# The Effects of Hamstrings Muscles Energy Technique and Postural Correction Exercise in People with Forward Head Posture: A randomized controlled trail

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**ABSTRACT**

**Objective**: To check the effects of hamstring muscle energy technique and postural correction exercises in subjects with forward head posture. **Study design:** Randomized controlled trial.
**Method:** 40 healthy subjects with forward head posture (FHP) of both gender ages between 20 to 50 years were randomly assigned to experimental and control groups. Both groups were given postural correction exercises but experimental group were given hamstring muscle energy technique (MET). Protocols were performed for 4 sessions per week for 4 weeks. And follow up has been taken in experimental group after 3 months. CVA measurement and popliteal angle measurement has been taken.
**Results:** within group analysis revealed significant improvements in all variables ($p<0.05$) and between group revealed improvement in CVA ($p<0.05$) in the experimental group in comparison with the control group.
**Discussion:** Gajdosik et.al. Stated that shortened hamstring muscle would lead to problems at the pelvis and spine, and stretching of the hamstring muscle would restore the normal posture.[20] Muscle chains are essential for the maintenance of the body posture. If any postural problems are in muscle segments, it will lead to shortening or lengthening of the muscles, which can interfere in the physiology of the postural muscles.[9]
**Conclusion:**Hamstring MET with postural correction exercises was effective in FHP healthy subjects. But this effect was not beneficial for long term. And only postural correction exercises in control group is also effective in FHP healthy subjects.

**Key Words:** forward head posture, Muscle energy technique, postural correction exercises.

## INTRODUCTION

Prevalence of postural abnormalities were including Forward head posture (66%), thoracic kyphosis (38%).[2] The head is move forward is called Forward Head posture, it causes the exaggerated anterior curve of the lower cervical spine and posterior curve of the upper cervical spine maintain the neck balance, it is known as forward head posture.[3]It is mainly caused by the excessive use of mobile phone (text neck), computer workers, abnormal breathing patterns and a backpack on cervical spine.[4,5,6,7] Prolonged adopted posture may results the sub occipital muscle shortening, neck flexors muscle imbalance, which leads the chronic neck pain, neck movement restriction, fatigue and also the joint and muscle loading.[8]

Forward head posture causes the weakness of deep cervical flexors and mid thoracic retractors [rhomboids, serratus anterior, middle and lower fibers of trapezius] so, strengthening of these muscles and stretching exercise for shorten muscles [pectoralis muscles, cervical extensors] may help for the correction of FHP.[7]
Some epidemiological studies suggested that muscle groups are responsible for posture maintenance are arranged and controlled by following a pattern known as “muscle chain”. Muscle chains are essential for the maintenance of the body posture. If any postural problems are in muscle segment, it leads to shortening or lengthening of the muscles, which can interfere in the physiology of the postural muscles. Postural changes are analyzed due to shortening of the different muscle chains. The muscles of orthostatic position against the gravitational action. For this reason, they are known as antigravity muscles.[9]
Posterior chain is composed of the muscle that sole of the foot, triceps surae, hamstrings, spinal erectors, sub occipital muscles.[9] The general statement that can be made about any of these anatomy trains lines is that strain, tension [good and bad], trauma and movement tend to be passes through the structure along with this fascial lines of transmission.[10] The superficial back line is continuting line of fascia and muscles from head to heel with includes both the sub occipital and hamstring. The superficial backline helps to keep us in upright position and connected by the one neural system. The very small sub occipital muscle have a link to the duramater and because of these are often described as a control centre of the SBL, having an effect on the movement of the muscles with the SBL, particularly the hamstring group.[10]
Some postural compensation patterns associated with the superficial back line includes-ankle dorsiflexion limitation, knee hyperextension, hamstring shortness, anterior pelvic tilt, sacral nutation, lordosis, extensor widening in thoracic flexion, sub occipital limitation, It leads to upper cervical hyperextension, anterior shift or rotation of the occiput on the atlas and eye-spine movement disconnection.[10]
There are some simple methods to lengthen the non-contractile or contractile components of the muscle tendinous unit, such as the active stretching, passive stretching applied manually, the active inhibition and self-stretching.11 Other stretching methods can also be used as the ballistic stretching, static stretching and also the stretching techniques by proprioceptive neuromuscular facilitation.12The muscle energy techniques (MET) constitute osteopathic procedures that have the function to lengthen fascias, muscles and also joints. MET is based on the fact that soon after a pre stretching contraction of a determined muscle retracted, this muscle will relax as a result of autogenic inhibition and it will be more easily stretched.[13]
The effect of MET on shortened muscle are neurological effects of loading of the Golgi tendon organ of the skeleton muscle by means of isometric contraction, which produces a post iso metric relaxation effects on shortened muscle. This isometric contraction seems to set the muscle to the new length by inhibiting via influence of the Golgi tendon organ. [13]
There are some studies has been done on the hamstring muscles by treating the sub occipital muscles. Previous studies were not focused on the postural correction. This study is intended to find out the relation of cervical postural correction by increasing hamstring flexibility.

## AIM AND OBJECTIVES

The aim of the study to check the effects of hamstring muscle energy technique and postural correction exercises in people with forward head posture.

**HYPOTHESIS**

NULL HYPOTHESIS-

There will be no significant effects of hamstring MET and postural correction exercise in subjects with forward head posture.

RESEARCH HYPOTHESIS-

There will be significant effects of hamstring MET and postural correction exercise in subjects with forward head posture.

**METHODS AND MATERIALS**

**STUDY DESIGN**-Randomized controlled trial

**STUDY POPULATION**- Healthy subjects with forward head posture

**SAMPLING**- Purposive sampling

**SAMPLE SIZE**- 40

**RANDOMIZATION**-

Block randomization was done to equally distribute the subjects in to two Groups.

**STUDY DURATION**-April 2018 to May 2019.

**STUDY SETTING**-

Srinivas Physiotherapy College and research Centre OPD and other government and private clinics in Mangalore [Karnataka] and Surat [Gujarat].

**INCLUSION CRITERIA AND EXCLUSION CRITERIA**

INCLUSION CRITERIA[3, 13, 20]

- Asymptomatic individuals both male and female with age group 20-50 years.
- Subjects with Cranio- vertebral angle (CVA) less than 50 degree in forward head posture.
- Tight hamstring [Inability to achieve 160˚ of knee extension with hip 90˚ flexion].

**EXCLUSION CRITERIA[21]-**

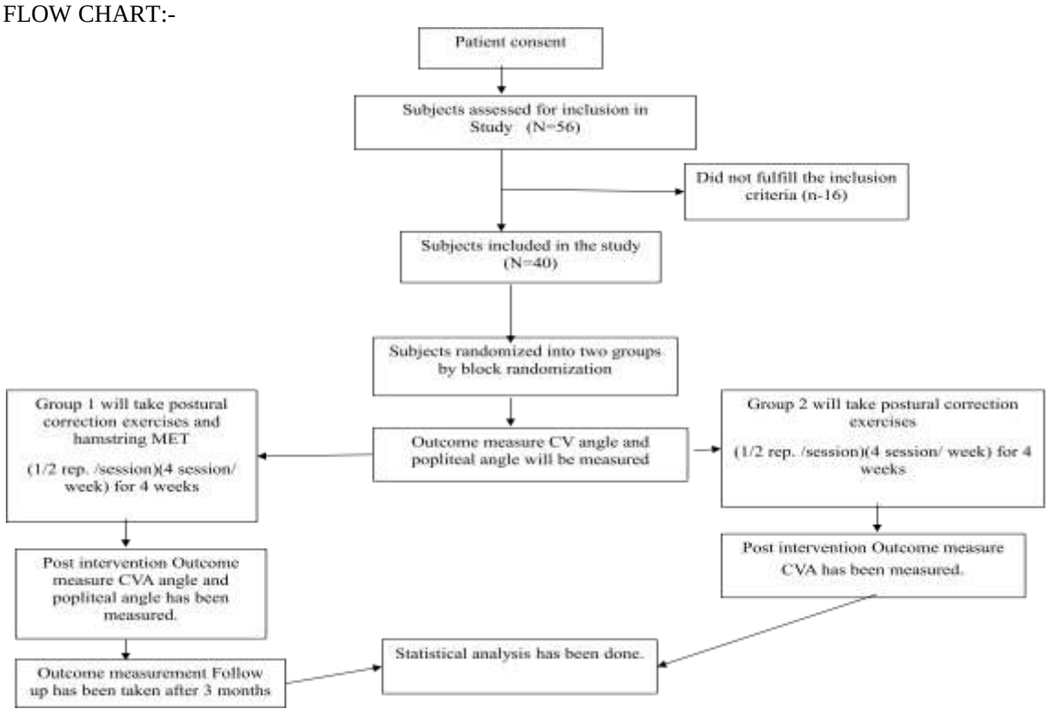
- Recent Cervical fracture or trauma
- Recent Cervical surgery
- Idiopathic scoliosis
- Torticolis
- Acute and chronic hamstring injury

**PROCEDURE**

The subjects with forward head posture referred for Physiotherapy was screened for inclusion and exclusion criteria. A total of 56 Subjects were screened. In that 40 subjects met the inclusion criteria. The purpose of the study was explained to all the subjects and was asked to sign the written consent form stating the voluntary acceptance to participate in this study. Then, the demographic information (i.e. age, gender, height and weight) was collected from all the subjects. By block randomization, the 40 subjects were assigned randomly into experimental or control group. The pre-treatment measurement for CVA and popliteal angle were taken. Experimental group (n=20) was treated with hamstring MET and postural correction exercises Control group (n=20) was treated with postural correction exercises.

The treatment was given for 4 sessions in a week for a period of four weeks. Post treatment score were evaluated after the last treatment session and follow up was taken after 3 months for experimental group. The data was analyzed and interpreted.

FLOW CHART:-




**RESULTS**

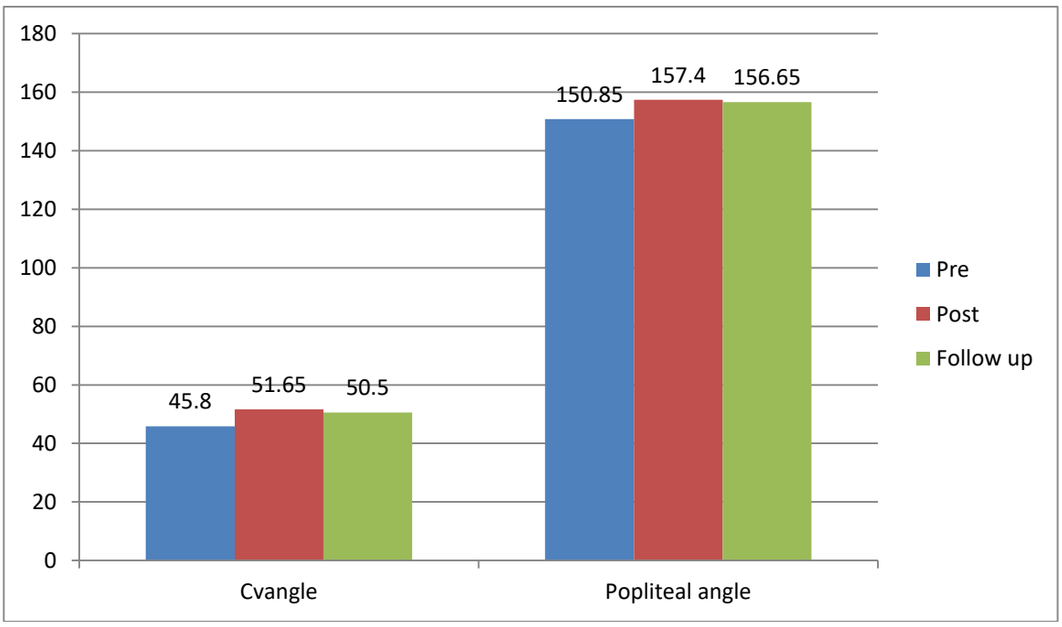
A Total 40 subjects were taken in the study and divided into experimental group and control group. Experimental group consisted of 20 subjects 9 males and 11 females with mean age of 30.35, whereas control group had 20 subjects 7 males and 13 females and mean age 29.35.

Statistical analysis was done using SPSS v.16 Descriptive statistics were subjected to tests of normality and inferential statistics was done using paired t test to compare differences within the groups and repeated measure ANOVA to compare the variables which was based on repeated observations and independent t test was used for analysis between the groups. Confidence interval (CI) for the tests was kept at 95%.

Results showed statistical significance within the groups post intervention in both groups- experimental and control ($p<0.05$) for outcome measures. Between groups post intervention analysis revealed significant differences in CVangle ($p<0.05$).

| PARAMETERS | | MEAN DIFFERNCE | P VALUE |
|---|---|---|---|
| CVANGLE | PRE | 45.80±2.30 | 0.00 |
| | POST | 51.65±2.46 | 0.00 |
| | FOLLOW UP | 50.50±2.66 | 0.00 |
| POPLITEAL ANGLE | PRE | 150.85±4.56 | 0.00 |
| | POST | 157.40±4.63 | 0.00 |
| | FOLLOW UP | 156.65±4.51 | 0.00 |

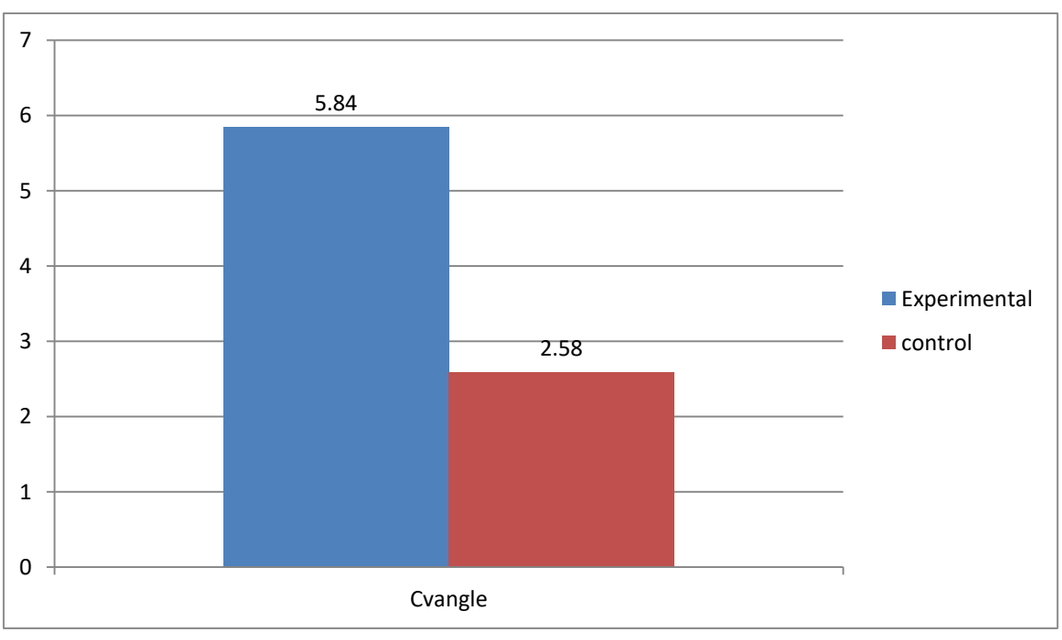
**TABLE:1** Shows the mean value of pre, post and follows up of CVangle and popliteal angle in experimental group.




**GRAPH:1** shows the mean value of pre, post and follows up of the CVangle and popliteal angle for experimental group.

**TABLE:2** shows the mean and standard deviation of post intervention CVangle in experimental and control groups. The mean difference and the significance level (p- value) shows CVangle have p-values<0.05 showing Stastical differences.

| PARAMETERS | EXPERIMENTAL | CONTROL | MEAN DIFFERNCE | P VALUE |
|---|---|---|---|---|
| CVANGLE | 5.84±1.45 | 2.58±1.06 | 3.26 | 0.00 |




**GRAPH:2**- shows the mean value of post intervention CVangle measurement of experimental and control groups.

## DISCUSSION

Prolong adopted posture may result in sub occipital muscle shortening, neck flexors muscle imbalance, which leads to chronic neck pain, neck movement restriction, fatigue and also the joint and muscle loading.8 Forward head posture is the highly prevalent abnormality which may lead to weakness in deep cervical flexors. Forward head posture is usually treated by postural correction exercises.

Gajdosik et.al. Stated that shortened hamstring muscle would lead to problems at the pelvis and spine, and stretching of the hamstring muscle would restore the normal posture. One previous study showed that passive stretching of muscles of the hamstring restore the length of the muscles related to the spine and pelvis, length of those muscles also restore the normal postures.[20]

The successful effects of stretching exercises lies in its physiological mechanism which have been attributed firstly to neurophysiological mechanism in which inhibition of the muscles decreases the activity of the contractile component and result in an increased extensibility of the muscle and an increase in range of motion as well. Secondly to the Biomechanical mechanism that is based on viscoelastic property in which muscles like biologic tissues react viscoelastically to stretch. Elastic behavior refers to the property of a structure to elongate when a force is applied, and to return to its original length when the force is withdrawn.[14] Meanwhile, viscous behavior refers to the property of a structure to elongate when a load is applied and elongation of a muscle is determined by the exerted force and force rate. Due to the above fact, this has been suggested that during the passive hamstring stretching technique subjects shown significant improvement may be due to the changes in viscoelastic property of the muscle.[14]

Likewise a study was done by Schleip and Aparicio et. Al. considered that if the tone of subocipital muscles is decreased, the length of the hamstring muscles and the increase in the amplitude of hip flexion will be greater.14 Some epidemiological studies showed that muscle groups are responsible for posture maintenance and are arranged and controlled by following a pattern known as “muscle chain”. Muscle chains are essential for the maintenance of the body posture. If any postural problems are in muscle segments, it will lead to shortening or lengthening of the muscles, which can interfere in the physiology of the postural muscles.9
Previous studies performed on healthy subjects, aiming to increase the cervical range of motion with giving treatment of hamstring stretching. And the result of this study shown the significantly improved the range of motion in cervical.19
Other study performed to check the effect of sub occipital muscle inhibition technique to improve the flexibility in hamstring. This was showed the effective.[16] But no study could be retrieved on correction of FHP by treating hamstring flexibility. So aim of the current study is to check the effects of hamstring muscle energy technique and postural correction exercises in subjects with forward head posture.
The technique MET was developed and popularized by Mitchell and although many texts promotes the use of MET, it is unforeseen how research, with regards to its effectiveness, is so limited. Of the few studies published to date, most have examined the effects of sub occipital muscles on hamstring muscles. Previous studies not focused on postural correction. Some studies proved that hamstring Proved that hamstring MET treatment is very much effective compare to stretching or other techniques.[20]
The follow up value is reduced because treatment was not given for 3 months. This proves that there is no any long term effect of treatment of this study. But if the treatment will give regularly than it is beneficial to reduce the forward head posture.

## LIMITATIONS

1. Limited follow up period.
2. In this study there is only experimental group follow up. There is no follow up for control group.
3. Healthy subjects were included in the study.
4. Homogeneity was not maintained in the genders as in our study. Male participants are less in comparison than females.
5. Small sample size.

## RECOMMANDATIONS FOR FURTHER RESEARCH

1. A long term follow up of 6 months to 1 year period can be taken to check the long term effects of MET and postural correction exercises on forward head posture.
2. Study can be done with symptomatic subject.

## CONCLUSION

- Hamstring MET with postural correction exercises was effective in FHP healthy subjects. But this effect was not beneficial for long term.
- And only postural correction exercises in control group is also effective in FHP healthy subjects.

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