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Effect of Muscle Energy Technique and Stabilization Exercise on Forward Head and Rounded Shoulder Posture Among College Students (18-30 Years)

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Abstract:

- ***Introduction***

Forward head and rounded shoulder posture (FHRSP) is one of the leading cause of neck pain and shoulder pain among college going students and adults. The aim of this study was to know the effect of muscle energy technique and stabilization exercise among college students with forward head and rounded shoulder posture.

- ***Methods***

Overall, 20 FHRSP population were recruited via convenient sampling and consecutively assigned into 2 groups (10 participants each). Group A received Stabilisation exercise while group B received MET. All treatments were administered for 30 minutes / session, 3 days a week for 6 weeks. NPRS [Numerical Pain Rating Scale], Measuring Craniovertebral angle [using goniometer], Neck Disability Index [NDI] are used as outcome measures. Descriptive statistics served to summarize the demographic characteristics of the participants and interferential statistics of t-test was used to determine the effect of intervention within the groups and between the groups. All statistical analysis was performed with the IBM SPSS statistics software.

- ***Results***

The participants mean difference within group showed significant improvement as compared to between group. It shows that there was improvement in patients with Muscle Energy Technique than Stabilisation Technique. CVA, NDI and NPRS have shown improvement in MET than ST.

- ***Conclusion***

MET and Stabilisation Technique are both beneficial in improving pain and postural issues, with MET being more advantageous. MET may be the preferred approach for the management of chronic shoulder, neck pain and forward head and rounded shoulder posture.

Keywords: *FHRSP, Muscle Energy Technique, Stabilisation Exercise, Craniovertebral Angle, Neck Disability Index, NPRS.*

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I. INTRODUCTION

One of the most prevalent musculoskeletal (MSK) pain sites among college going students and adults are neck pain and shoulder pain. Neck pain and shoulder pain is reported to occur in up to 60% of the general population [1] and is thought to be the result of extrinsic risk factors such as repetitive weight carrying on shoulder, sustained overhead work, and

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higher loads raised above shoulder height. Forward Head Posture (FHP) is related as a misalignment in the cervical spine that moves the head into the anterior space of the body often go along with rounded shoulders (RS).

Forward head and rounded shoulder posture (FHRSP) is believed to alter scapular kinematics and muscle activity placing increased stress on the shoulder and neck, leading to both shoulder and neck pain and dysfunction[2]. Understanding how FHRSP affects scapular kinematics and muscle activation is crucial for reducing shoulder stress. Silva et al. (2008) indicated that those with chronic non-traumatic neck pain have more FHP in standing position than pain-free participants.[3]

When performing loaded flexion and reaching activities, people with FHRSP exhibited increases in scapular upward rotation, internal rotation, and anterior tilting. There is also decrease in serratus anterior muscle activation during the ascending phase of flexion. Furthermore, uncoupled scapulohumeral coordination mechanisms for scapular upward rotation and anterior tilting were observed. The humerus and scapular rotations of people with FHRSP are not in sync with one another.[6] The associated muscle shortening and elongation due to muscular imbalance accompanies to malfunctioning of various parts of the body. Individuals who were placed in a slouched sitting posture have showed decrease in scapular muscle strength whereas protracted and forward scapular positions alone are not associated with decreased strength.[7] Anterior position of the cervical spine seen in forward head posture that occurs when the lower cervical spine is bent and there is an extension of the upper cervical bone and head. The biomechanical link between the head, cervical, oral, and facial tissues is the primary cause of significant issues with head and cervical posture. FHP is caused by the cervical spine's frontal placement, and the cervical spine bears an additional 4.5 kg of weight for every inch of front head positioning, which causes abnormal function of musculoskeletal, neural and vascular system [4].

The approach is aimed at improving the neuromuscular control, strength, and endurance of the muscles that are centred to maintain cervical spine in posture. Several groups of muscles targeted are pectoralis major, latissimus dorsi, serratus anterior, muscles of the cervical spine and head that attached to the scapula and upper thorax, and muscles of the suboccipital region (Rectus capitis major and minor, Obliques capitis inferior and superior).

Muscle Energy Technique is a therapeutic intervention in which the patient contracts actively the targeted muscles against an exact point, clinically controlled counter force, followed by rest and stretching. It helps to strengthen and enlarge muscles, reduce oedema, improve circulation, and mobilize limited articulation.

Stabilisation exercise is a type of exercise that help improve your body's balance, coordination, and strength. According to Richardson et al, stabilisation exercise is facilitation of deep muscles of the spine (cervical), integrated into exercise, progressing into functional activity [5].

The purpose of this research is to compare the results of stabilization exercise with those of MET in order to draw conclusions about the effectiveness of the two treatments. The study will evaluate the effect of each study intervention on the level of pain perception, trunk Range of Motion (ROM), cervical muscles endurance, Quality of Life (QoL), functional disability and activity limitations/participation limitation.

- *Subjects and Methods*

The participants in this comparative study were randomly assigned into 2 groups. The populations for the study were received from National Institute for Empowerment Of Person With Multiple Disabilities (NIEPMD) and consent was taken from the patient. College students of age between 18-30 years having general neck pain, nonspecific neck pain between 3 cm and 8 cm on a visual analogue scale reproduces by neck movement, and at least within the last 3 months as chronic pain were included. Subjects with history of cervical spine injury, any surgery relating to neck region, neurological deficit, infection or inflammatory arthritis in the cervical spine and received physiotherapy within the last 6 months were excluded from the study.

- *Outcome Measures*

The main outcome measures include Measuring Craniovertebral angle [using goniometer, postural grid and plumb line], NPRS [Numerical Pain Rating Scale, Posture screen mobile, Neck Disability Index [NDI]

Fig 1 Craniovertebral Angle Measurement

- *Procedure*

All participants filled informed consent before randomization. Patient will be taught and explained about the methods of intervention. A total of 40 subjects consented to participate but only 20 met inclusion criteria and these 20 were divided into 2 groups: A and B (Stabilization exercises and MET respectively), each of 10 subjects.

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➢ *Intervention*

Group A received stabilization exercises for 30 minutes. Warm-up exercises are provided before starting stabilization exercises like walking and push-ups. It was conducted 3 times a week for 6 weeks. Each exercise will be executed for 15 repetitions. Stretching exercises are first performed before stabilisation exercise, with the aim of increasing the flexibility of the pectoralis muscles and cervical neck extensor muscles. Subjects were advised to be in prone lying position. Different pattern of stabilisation exercises like Y,W and L pattern exercises were given which aimed to activate sternocleidomastoid, upper trapezius, deltoid, pectoralis major and minor.

Fig 2 Y Pattern

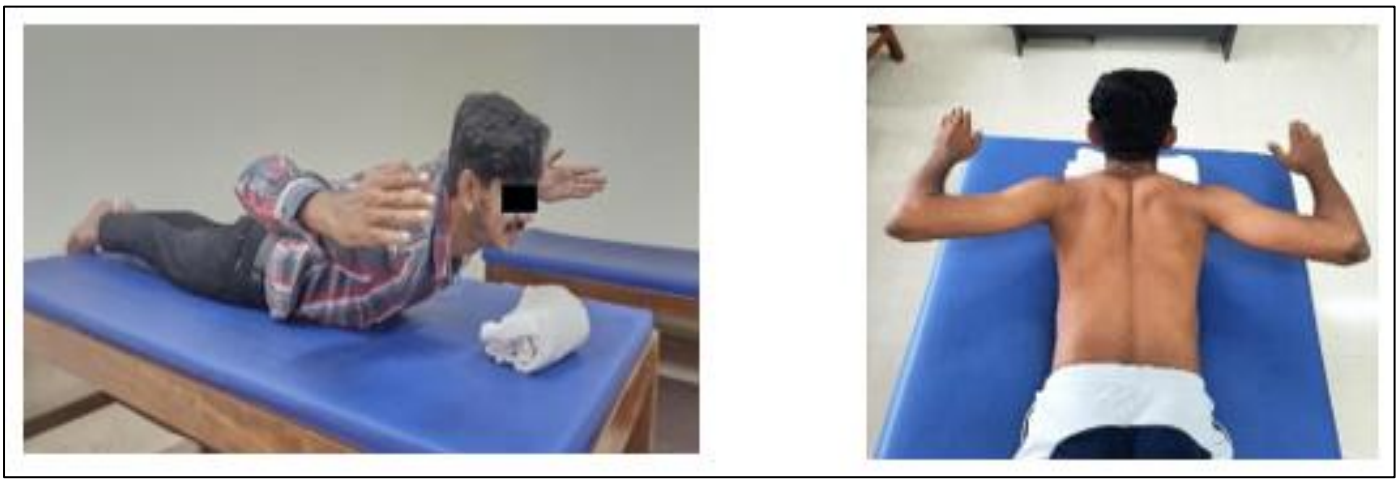

Fig 3 W-Pattern

Fig 4 L-Pattern

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Group B received MET intervention administered for 30 min/session, 3 times/week for 6 weeks. MET was given for suboccipitalis muscle, upper trapezius, pectoralis major muscle. In order to apply muscle energy technique the occiput is supported by the therapist's one hand and other hand of therapist is kept straight and lateral aspect of index is kept superior to the C2 spinous process stabilizing the C2 spinous process and then therapist is stretching the occiput in posterior-superior direction and moving neck into cranio-cervical flexion and reaching the barrier as shown in fig.4. For Post Isometric Relaxation of respective muscle, therapist's one hand supports the occiput from down and other hand place over the head and giving pressure from superiorly and making the chin tuck in. Therapist advise patient to give mild force and try to look to the ceiling and holding the position for 7-10 seconds.

Fig 5 MET for Sub Occipitalis

For giving MET exercises for upper trapezius, patient need to lie in supine position without pillow below head. As per fig.5, therapist need to stand behind the patient's head and holding the side head of patient and make it turn to opposite side with his one hand and another hand is placed on same side shoulder to stabilize. Patient need to relax and out breath and then slowly bend the neck and therapist depress the shoulder. Patient need to push up the depressed shoulder actively. For Isometric Relaxation, patient should come to sitting position on a chair and therapist should stand beside. Then therapist make subject's neck flexion and ipsilateral rotation by one hand and other hand stabilise the shoulder and advise the patient to give mild force to elevate the shoulder and isometrically contract the neck for 7 second. After that take a deep breath in and all out being relax and therapist need to do stretch the head little bit more until getting the barrier resistance.

Fig 6 MET for Upper Trapezius

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For Pectoralis Major, the subject arm was abducted to 90° and 140° and externally rotated as given in fig.6. Obstruct the internal rotation of arm by putting the hand above elbow then subject was asked to slowly push the arm towards the ceiling for 7 seconds and arm was moved into barrier. For Isometric Relaxation, therapist will be obstructing the movement for 7 sec and after that advise the patient to be relax and give a gentle stretch of pectoralis major by pushing the elbow towards floor.

Fig 7 MET for Pectoralis Major

II. DATA ANALYSIS AND RESULTS

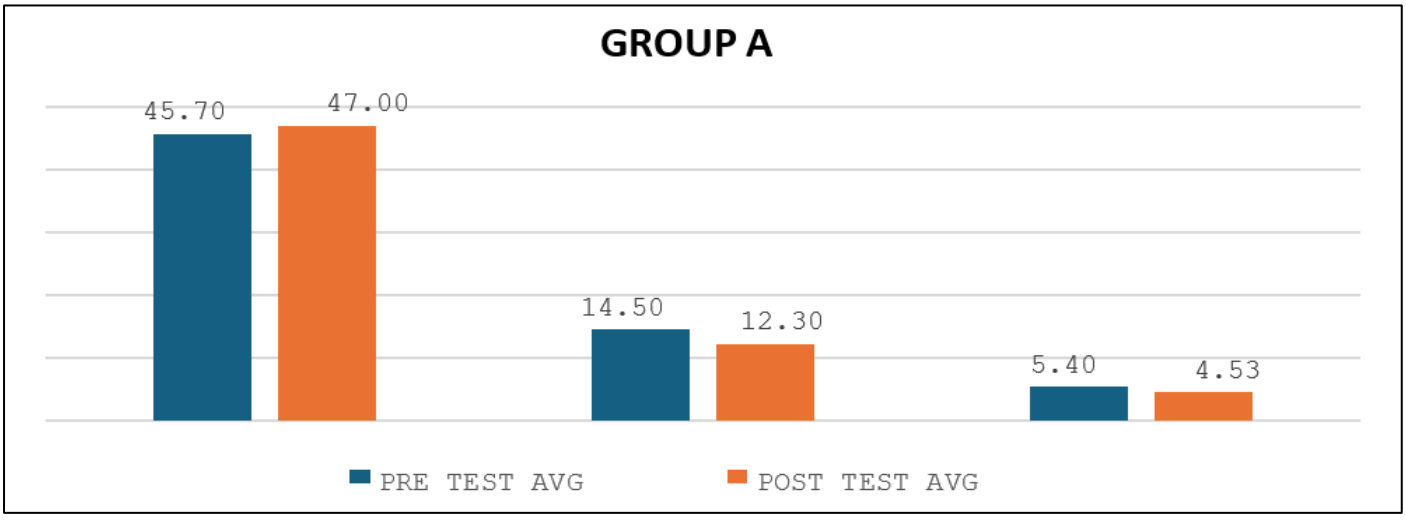
For statistical analysis, both Paired t-test and Independent t-test are used within the group and between the group respectively, to find out the difference between pre and post outcome measures by using Statistical Package for the Social Sciences (SPSS) software, version 26.0. The level of significance was fixed at $p < 0.05$.

Table 1 Analysis of 3 outcome Measures for "within and between group a."

GROUP A						
Scales	**Pre Test Avg**	**Post Test Avg**	**Mean difference**	**Std. Difference**	**T value**	**P value**
CVA	45.70	47.00	1.3	0.4	-8.5	<.001
NDI	14.50	12.30	2.2	1.03	6.7	<.001
NPRS	5.40	4.53	0.8	0.5	6.5	<.001

Table 1 Shows the value of pre-test average, post-test average, mean difference, standard deviation, t-value, p-value of 3 outcome measures (CVA, NDI, NPRS) for group A (15 subjects).

➢ *Paired T-Test for within Group A Comparision*



Graph 1 Pre and Post-Test Values for CVA, NDI, NPRS within Group A

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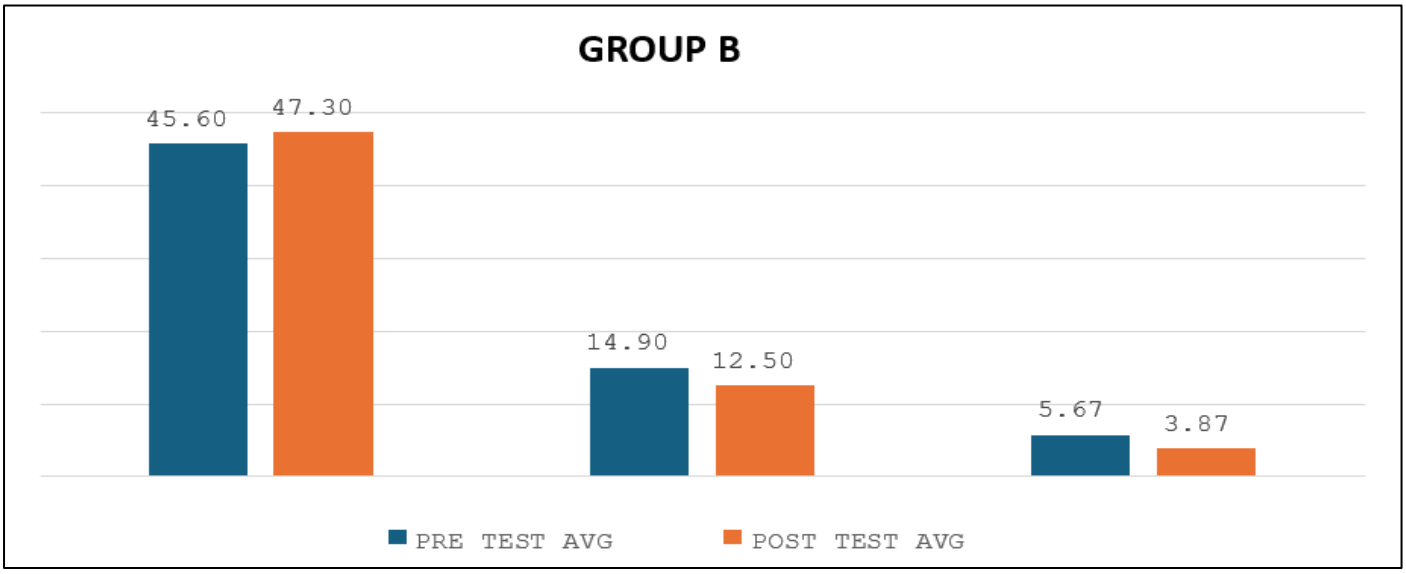
Graph-1 represents the pre and post values of GROUP A, where the results of this group shows that CVA increased 47º in post-test from pre-test value 45.7º, NDI decreased 12.3 points in post-test from pre-test value 14.5 points, NPRS decreased 4.5 points in post-test from pre-test value 5.4 points.

Table 2 Analysis of 3 outcome Measures for "within AND Between Group B."

GROUP B						
Scales	**Pre Test Avg**	**Post Test Avg**	**Mean difference**	**Std. Difference**	**T value**	**P value**
CVA	45.6	47.30	1.7	0.8	-6.5	<.001
NDI	14.90	12.50	2.4	1.5	5	<.001
NPRS	5.66	3.86	1.8	0.6	10.3	<.001

Table 2 Shows the value of pre-test average, post-test average, mean difference, standard deviation, t-value, p-value of 3 outcome measures (CVA, NDI, NPRS) for group B (15 subjects).

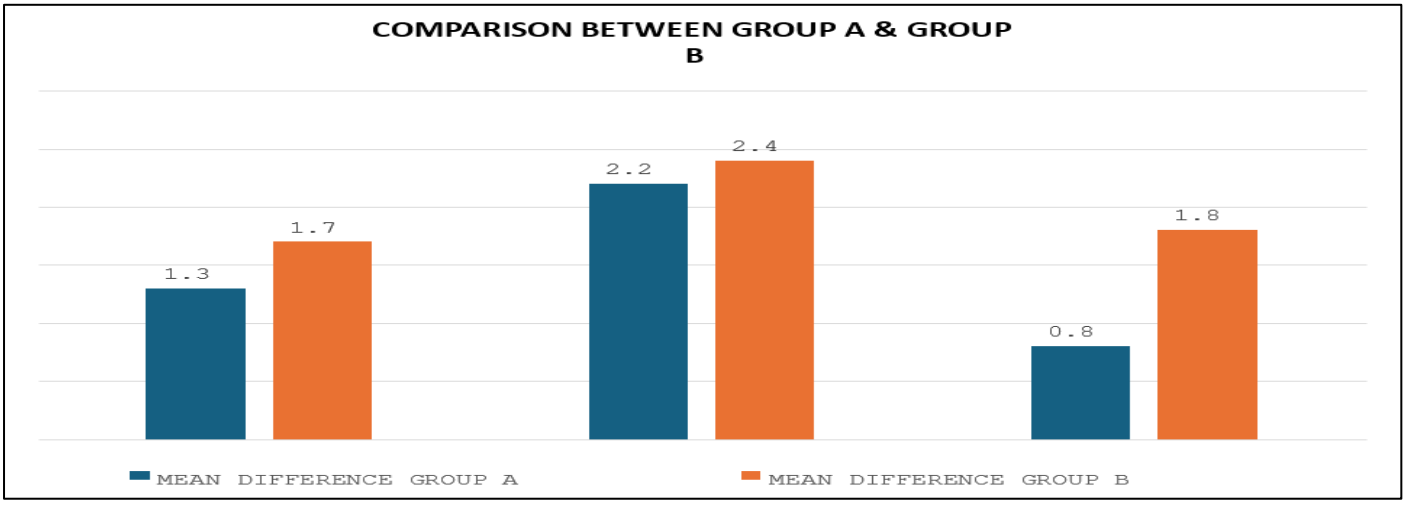
➢ *Paired T-Test for within Group B Comparision*



Graph 2 Pre and Post-Test Values for CVA, NDI, NPRS within Group B

Graph 2 represents the pre and post values of GROUP B, where the result of this graph shows that CVA increased 47.3º in post-test from pre-test value 45.6º, NDI decreased 12.5 points in post-test from pre-test value 14.9 points, NPRS decreased 3.8 points in post-test from pre-test value 5.6 points. GROUP B showed improvement as compared to GROUP A. NPRS shown significant improvement in GROUP B which visualising that there is more reduction of pain in GROUP B as compared to GROUP A.

➢ *Independent T-Test for Between Group Comparisons*



Graph 3 Mean Difference Between Group A and Group B

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Group 3 represents the Mean difference between GROUP A and GROUP B. While analysing statistically, there is not more improvement shown in “Between groups” where on the other hand “Within group” showed significant improvement. Both groups demonstrated improvement across all tests, with statistically significant differences($p<0.01$). There is only notable improvement in NPRS while CVA and NDI showed less improvement in “Between group.”

III. DISCUSSION

The study aimed to compare the effectiveness of muscular energy technique to reduce neck pain and improving function in comparison to strengthening exercise. On comparison, both groups showed significant improvement in CVA, NPRS and NDI but Muscle Energy technique with post isometric relaxation showed better result than strengthening exercise after receiving their respective treatment protocol. This may result from the isometric contraction of muscles, which activates muscle and joint mechanoreceptors and proprioceptors, hence diminishing the perception of pain and facilitating a more manageable subsequent stretch. MET application to the sub-occipital muscles, pectoralis major and upper trapezius reduces muscle hyperactivation and tightness through the Golgi tendon reflex, which inhibits the alpha motor neuron, relaxes the muscles and reduce pain. In contrast, while stabilization exercises also yielded positive outcomes, they did not achieve the same level of improvement as MET. A study by Paulraj [7] on the effects of MET versus stabilization exercise are in accordance with our results for MET group, which concluded that post isometric relaxation has better reduction in pain. There is a noticeable improvement in "within group" statistical analysis for three outcome measures, but there is no similar improvement in "between group" except for the NPRS outcome measure.

IV. LIMITATIONS

Limitation of this study is that it is difficult to generalize the results that involved only 20 subjects and inability to assess long term effects for retention. Also, only adults with no other disorders, aside from FHRSP, were selected for this study.

V. CONCLUSIONS

The study revealed that both MET and Stabilisation exercise were effective in management of FHRSP; however, MET might be the preferred technique. Future research should explore the long-term effects of these interventions and consider integrating them into comprehensive physiotherapy programs aimed at enhancing postural awareness and prevention strategies among young adults.

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