

To Study Effects of Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation on Computer Users Suffering from Neck Pain: A Comparative Study

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Abstract

Prolonged use of computers during daily work activities and recreation is often cited as a cause of neck pain. Neck pain and computer users are clearly connected due to extended periods of sitting in a certain position with no breaks to stretch the neck muscles. Prolonged computer use with neck bent forward, will cause the anterior neck muscles to gradually get shorter and tighter, while the muscles in the back of neck will grow longer and weaker. These changes will lead to development of neck pain. **METHODOLOGY:** A total 40 subjects were selected for study. They were divided into 2 groups 20 in each. Group A was given Muscle Energy Technique, And Group B was given Proprioceptive Neuromuscular Facilitation. Treatment was given 5 days per week, for 6 weeks. Outcome measure in form of NPRS, And NDI were recorded on 1st day before treatment and after 6 weeks. **RESULT:** Group A and B showed significant improvement in all three outcome measures within group ($P > 0.05$). Between Group A and B were significant ($p > 0.05$). So, three groups were shows significant difference. **CONCLUSIONS:** The results of this Comparative study indicated that the treatment in all three Groups (Muscle Energy Technique And Proprioceptive Neuromuscular Facilitation) are effective in participants with Computer Users Suffering From neck pain on pain and functional disability. However, MET was found to be superior to Proprioceptive Neuromuscular Facilitation alone in participants with Computer Users Suffering From neck pain.

Keywords: Neck Pain With Computer Users, Muscle Energy Technique, Proprioceptive Neuromuscular Facilitation.

Introduction

Computer related activities are positively associated with NP. In visual display unit work as in computers, information is displayed on a screen and processed via manual input devices like keyboard and mouse. The devices remaining immobile on the desk, the worker is obliged to maintain the same static posture while working. Computer work means sitting at desk with neck in flexion position, while the keyboard

and .mouse operation requires repetitive upper extremity motion.⁽¹⁾ Neck pain is a common complaint in the general population, with a 12 month prevalence ranging from 12-72%, and more specifically in the working population 27-48%.¹ Neck pain with associated disability is less common, with 12 month prevalence of 1.7 – 11.5%. Many individuals with neck pain continue to report symptoms a year later, particularly office workers. Office workers have the highest incidence of neck pain, estimated at 36-57.5 per hundred worker years. Individuals who perform jobs involving sitting the majority of the day have an identified risk factor for neck pain that is double that of other workers. Many jobs today performed in sitting include use of computer workstations.⁽²⁾

NEED OF STUDY

Neck pain is a common problem within our society affecting individual's physical and social functioning considerably and interfering with sufferer's daily activities.⁽³⁾ Upper trapezius and levator scapulae are the most common postural muscles that tends to get shorten leading to restricted neck mobility as they are most frequently used to maintain posture. If these group of muscles are treated it may provide with best results.⁽⁴⁾ A wide variety of treatment protocols for Computer users suffering from neck pain are available however, the most effective management remains an area of debate. There is lack of evidence to allow conclusions to be drawn about the effectiveness of Muscle energy technique when compared with Strengthening exercise for relieving neck pain. Therefore this study will add to the growing body of knowledge that if two techniques yield comparable outcomes and if one technique is superior to the other, which should be the alternate choice of therapy.

OBJECTIVE OF THE STUDY

To determined the effects of Muscle energy technique in patients with Computer users suffering from neck pain.

To determined the effects of Proprioceptive Neuromuscular Facilitation in patients with Computer users suffering from neck pain .

To Compare the effects of Muscle energy technique And Proprioceptive Neuromuscular Facilitation in patients with Computer users suffering from neck pain .

AIM OF THE STUDY: To compare effectiveness of Muscle energy technique And Proprioceptive Neuromuscular Facilitation on computer users suffering from neck pain.

NULL HYPOTHESIS (H₀):-

There is no significant difference in effect of Muscle energy technique in patients with Computer user suffering from neck pain. There is no significant difference in effect of Proprioceptive Neuromuscular Facilitation in patients with Computer user suffering from neck pain. There is no significant difference between the effectiveness of Muscle energy technique and Proprioceptive Neuromuscular Facilitation in patients with Computer user suffering from neck pain.

ALTERNATIVE HYPOTHESIS(H₁):-

There is significant difference in effect of Muscle energy technique in patients with Computer user suffering from neck pain. There is significant difference in effect of Proprioceptive Neuromuscular Facilitation in patients with Computer user suffering from neck pain. There is significant difference

between the effectiveness of Muscle energy technique and Proprioceptive Neuromuscular Facilitation in patients with Computer user suffering from neck pain.

OUTCOME MEASURES:

1. Numeric Pain Rating Scale (NPRS):

The 11-point numeric scale ranges from '0' representing no pain and '10' representing —the unbearable pain (e.g. pain as bad as you can imagine or worst pain imaginable). The NPRS can be administered verbally or graphically for self completion. As mentioned above, the respondent is asked to indicate the numeric value on the segmented scale that best describes their pain intensity.⁽⁵⁾

2. Neck Disability Index (NDI):

It is a valid and reliable self-rated disability questionnaire used for patients with neck pain that contains 10 items related to pain and function was used to measure disability level in cervical region. Patient had to choose from a 0 to 5 scale with low scores being associated with better function and five representing the greatest level of disability. The scores of each section are summated for a composite total score of 50, which are used to determine the level of disability.⁽⁶⁾

MATERIALS

MATERIALS & TOOLS USED

- Paper
- Pen
- Chair
- Scales : (1)NPRS (2)NDI
- Performa
- Consent Form
- Plinth
- Stopwatch

METHODS

STUDY DESIGN AND SETTING

- Study Design: - Comparative Study.
- Study Setting: - Computer Users from.
 1. Vasant Masala Pvt. Ltd- Ahmedabad.

POPULATION

Patients with Computer Users Suffering From Neck Pain between 18-40 years of both sexes.

SELECTION CRITERIA

Inclusion criteria:

1. Persons using computer more than 3 hours a day.
2. Age between 18-40years.
3. Mechanical Pain at Neck Region.
4. NPRS: 8 or >8
5. NDI: More than 10 points on 0-50 scales

6. Chronic Mechanical Neck Pain For Computer Users

Exclusion criteria:

1. All other persons who were not fulfilling the above mentioned criteria were excluded.
2. Participants were excluded if they had any specific medical condition affecting the cervical spine (such as ankylosing spondylitis, tumors, infection, and rheumatoid arthritis), cervical tumor, infection ,non-mechanical cause, neuritis, spinal fracture, Neurological Disorders.
3. Subjects taking anesthetics drug such as Ketamine , Propofol , etc.
4. Currently undertaking exercise or any other therapy for neck pain.

SAMPLING METHOD AND SAMPLE SIZE:

- Sampling Technique: - Purposive sampling technique.
- Sample Size: - 40 Computer Users

PROCEDURE:

Data Collection:

All subjects will be selected according to the inclusion criteria.

The purpose of the study will be explained to all the participants and informed consent will be taken from each subject.

After signing the consent form, demographic data will be collected.

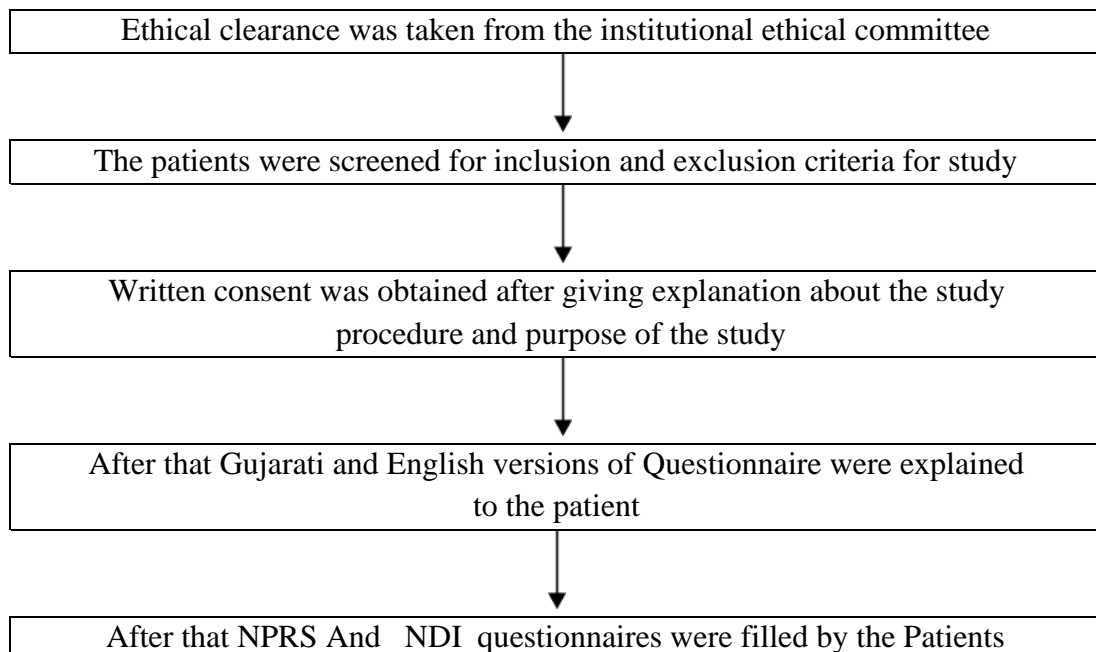
All subjects will be divided in to two groups using random sampling method as follows:

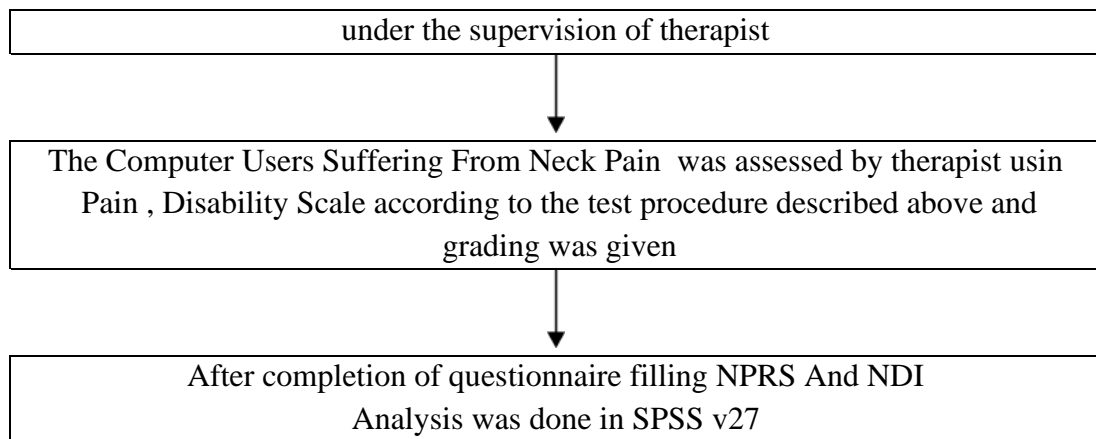
- GROUP 1: 20 subjects will be treated with MET protocol.
- GROUP 2: 20 subjects will be treated with Proprioceptive Neuromuscular Facilitation.

In this study pre and post data will be used for NPRS And NDI Measurement.

STUDY DURATION:

The total duration of study was 1 Year. The subjects were treated 5 days per week for 6 Weeks.





EXERCISE PROTOCOL FOR GROUP 1 (MUSCLE ENERGY TECHNIQUE):

This technique for 3 sets with 1 to 2 minutes rest in between each sets. And maintained for 30 sec.⁽⁷⁾

1. MET for upper trapezius
2. MET for levator scapulae
3. MET for sternocleidomastoid

1) MET for Upper Trapezius:

- Subject- supine lying
- Therapist- stabilized the shoulder of affected side with one hand and other hand at the ear and mastoid area of the affected side.
- Then flexed neck fully side bent in unaffected side and slight rotation towards the affected side.
- Subject was introduces a slight resisted effort (20% of available strength) to take the stabilized shoulder towards the ear (a shrug movement) and ear towards the shoulder.
- Isometric contraction for 7-10 seconds with appropriate breathing.⁽⁸⁾



Photograph 1 :MET for Upper Trapezius

2) MET for levator Scapulae:

- Subject - supine lying.
- Therapist- one hand supports the head and other hand on the affected side shoulder.

- Then therapist's forearm lift the neck into full flexion and head turned fully into side flexion and rotation on unaffected side.
- Asked the subject to take the head backwards towards the table against the therapist's unmoving resistance, while at the same time a slight (20% of available strength) shoulder shrug.
- Isometric contraction was held for 7-10 seconds with appropriate breathing. This position was maintained for 30 seconds (post isometric relaxation).⁽⁸⁾



Photograph 2 :MET for Sternocleidomastoid

3) MET of Sternocleidomastoid:

- The patient lay in the supine position with a cushion under the shoulder to keep the head slightly bent backward onto the bed.
- The therapist placed his contact hand on the ipsilateral mastoid on the temporal region, which is the insertion site of the SCM muscle, and his stabilizing hand on the sternum, which is the point of origin.
- The patient was asked to rotate his head to the contralateral side and lift his head while holding his breath, while the therapist pressed on the patient in the opposite direction.
- The patient was then asked to breathe out 7 - 10 seconds later, and the area where the contact hand was placed was diagonally pushed toward the foot on the same side to stretch the muscles while the patient was in a relaxed state.⁽⁸⁾



Photograph 3:MET of levator Scapulae

EXERCISE PROTOCOL FOR GROUP 2 (PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION):**a) Head and neck flexion with rotation to right**

- Patient's position - Supine lying and head and neck out of plinth.
- Starting position- extension of the head and neck with rotation to left.
- Therapist's position – Standing, one hand on the occiput and other hand on the mandible.
- Commands- pull your chin up towards the sternum.
- Movement- flexion of the head and neck with rotation to the right with normal timing. Facilitation through appropriate verbal commands and manual contact.⁽⁹⁾



Photograph 4: Head and neck flexion with rotation to right

b) Head and neck extension with rotation to left

- Patient's position- same as above
- The starting position- head and neck flexion with rotation to right.
- Therapist's position – Standing, one hand on the occiput and other hand on the mandible.
- Commands- push and look to the left.
- Movement- Extension of the head and neck with rotation to the left with normal timing. Facilitation through appropriate verbal commands and manual contact.⁽⁹⁾

Duration: [8-12 repetitions 3 times a week for 4 weeks]



Photograph 5: Head and neck extension with rotation to left

RESULTS

The present study compared the effect MUSCLE ENERGY TECHNIQUE AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION on Computer Users Suffering from Neck Pain. The study comprised 20 subjects in each group. Data was analyzed using statistical software SPSS v27 version. Before applying statistical tests, data was screened for normal distribution. All outcome measures were analyzed at baseline and after 6 weeks of treatment using appropriate statistical test. Level of significance kept at 5%. Changes in outcome measures were analyzed within group as well as between groups. The outcome measurements were pain measured on Numerical pain rating scale And Neck Disability Index.

Table 1 shows the gender distribution of the 40 patients participated in the study. All the groups, i.e. the group in which the patients were given Muscle Energy Technique (Group A) had 13 females and 7 males and the group in which Proprioceptive Neuromuscular Facilitation. (Group B) had 14 females and 6 male

TABLE 1: GENDER DISTRIBUTION OF THE SUBJECTS

GENDER	GROUP A	GROUP B	TOTAL
MALE	7 (35%)	6(30%)	13(32.5%)
FEMALE	13(65%)	14(70%)	27(67.5%)
TOTAL	20 (100%)	20 (100%)	40(100%)

GRAPH 1: GENDER DISTRIBUTION OF THE SUBJECTS

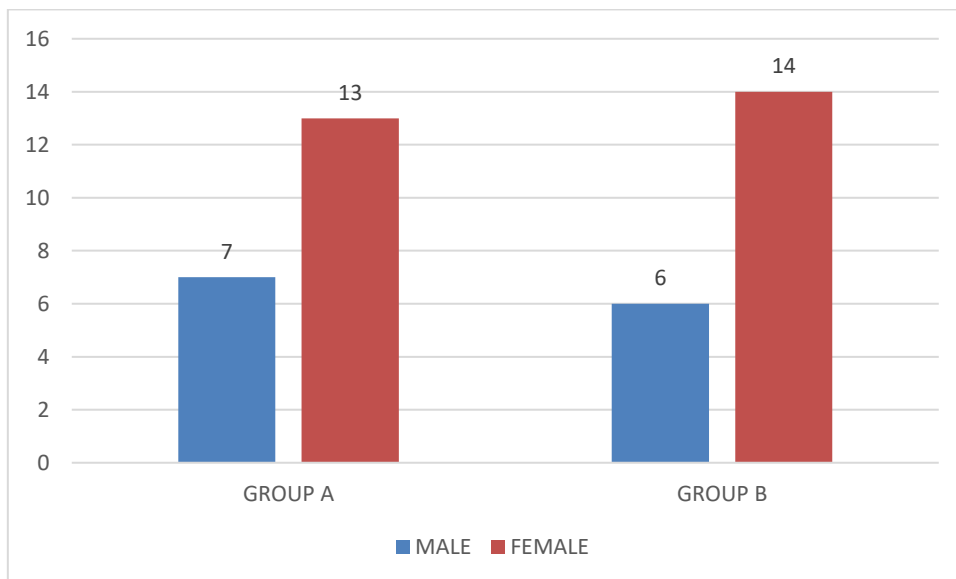
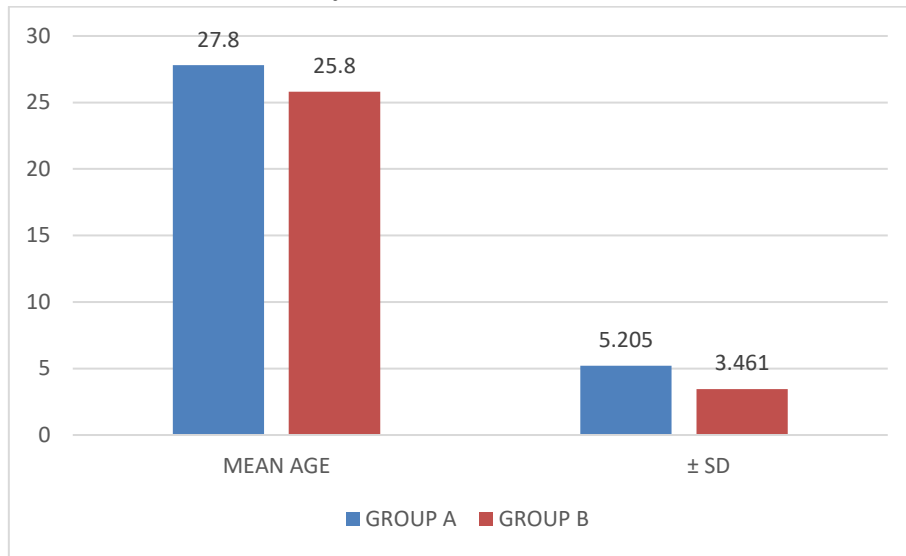


TABLE 2: AGE(In years) DISTRIBUTION OF THE SUBJECTS:

GROUP	MEAN AGE	± SD
GROUP A	27.8	5.205
GROUP B	25.8	3.461

GRAPH 2: MEAN AGE(In years) DISTRIBUTION OF THE SUBJECTS:

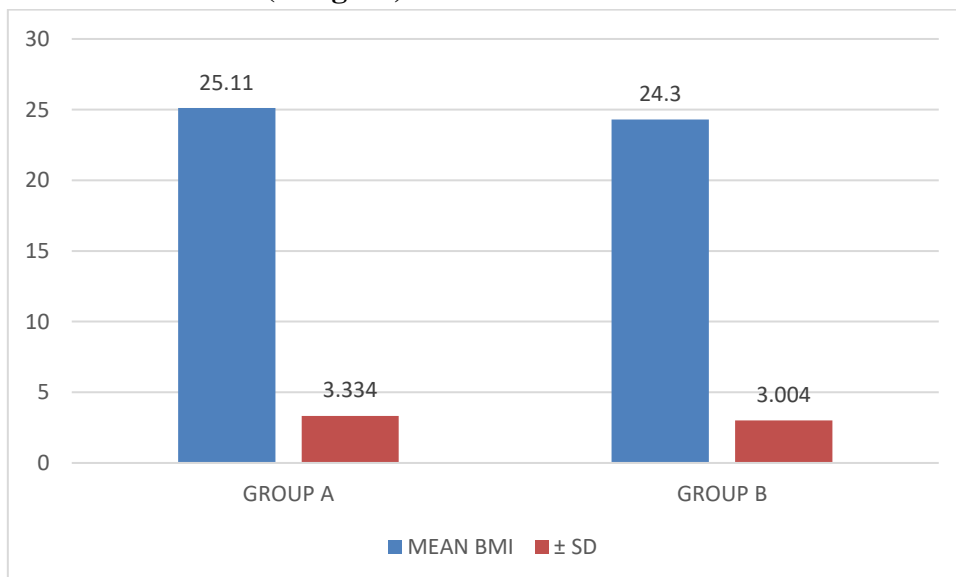


Here, among 40 patients, the mean age of 20 subjects in Muscle Energy Technique (Group A) was 27.8 years with SD 5.205 of ; mean age of 20 subjects in Proprioceptive Neuromuscular Facilitation (Group B) was years 25.8 with SD of 3.461.

TABLE 3: BMI(In kg/m²) DISTRIBUTION OF THE SUBJECTS:

GROUP	MEAN BMI	± SD
GROUP A	25.11	3.334
GROUP B	24.30	3.004

GRAPH 3: BMI(In kg/m²) DISTRIBUTION OF THE SUBJECTS:



Here, among 60 patients, the mean BMI of 20 subjects in Muscle Energy Technique (Group A) was 25.11 kg/m² with SD of 3.334; mean age of 20 subjects in Proprioceptive Neuromuscular Facilitation (Group B) was 24.30 kg/m² with SD of 3.004.

In this study, to analyze the effects on outcome measure NPRS before and after exercise in Group A and B Wilcoxon Signed Rank Test was used.

To analyze the effects on outcome measure NDI before and after exercise in Group A and B Paired t Test was used.

To analyze the effects on outcome measure i.e. NPRS And NDI between Group A And B Mann Whitney U Test and Unpaired t test was used.

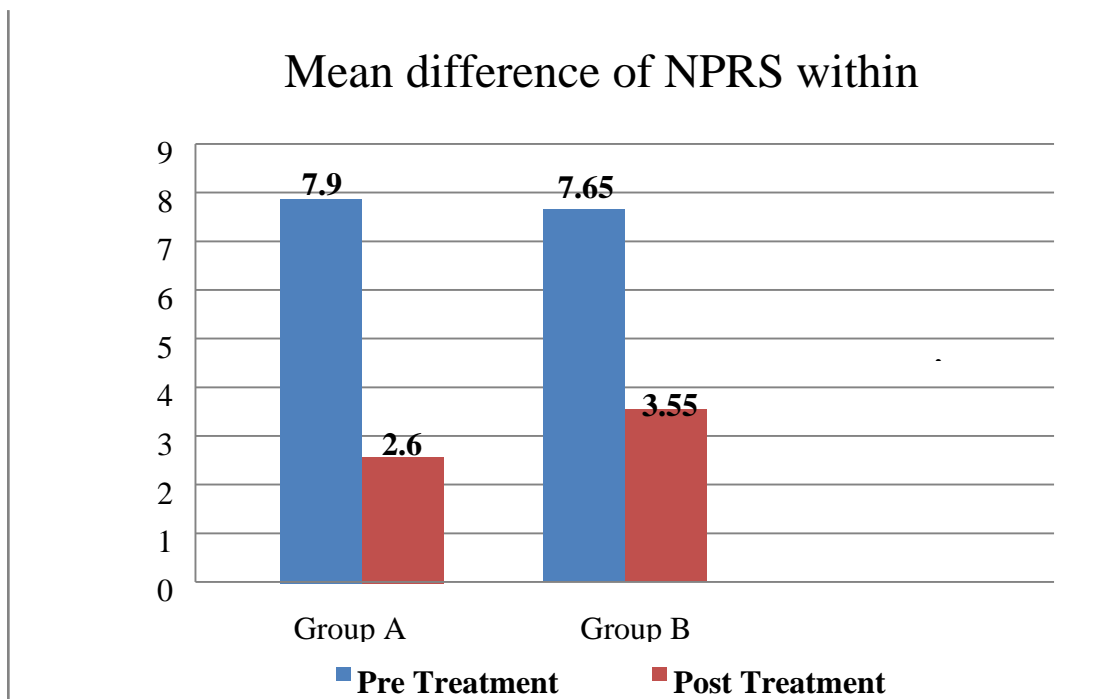
TABLE 4: TESTS USED TO COMPARE OUTCOME MEASURE WITHIN AND BETWEEN GROUPS:

OUTCOME MEASURES	TESTS USED TO COMPARE WITHIN GROUP A	TESTS USED TO COMPARE WITHIN GROUP B	TESTS USED TO COMPARE BETWEEN GROUP A AND B
NPRS	Wilcoxon Signed Rank Test	Wilcoxon Signed Rank Test	Mann Whitney U Test
NDI	Paired t test	Paired t test	Unpaired t test

TABLE 5: MEAN DIFFERENCE OF NPRS WITHIN GROUP A AND B

Groups	Pre Treatment		Post treatment		Z value	p value
	Mean	±SD	Mean	±SD		
Group A	7.9	1.021	2.6	0.940	4.026	<0.0004
Group B	7.65	1.040	3.55	1.146	3.964	<0.0004

GRAPH 4: CHANGES IN MEAN NPRS BEFORE AND AFTER INTERVENTION

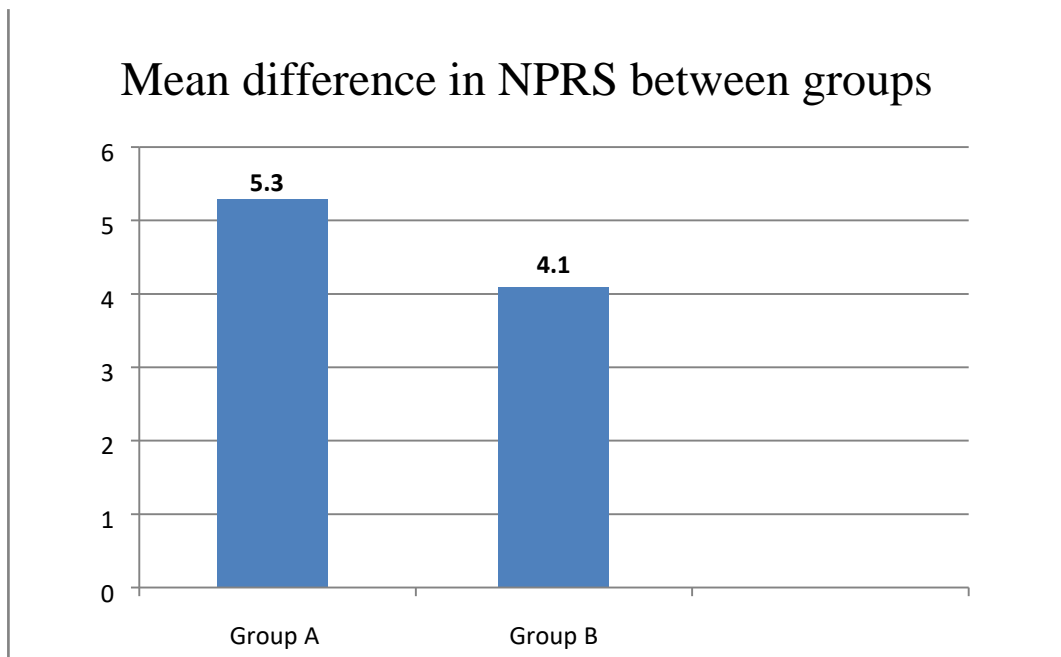


Here Table 5 and Graph 4 shows, the intra group comparison of NPRS was done by using Wilcoxon Signed Rank Test in three groups, where the p value for group A and B is <0.0004 which shows significant difference in NPRS for three groups. All groups improved after intervention.

TABLE 6: MEAN DIFFERENCE IN NPRS BETWEEN GROUPS

Difference in NPRS score	Group A	Group B	p- value
Mean	5.3	4.1	<0.004
±SD	0.081	0.106	

GRAPH 5: MEAN DIFFERENCE IN NPRS BETWEEN GROUPS



Here Table 6 and Graph 5 shows the inter group comparison of NPRS by comparing Mean difference in score among three groups Group A and B which shows the Group A having highest mean of (5.3 ± 0.081), which suggest the highest improvement in NPRS score after the 6 weeks protocol

TABLE 7 : TEST USED FOR MULTIPLE COMPARISONS NPRS

Outcome Measure	COMPARISONS	U score	P value
NPRS	Between Group A & B	105.5	<0.0055

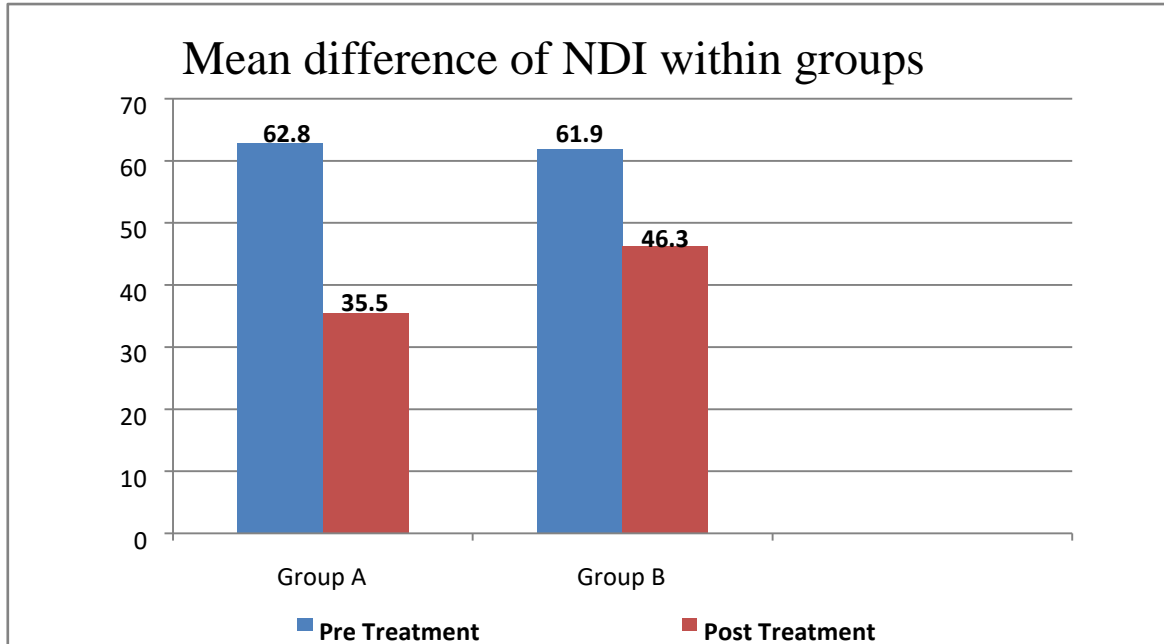
Here the multiple comparisons of NPRS were done using Mann Whitney U Test. Where the p-value is < 0.05 shows significant difference in NPRS score. Where the p value for comparison between Group A & B is 0.0055 respectively which is >0.05 suggested that there is a significant difference between the groups.

TABLE 8: MEAN DIFFERENCE OF NDI WITHIN GROUP A AND B

Groups	Pre Treatment		Post treatment		t value	p value
	Mean	±SD	Mean	±SD		

Group A	62.8	7.090	35.5	6.517	21.267	<0.0004
Group B	61.9	7.326	46.3	8.060	11.487	<0.0005

GRAPH 6: CHANGES IN MEAN NDI BEFORE AND AFTER INTERVENTION

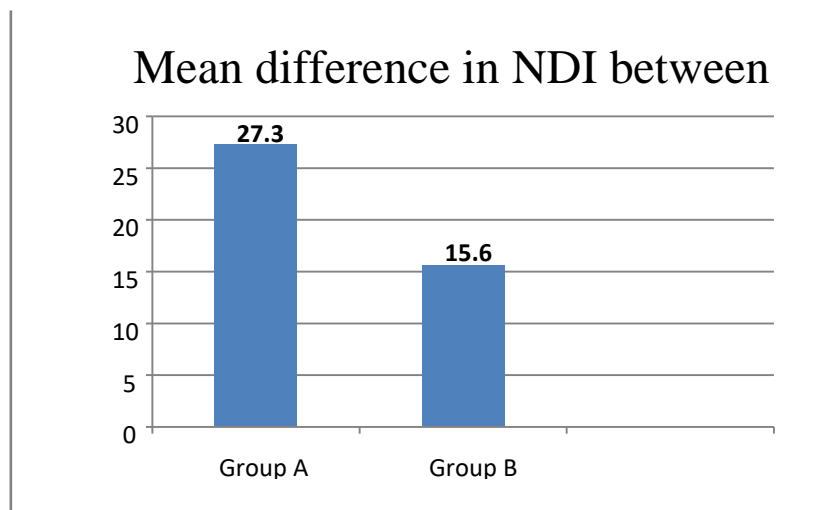


Here Table 8 and Graph 6 shows the intra group comparison of NDI was done by using Paired t- Test in three groups, where the p value for group A and B is <0.0004 which shows significant difference in NPRS for two groups. All groups improved after intervention.

TABLE 9: MEAN DIFFERENCE IN NDI BETWEEN GROUPS

Difference in NDI score	Group A	Group B	p- value
Mean	27.300	15.600	<0.0004
±SD	5.74	6.073	

GRAPH 7: MEAN DIFFERENCE IN NDI BETWEEN GROUPS



Here Table 9 and Graph 7 shows ,the inter group comparison of NDI by comparing Mean difference in score among three groups Group A and B which shows the Group A having highest mean of (27.3 ± 5.74) , which suggest the highest improvement in NDI score after the 6 weeks protocol.

TABLE 10: TEST USED FOR MULTIPLE COMPARISONS NDI

Outcome Measure	COMPARISONS	t score	P value
NDI	Between Group A & B	4.660	<0.02

Here the multiple comparisons of NDI were done using unpaired t test. Where the p-value is < 0.05 shows significant difference in NDI score. Where the p value for comparison between Group A & B is 0.02 respectively which is >0.05 suggested that there is a significant difference between the groups.

DISCUSSION

The current study was conducted to compare the effect of Muscle energy technique And the Proprioceptive Neuromuscular Facilitation in patients with Computer users suffering from neck pain with mean age of 42.1 ± 6.48 years in Group A, 40.05 ± 6.29 years in Group B.

As per results, both the techniques, Muscle energy technique and Proprioceptive Neuromuscular Facilitation are found to be effective on pain And disability within groups and between groups.

According to result, NPRS score decreases in all groups the Muscle energy technique group (Group A), the Proprioceptive Neuromuscular Facilitation group (Group B).

The study showed significant improvement in NPRS score ($z=4.026$, $p= 0.0004$) and in Group A receiving Neck Muscle Energy Technique. Muscle Energy Technique (MET) has a specific role in the treatment of Neck pain with Computer Users. Furthermore NDI and NPRS plays a significant role in evaluating and in improving the mechanical and neurophysiological integrity of the peripheral nerves in populations.

An explanation for improvement of pain level And functional disability as by Muscles Pain is that it affected mechanical properties of peripheral nerves and this alteration of Muscle mechanics directly affect Muscle physiology

Group B who receiving Proprioceptive Neuromuscular Facilitation showed significant improvement in NPRS score ($z= 3.964$, $p =0.0004$), this is explained by some biomechanical co relations. Biomechanically, the Neck extensors and Flexors play a major role in all ambulatory activities, stabilizing the Neck helping to transfer force from the Upper extremities.

According to result, NDI score decreases in all groups the Muscle Energy Technique (Group A), the Proprioceptive Neuromuscular Facilitation group (Group B).

The study showed significant improvement in NDI score ($t= 21.267$, $p= 0.0004$) in Group A receiving Neck Muscle Energy Technique . It has been reported that Muscle Energy

Technique generated various amounts of longitudinal Muscle excursion and strain. Also Muscle Energy techniques helped in restoring the movement between the muscle and surrounding structures through the gliding movement. Therefore, the intrinsic pressures on the nervous tissue were decreased and consequently enhanced the Movement function.

Group B who receiving the Proprioceptive Neuromuscular Facilitation showed significant improvement in NDI score ($t=11.487$, $p=0.0005$).

This is in accordance with a study conducted by **Deepak Jain et al (2021)** The findings of this case study indicate that a specific muscle energy technique It's possible that a routine will help to alleviate the problem of neck pain, improves strength and functional ability.⁽¹⁰⁾ Furthermore, **Sunyue Ye et al (2017)**

was reported to be an important risk factor for NP and LBP in computer-using female workers. This information may not only enable the development of potential preventive strategies but may also provide new insights for designing appropriate workstations.⁽¹¹⁾

This is in accordance with a study conducted by **Richa Mahajan et al (2012)** reported that effective in alleviating the mechanical neck pain in terms of decreasing pain intensity and increasing active cervical range of motion as there was no significant difference between the two groups, however MET was superior than static stretching in decreasing pain intensity and increasing active cervical range of motion.⁽¹²⁾ Furthermore, **Cagnie B et al (2007)** this study indicate that physical and psychosocial work factors, as well as individual variables, are associated with the frequency of neck pain. These association patterns suggest also opportunities for intervention strategies in order to stimulate an ergonomic work place setting and increase a positive psychosocial work environment.⁽¹³⁾

CONCLUSION

The results of this Comparative study indicated that the treatment in all two Groups (Muscle Energy Technique And Proprioceptive Neuromuscular Facilitation) are effective in participants with Computer Users Suffering From neck pain on pain and functional disability. However, MET was found to be superior to Proprioceptive Neuromuscular Facilitation in participants with Computer Users Suffering From neck pain.

LIMITATION OF STUDY

- Small sample size was taken for the Study.

FUTURE STUDY

- Future study can include larger sample size.
- Future studies can be done to examine long term effects of intervention.

SUMMARY

This purpose of study is to find out the effectiveness of Computer Users Suffering From neck pain. A total 40 Computer users patients had participated in the study . All patients were screened based on inclusion and exclusion criteria. A written informed consent was taken. Patients were divided into 2 groups of 20 patients each. The Comparative group received Muscle Energy & Proprioceptive Neuromuscular Facilitation. The intervention was given for the MET and Proprioceptive Neuromuscular Facilitation 20-25 minutes/days , 5 days/week for 6 weeks. NPRS and NDI scale taken as the outcome measure. The measurements were taken before and after six weeks of intervention. Paired t- test and Wilcoxon signed Rank test was applied for within- groups analysis and unpaired t-test and Mean Whitney U test was applied for between-groups analysis. The Comparative study groups showed a statistically significant difference ($p < 0.05$) and the control groups showed statistically no significant difference ($p > 0.05$). The results of the between -groups analysis revealed a statistically significant difference ($p < 0.05$) in outcome measures of the NPRS and NDI assessment scales. Hence, it is concluded that Muscle Energy Technique is effective to improve Function , Disability and reduce neck pain for Computer user suffering from neck pain.

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