading to the rejection of null hypothesis. So, there is significant difference in pre and post values of NDI after treatment of Proprioceptive Neuromuscular Facilitation.

Graphs 7 visually represent the Neck Disability Index before and after the intervention, demonstrating a significant reduction of scores following the intervention.

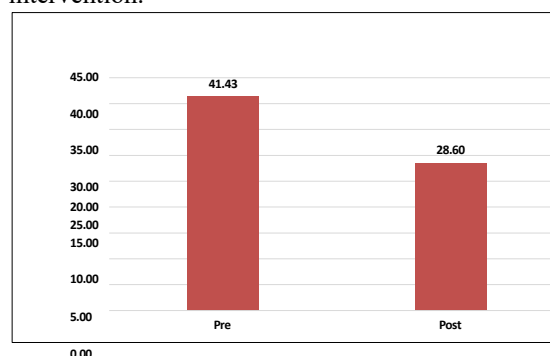


Table No. 7c Pre-Post Intervention of Neck Disability Index in Group B

Graph 7 – Pre and Post Score of Neck Disability Index

Related-Samples Paired-t-Test	
Summary	
Total	4
N	0
Test Statistic	22.2
Standard Error	8
Standardized Test Statistic	0.5
Asymptotic Sig. (2-sided test)	7
	22.2
	8
	<0.00
	1

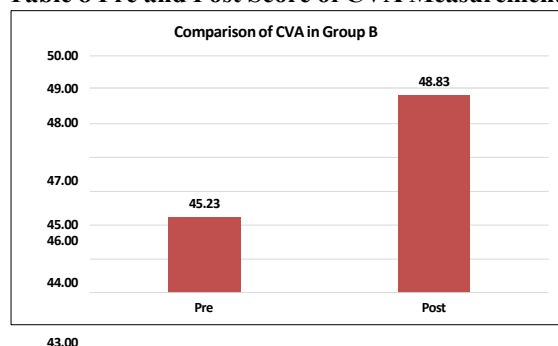
G. PRE-POST INTERVENTION OF CRANIO-VERTEBRAL ANGLE IN GROUP B

Table 8 represents pre and post intervention values of cranio-vertebral angle which is assessed by smartphone app i.e. PhysioMaster app. Before treatment mean was **45.23** and post treatment means is **48.83** and p- value is **<0.001***. So, it is shown that CVA angle is significantly improved after treatment.

Graphs 8 visually represent the Cranio-vertebral Angle before and after the intervention, demonstrating a significant rising of scores following the intervention. i.e. changes occur in posture or in forward head posture.

GROUP	Mean	St. Deviation	p-values
B			
- CVA			
Pre	45.23	3.64	<0.001*
Post	48.83	2.98	

Table 8 Pre and Post Score of CVA Measurement



Graph 8 – Pre and Post Score of Cranio-vertebral Angle

H. GROUP WISE COMPARISON OF ON REST PAIN & ON MOVEMENT PAIN ON NPRS

Table 9 represents a group-wise comparison of post-intervention **ON REST PAIN** and **ON MOVEMENT PAIN** values, highlighting a significantly greater improvement in **Group A** in comparison to **Group B**. The mean of **ON REST PAIN** for **Group A** was **0.50** with a standard deviation of **0.60** while for **Group B**, it was **1.15**, S.D. **1.03** (**P-value: <0.001***). Similarly, the mean **ON MOVEMENT PAIN** for **Group A** was **2.05** with a standard deviation of **0.85**, whereas for **Group B**, it was **3.78** with a standard deviation of **1.19** (**P-value: <0.001***).

Graphs 9 visually illustrate the group-wise comparison of **ON REST PAIN** and **ON MOVEMENT PAIN** values, demonstrating that **Group A** exhibited significantly greater improvement than **Group B**.

Group Comparison

Parameters	Group	Mean	Std. Deviation	p-value
NPRS On Rest	A	0.50	0.60	<0.001*
	B	1.15	1.03	
NPRS On Move	A	2.05	0.85	<0.001*
	B	3.78	1.19	

Table No. 9 Group wise comparison of on rest pain \ on movement pain

Graph No. 9 Group wise comparison of on rest pain \ on movement pain

I. GROUP WISE COMPARISON OF NECK DISABILITY INDEX SCORE

Tables 10a,10b and 10c represent a group-wise comparison of Neck Disability Index scores for **Group A** and **Group B**, indicating that the score distribution in group A is more than group B. The significance level of <0.001*suggests that **Group A** is more effective.

Graph 10 Graphically presents the comparison, showing that the mean Neck Disability Index for **Group A** is **22.85**, while for **Group B**, it is **28.60**.

GROUP	Mean	St. Deviation	p-values
COMPARISON			

Group A	22.85	2.62	<0.001*
Group B	28.60	2.98	

Table 10a Group wise comparison of Neck Disability Index

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig. ^{a, b}	Decision
1	The distribution of Score is the same across categories of Group. (To accept hypothesis)	Independent-T-Test	P<0.001	Reject the null hypothesis. (score between 2 groups not same)
a. The significance level is .001*.				
b. Asymptotic significance is displayed.				
c. Exact significance is displayed for this test.				

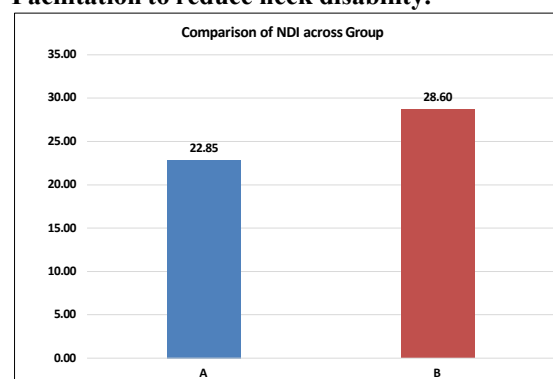
Table NO.- 10b - Group wise comparison of Neck Disability Index

Independent-Unpaired-t-test Summary	
Total N	80
Test Statistic	9.13
Standard Error	0.63

Standardized Test Statistic	9.13
Asymptotic Sig.(2-sided test)	0.001*
Exact Sig.(2-sided test)	0.001

Table No. 10b Group wise comparison of Neck Disability Index Score

According to Independent -sample Unpaired-t-Test suggested that Muscle Energy Technique is more effective than Proprioceptive Neuromuscular Facilitation to reduce neck disability.



Graph No. 10 Group wise comparison of Neck Disability Index

J. GROUP WISE COMPARISON OF CRANIO-VERTEBRAL ANGLE

Table 11 represents a group-wise comparison of the Cranio-vertebral Angle i.e. Forward Head Posture. highlighting differences among **Group A** and **Group B**. mean of CVA for **Group A** was **51.33**, std deviation was 1.70 and p-value: <0.001 while for **Group B**, mean was **48.83**, std deviation 1.38 and p-value: <0.001. CVA was measured by Smartphone app i.e. PhysioMaster app.

So, the Group A showed markedly increasing angle i.e. decreasing forward head posture than in Group B. Graph 11 Graphically illustrate the group-wise comparison of Cranio-vertebral Angle.

GROUP	Mean	St. Deviation	p-values
COMPARISON			

Group A	51.33	1.70	<0.001*
Group B	48.33	1.38	

Table 11 Group wise comparison of Craniovertebral Angle
Graph 11 Group wise comparison of Craniovertebral Angle

Result - According to statistics analysis, Group A i.e. Muscle Energy Technique was showed more effective than Group B i.e. Proprioceptive Neuromuscular Facilitation by reducing pain, improve functional ability and improve forward head posture by decreasing cranio-vertebral angle by using NPRS, NDI Scale, PhysioMaster app in individual with ACUTE TEXT NECK SYNDROME. Also, by using Paired-t-test and Unpaired-t-test showed that Rejection of NULL HYPOTHESIS.

DISCUSSION

This study aimed to compare the effect of Muscle Energy Technique (MET) and Proprioceptive Neuromuscular Facilitation (PNF) in Acute Text Neck Syndrome. A total of 80 subjects aged 18–28 years were recruited and equally divided into two groups. Group A received MET with conventional therapy for 4 days/week for four weeks, while Group B received PNF with conventional therapy for the same duration.

Previous studies have shown that Text Neck Syndrome is increasing among young adults due to excessive use of smartphones and other gadgets. The prevalence of Text Neck Syndrome in the general population is reported to be 79% among individuals aged 18–44 years (1). The incidence among individuals aged 18–25 years ranges from 32%–34%, which justifies the inclusion of the 18–28 years age group in the present study (18). Studies also reported that females are more commonly affected than males due to prolonged gadget use and poor postural habits (18). Continuous use of gadgets is associated with neck pain, muscle tightness, weakness, and postural abnormalities affecting the cervical and upper thoracic regions.

Research has classified Text Neck Syndrome into mild (36.5%), moderate (23.4%), and severe (2.1%) categories (3). Increased gadget addiction, stress, anxiety, and psychological factors may further worsen physical symptoms (3). Common assessment tools used in recent studies include the Numeric Pain Rating Scale (NPRS) for pain, Neck Disability Index (NDI) for functional disability, and Craniovertebral Angle (CVA) for forward head posture analysis (2). A CVA less than 45° indicates forward head posture, while higher NDI scores suggest greater neck disability (2).

A systematic review by Sandeep Shinde and Radha Bhende (2023) described Text Neck Syndrome as a repetitive stress injury commonly affecting individuals aged 18–28 years due to prolonged gadget use (2). The study explained that sustained neck flexion causes muscle tightness, weakness, spasms, flattening of cervical curvature, upper crossed syndrome, and nerve involvement. Physiotherapy interventions such as postural correction exercises, strengthening exercises, proprioceptive training, and ergonomic modifications were found effective in reducing symptoms and preventing complications (2).

Similarly, Sunil Neupane, U T Ifthikar et al. (2017) reported a 79% prevalence of Text Neck Syndrome among gadget users aged 18–44 years (1). The condition, also referred to as “Turtle Neck Syndrome,” results from prolonged neck flexion while using smartphones. The normal head weight of 10–12 lb increases up to 60 lb during excessive neck flexion, causing stress on cervical structures and leading to spinal degeneration, disc compression, and nerve involvement if untreated (1).

Previous studies have also demonstrated the effectiveness of MET in Text Neck Syndrome. Pakeeza Seemal, Rabiya Noor et al. (2022) explained that MET is a manual therapy using post-isometric relaxation to stretch tight muscles and strengthen weak muscles (8). MET was applied to the upper trapezius, levator scapulae, scalenes, and sternocleidomastoid muscles, which are commonly affected in Text Neck Syndrome. The study reported significant improvement in pain, disability, posture, and CVA when MET was combined with conventional therapy (8).

Ewan Thomas, A. Cavallaro et al. (2019) described MET as a manual therapy involving controlled muscle contraction against therapist resistance (9). MET works by activating mechanoreceptors and joint proprioceptors, thereby reducing pain and improving circulation, flexibility, and range of motion. The

authors explained two major principles of MET: Post-Isometric Relaxation (PIR) and Reciprocal Inhibition. The review concluded that MET is effective in both acute and chronic cervical pain and suggested future studies comparing MET with stretching techniques such as PNF (9).

PNF has also been found effective in managing Text Neck Syndrome. Kaya M, Ucgun Hikmat et al. (2024) explained that PNF is based on neurophysiological principles and stimulates proprioceptors using diagonal movement patterns and stretching techniques (13). Contract-relax techniques improve flexibility, posture, endurance, and pain reduction in individuals with Text Neck Syndrome. Sonali R and Dr. Priyanka H (2023) also reported that PNF techniques such as Dynamic Reversal and Rhythmic Stabilization improve cervical extension, flexibility, and neck function while reducing pain (14). PNF works through autogenic inhibition and reciprocal inhibition mechanisms to decrease muscle tension and improve neuromuscular control.

Another study by Reema Joshi and Nishita P (2022) highlighted that MET combined with postural correction exercises improves blood circulation, reduces nociceptive stimuli, increases muscle flexibility, and restores normal muscle function through post-isometric relaxation (10). Chindani Kumari, Bibhuti Sarkar et al. (2016) compared MET and PNF in chronic mechanical neck pain and concluded that both techniques effectively reduce pain and improve functional ability, although MET showed greater relaxation and muscle inhibition effects (17).

The present study evaluated the effectiveness of MET and PNF using NPRS, NDI, and CVA in individuals with Acute Text Neck Syndrome aged 18–28 years. Within-group analysis using repeated measure ANOVA demonstrated that both MET and PNF significantly reduced pain, improved functional status, and increased CVA. However, MET combined with conventional physiotherapy showed greater statistical significance ($p < 0.001$) compared to PNF.

The superior effect of MET may be attributed to its ability to reduce muscle tightness, improve flexibility, restore joint mobility, and correct posture through post-isometric relaxation. Acute Text Neck Syndrome is associated with tight cervical extensors and weak cervical flexors due to prolonged neck flexion. MET uses active isometric contraction, producing viscoelastic changes within muscles that improve circulation, reduce nociceptive input, and promote faster recovery (12). Activation of Golgi tendon

organs during isometric contraction produces autogenic inhibition, resulting in muscle relaxation and restoration of normal muscle length.

Although PNF effectively improves flexibility, neuromuscular control, and cervical stability through diagonal movement patterns and reciprocal inhibition, it may require more time to achieve significant improvements in acute conditions. Therefore, the findings of the present study suggest that MET is more effective than PNF in reducing pain, improving functional ability, and correcting forward head posture in individuals with Acute Text Neck Syndrome.

CONCLUSION

The present study aimed to compare the effect of Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation in Acute Text Neck Syndrome. The findings showed a significant improvement in Neck Pain, Functional disability and Craniovertebral Angle post interventions in Group A. When both techniques comparing the MET and PNF, muscle energy technique demonstrated greater effectiveness to improving neck pain, functional disability and craniovertebral angle pre and post values based on outcome measures, Numerical Pain Rating Scale (NPRS) Neck Disability Index (NDI) Craniovertebral Angle (CVA), suggesting its excellence in optimizing neck function in individual with Acute Text Neck Syndrome over the 4-week treatment protocol.

However, when two techniques comparing, MET showed more effective to reduce pain and decreasing disability and correction of forward head posture (increasing CVA) than PNF. Therefore, within limitation of the present study, in conclusion that Muscle Energy Technique is more effective technique compared to Proprioceptive Neuromuscular Facilitation in Acute Text Neck Syndrome.

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