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Short Communication

Prompt Impact of Muscle Energy Technique on Pectoralis Muscle Tightness in Computer Users: A Quasi-Experimental Study

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Tightness of the pectoralis minor muscle has been a common characteristic of abnormal posture. Prolonged inappropriate posture while using computers/laptops results in musculoskeletal problems, mainly in the upper limb. This study aims to see how the muscular energy technique affected pectoralis minor tightness in computer users right away. This study included 65 individuals aged 20-40 years following the inclusion/exclusion criteria. Participants received muscle energy technique for the pectoralis minor muscle. Pre- and post-assessment included the evaluation of pectoralis minor length, round shoulder posture (RSP), and forward head posture (FHP). We used the Kolmogorov–Smirnov test to assess the normality of data, as this study included > 50 participants. Data analysis was conducted using a paired t-test for within-group analysis. The outcome measures demonstrated significant improvement ($p < 0.001$). In conclusion, the muscle energy technique is effective in reducing muscle tightness, improving RSP and reducing FHP.

Keywords: Computers, Pectoralis muscles, Posture, Shoulder

INTRODUCTION

Skeletal muscle adaptation, which includes changes in muscle length and power differences, is caused by bad posture, long-term use at a certain length or angle, and more activity in the muscles on one side than the other [1]. The pectoralis minor (PM) muscle is attached to ribs three through five and the scapula's coracoid process. When the arm is raised, the shoulder is stretched and turned up, out, and back [2]. Theoretically, muscle changes happen slowly when the scapula is moved down and forward over and over again or when the muscle is kept tight for a long time. This is the main reason why PM tightness has been getting worse over time [3].

Ergonomics links posture and movement to musculoskeletal disorders (MSDs), which are common among sedentary workers and those who use computers. MSDs incidence is 40%-70% among frequent computer users (3-5 hours/day), with university employees/students (70%), new job workers (50%), and college students (40%) having the greatest rates [4,5].

Computer users have forward head posture (FHP), round shoulder posture (RSP), and kyphotic posture. Long-term suboptimal postures like FHP, RSP, etc. weaken muscles and biomechanically inefficiently shorten the anterior shoulder complex and expand the posterior structures [6].

Improper computer use shifts the head forward and upward, causing neck discomfort and upper body posture [7]. Head anteriority is FHP [8]. FHP and RSP are connected to unhealthy habits, backpacks, desk labor, repetitive overhead motions, and protracted study times [9]. RSP induces forward shoulder deviation and extended scapula [10].

Muscle energy technique (MET) is a type of manual procedure where the patient contracts their muscles in opposition to the therapist's force in a controlled manner. It was developed by osteopaths Fred Mitchell Sr. and Jr [11]. This is employed to mobilize joints, enhance circulation, reduces swelling, and muscle stretching and strengthening [12]. There has been few studies that has evaluated the effect of MET on PM tightness. So this study aims to evaluate the immediate effectiveness of MET on PM tightness.

MATERIALS AND METHODS

1. Study design

This study was one group, pretest-posttest, Quasi-experimental trial. The end-point for analysis of outcome was immediately after the intervention, and before intervention. The study's Clinical Trial Registry number is CTRI/2023/04/051912.

2. Study participants

We recruited computer users (n = 65), based on the selection criteria. The inclusion criteria were: age 20-40 years, computer use between 4-6 hours/day, pectoralis minor length (PML) test (> 2.6 cm), and occupations (administrative job, book keeper and cashiers, commercial occupation, policy makers, students and non-specific occupation). The exclusion criteria were: cervical rib, breast cancer, pregnancy, history of shoulder surgery, shoulder pathology, clavicle fracture, neurogenic and cardiac symptoms. The sample size was calculated using G*Power 3.1.9.4 statistical software (Heinrich Heine-University, Düsseldorf, Germany). The calculated effect size is 0.4, the significance level set is 0.05 and power set is 80% confident interval. At 20% drop out rate consideration, the total sample size equal to 65 [13].

3. Outcome measurements

1) Pectoralis minor length measurement

Participants were lying flat with a pillow beneath their heads so that their shoulder position was unaffected. The palms of their hands were resting against their thighs, and their arms were relaxed at their sides. The fourth rib was next palpated, followed by the medial border of the anterior portion of the coracoid process. Between these places, a measurement was made with a tape measure (precision of 1 mm). Before taking the average of two additional readings, the tape measure was removed [14].

2) Round shoulder posture

During the measurement, the patients were lying supine with their arms neatly positioned next to their abdomen in a neutral position. Then, the vertical distance between the posterior part of the subject's acromion and the treatment table was recorded and the average was taken. If the measurement was 2.5 cm or higher, the shoulders are rounded [15].

3) Forward head shoulder

In this study, the FHPapp (SD Net) and Oneplus 9 camera (Oneplus, Shenzhen, China) were used to evaluate the Craniovertebral angle. Following that, the photos were examined using the free Kinovea® software (Kinovea, Boston, MA, USA). Reference markers were positioned on the spinous process of C7 and in the subjects' ears' swallow, which was located by palpitating them. The subject was standing side by side with the assessor. A photograph was taken at this time while instructing person to stand in a relaxed position. An angle value less than 50° was used to identify the presence of FHP [16].

4) Intervention and procedure

Individuals using computer were recruited from out patient department of orthopaedic physiotherapy, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation. After being informed of the study's approach, participants were asked to willingly participate in the study's research process. English-language details regarding the study, that is, informed consent was presented and participants signed it. The subjects were then performed upon MET.

5) Muscle energy technique for pectoralis minor

On a typical treatment table participants were instructed to lie supine with their treatment arm off the couch. The treated arm was passively shifted into horizontal abduction (150 degree) in alignment with the PM and sternal fibres of the pectoralis major muscle. The arm was held at the barrier. The shoulder was then brought out to the stretch slightly, and the participant was instructed to 'pull against the resistance by therapist towards the opposite hip'. This contraction was performed isometrically with approximately 25% of the participant's maximal effort for 7 seconds. Then muscle was stretched for 20 seconds and then moved into new barrier. 3 cycles of this were continually administered in MET treatment session with the arm again being passively horizontally abducted to the new barrier immediately following the contraction [12].

6) Statistical analysis

The collected data was analysed for normality using Kolmogorov-Smirnov test as the sample size was more than 50. Demographic data of sample recruited in the study were expressed in terms of median and interquartile range for data not normally distributed; whereas it is expressed in terms of mean and standard deviation for normally distributed data. There was a single group in the study and data was normally distributed hence, paired t-test was applied for within group analysis of data. The data collected will be analysed using IBM SPSS Statistics for Windows, Version 20.0 software (IBM Corp., Armonk, New York, USA). Post hoc analysis was performed to determine the power of study, using G*power 3.1.9.4 software. Data was collected by primary researcher; the level of significance was set at value ≤ 0.05 for analysis.

RESULTS

Total 65 individuals, including 33 females and 32 males (aged 26.57±6.29 years, weight 63.34±12.40 kg, height 163.72±9.69 cm, and BMI 23.48±3.47 kg/m^2) were enrolled in the study, demographics have been mentioned (Table 1). PML, RSP and FHP showed statistically significant results ($p < 0.001$). Intra-group analysis mentioned (Table 2) and graphical representation (Fig. 1). The PML was immediately improved from 12.88 cm pre-intervention to 13.3 cm post intervention of MET. The round shoulder posture decreased from 4.63 cm to 4.23 cm following the one session intervention of MET. Similarly, the FHP was increased from 44.73 degree to 48.43 degree following the intervention.

DISCUSSION

We conducted this study to determine the immediate effect of MET on PM tightness. This study aimed to evaluate

Table 1. Demographic details of computer users

Demographic details	Mean (SD)	Median	p-value
Age (yr)	26.57 (6.29)	25.00	< 0.001[a]
Weight (kg)	63.34 (12.40)	60.00	0.009[a]
Height (cm)	163.72 (9.69)	162.00	0.014[a]
BMI (kg/m^2)	23.48 (3.47)	22.90	0.089[a]

p-value significant at < 0.05.
BMI: body mass index.
[a]Kolmogorov-Smirnov test.

Table 2. Intra-group analysis of outcome variables

Outcome variables	Mean ± SD	Mean difference (95% CI)	p-value
PML		−0.423 (−0.458, −0.387)	< 0.001[a]
Pre-intervention	12.882 ± 0.718		
Post-intervention	13.305 ± 0.733		
RSP		0.395 (0.209, 0.581)	< 0.001[a]
Pre-intervention	4.631 ± 0.537		
Post-intervention	4.235 ± 0.538		
FHP		−3.701 (−4.236, −3.166)	< 0.001[a]
Pre-intervention	44.732 ± 4.601		
Post-intervention	48.434 ± 4.830		

PML: pectoralis minor length, RSP: round shoulder posture, FHP: forward head posture.
[a]Paired t-test. p-value significant at < 0.05.

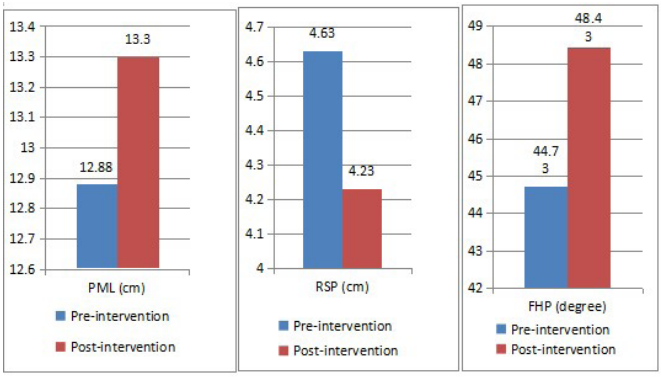

Fig. 1. Immediate changes in PML, RSP, FHP after MET.
PML: pectoralis minor length, RSP: round shoulder posture, FHP: forward head posture, MET: muscle energy technique.

the effectiveness of MET on PML, RSP and FHP in computer users. Considering the result of this study, MET showed statistically significant result in improving the above mentioned outcome measures. Hence, this showed that the intervention is a potential method in reducing PM tightness, improving its length, reducing RSP and improving FHP in computer users. To the best of our knowledge, this is the first study to determine the immediate impact of MET on computer users with PM tightness.

Muscle tightness is common in computer users due to their persistently unfavourable posture while using computer, growing computer use was accompanied by a sharp rise in the incidence of neck and upper limb occupational illnesses [6]. The notion that adaptive changes in the muscular belly will occur over time when the muscle is chronically held in a static shortened condition for long periods of time has served as the foundation for the creation of PM tightness. It is generally believed that a shortened PM is connected to greater scapular protraction/tilting, FHP, thoracic kyphosis, as well as poor upper body quadrant mobility [3].

Williams et al. [13] applied two types of passive stretches (for 15-30 seconds; 2-4 repetitions) to PM on swimmers and evaluate its acute effect on PML and scapular kinematics. Results showed significant improvement in PML in gross stretch on comparing with control group, whereas no improvement in PML for focused stretch or control. There wasn't any significance in terms of scapular kinematics [13].

MET a manual therapy has been employed to stretch and lengthen muscle and associated fascia lacking flexibility [17]. In a previous study, static stretch, autogenic inhibition and reciprocal inhibition MET were compared in individuals with mechanical neck pain, conventional treatment was provided in each group. Outcome variables used were numerical pain rating scale, neck disability index and cervical range of motion; result showed a statistical difference among the three groups in terms of the outcome variable used [18].

Rosa et al. [19] evaluated effect of 6 week stretching protocol of PM on individuals with and without shoulder discomfort, using PML, function (disabilities of arm, shoulder and hand) and scapular kinematics as outcome variables. There was statistical significant result in terms of improvement of function in patient group, whereas, there wasn't any statistical difference in PML among both the groups [19].

Wong et al. [20] conducted experiment evaluating effect of PM stretch on RSP subjects; experimental group received PM soft tissue mobilization and stretching of PM, whereas control group received manual placebo touch and pectoralis major stretch. The outcome variable RSP and lower trapezius strength (LTS), result showed decreases in RSP in experimental group, and LTS increased in both the groups.

Roddey et al. [21] demonstrated the effect of PM stretching on individuals with FHP/RSP, they were divided into 3 groups, namely, mild FHP/RSP/control, mild FHP/RSP/stretching and moderate FHP/RSP/stretching. The stretching groups PM stretch for 14 days; twice daily. Total scapular distance was evaluated and statistical difference was found between the control v/s moderate FHP/RSP/stretch group and between mild and moderate FHP/RSP/stretch group, whereas no significant difference was found between the control and mild FHP/RSP/stretch group [21].

Laudner et al. [12] provided MET to PM in swimmers for 6 weeks period (2 sessions per week) and evaluated its effect on PML, forward scapular position and scapular upward rotation; results showed statistical increase in PML, and decrease in forward scapular position when compared with the control group, however there wasn't any difference in scapular upward rotation.

Nitayarak and Charntaraviroj [22] provided scapular stabilization exercises for 4 weeks to experimental group of individuals with upper cross syndrome and no intervention wad provided to control group, on evaluating the PML, strength of scapular stabilizer muscle and mid-thoracic curve; it was found that significant improvement was shown in PML, and strength of scapular stabilizers whereas no difference was found in mid-thoracic curve. In our study, statistically significant improvement was shown in PML, RSP and FHP on evaluating the intra-group comparison. In literature, MET has been shown to improve flexibility of muscles, ROM and length of muscles [11] and so has our study, in improving PML.

This study has few limitations, namely, inability to measure 25% of maximal effort applied by subjects, lack of control group and immediate impact of MET was evaluated, long-term effect could have been checked, along with follow-ups. Hence, it might be interesting to evaluate the long-term impact, along with comparison to a control group and MET of PM on individuals with shoulder pathologies.

On the other hand, prominent strengthens that make our study valuable is use of a single group with intention to treat all, pocket friendly intervention and statistically as well as clinically significant study along with power analysis of the outcome measures has been done.

Conclusion withdrawn from the present study suggests that MET was highly efficient technique in improving PM muscle length, reducing RSP and improving FHP, in subjects using computer. Hence, MET could be a useful way for easing tight muscle (PM) among computer users from many occupations.

NOTES

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