



(RESEARCH ARTICLE)



## A study to assess the effect of muscle energy technique on hamstring flexibility in basketball players

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### Abstract

Basketball is a high-intensity sport that demands explosive movements such as jumping, sprinting, and quick directional changes. Muscle Energy Technique (MET), a form of manual therapy involving active muscle contractions, has been shown to enhance flexibility and reduce muscle tightness. In this quasi-experimental study, 30 basketball players aged 18-28 years with hamstring tightness (SLR<80°) were selected. Participants received a Muscle Energy Technique (MET) intervention over 6 days. Outcome measures included hamstring flexibility and tightness, assessed using the sit and reach test and straight leg raise (SLR). The sit-and-reach test revealed a paired t-value of 14.2267 ( $p < 0.0001$ ), indicating a statistically significant difference between pre-test and post-test scores. MET is effective in improving hamstring flexibility in basketball players.

**Keywords:** Basketball Players; Muscle Energy Technique; Sit and Reach Test; Straight Leg Raise

### 1. Introduction

Basketball is a competitive team sport that requires sports skills like jumping, flexibility, physical strength, speed, balance, and coordination. Rapid changes in direction, repeated strain, and frequent jumping during training and competitions will diminish the neuromuscular efficiency, increase muscular fatigue, and increase muscle loading and the potential for injury<sup>1</sup>. Several research studies have found that physical and technical ability in sports like balance, kicking, jumping, agility, and sprinting decreases when muscle tightness restricts technical movement<sup>3</sup>. The hamstring muscle is present at the back of the thigh. The hamstring muscle comprises two components: the long and short heads. The long head originates from the ischial tuberosity of the pelvis and is inserted into the head of the fibula, and it contributes to hip extension. In contrast to that, the short head originates from the Linea aspera of the femur and gets inserted into the head of the fibula, primarily facilitating knee flexion<sup>4</sup>. The hamstring muscle contributed to postural stabilization and control of the pelvic region. With the high percentage of type 2 Muscle Fibers in the hamstring muscles rapidly produce significant force during both concentric and eccentric contractions<sup>6</sup>. MET is a therapeutic method that involves the voluntary contraction of a muscle in a specific direction with controlled intensity. The key feature of this method is that the patient actively participates in the effort while the practitioner assists in applying the technique<sup>7</sup>. MET helps in maintaining normal tone in hypertonic muscles, enhancing joint mobility, strengthening weak muscles, and preparing tissues for further stretching. Post- isometric relaxation technique is the main mechanism in MET, which improves the muscle flexibility<sup>5</sup>. MET is a well-recognized and effective technique for addressing hamstring tightness<sup>8</sup>. Hence, the study aims to investigate the effect of the muscle energy technique on Hamstring flexibility in basketball players.

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## 2. Materials and methodology

The study design was a quasi-experimental investigation conducted among Puducherry basketball players. A total of 30 subjects were included in the study, with a duration spanning six months. Data collection focused on both male and female subjects. The primary tools were utilized for assessment was the sit and reach. The outcome measures were flexibility and muscle tightness.

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## 3. Procedure

Subjects who fulfilled the inclusion criteria were included in this study. The benefit of the study and its intervention will be explained to the patient, and a written informed consent will be obtained. The subject will be assessed using the sit and reach test as an objective measure.

### 3.1. Sit And Reach Test:

Patient Position: Long Sitting Therapist Position: Standing

#### 3.1.1. Procedure

The sit and reach test is used to measure hamstring flexibility. The participants sat on the floor and fully extended their two legs so that the sole of the foot was flat against the end of the box. They extended their arms forward, placing one hand on the other hand. With the palm down, they reached forward, slinging their hands along the measuring scale as far as possible without bending their knee of the extended leg. Throughout testing, the physiotherapist checked to ensure that the heel remained at the 23 cm mark. Three trials were performed, and the average of the three trials was used for subsequent analyses <sup>(10)</sup>.



**Figure 1** Sit and Reach Test

### 3.2. Muscle Energy Technique

Post-Isometric Relaxation: Patient Position: Supine Lying Therapist Position: Half Kneeling.



**Figure 2** Muscle Energy Technique

The hip was fixed at 90 degrees of flexion. The therapist extended the flexed knee to the point of resistance (Identification of barriers).

The calf of the treating knee was placed on the shoulder of the therapist, facing the head of the table, and facing the side of the treated leg. The therapist, on the one hand, holds the treating leg's thigh to maintain stability when the barrier is being assessed.

The patient was then asked to extend the knee utilizing the antagonist to the hamstring (quadriceps), employing 20% of strength to the quadriceps. This was resisted by the therapist for 7-10 seconds.

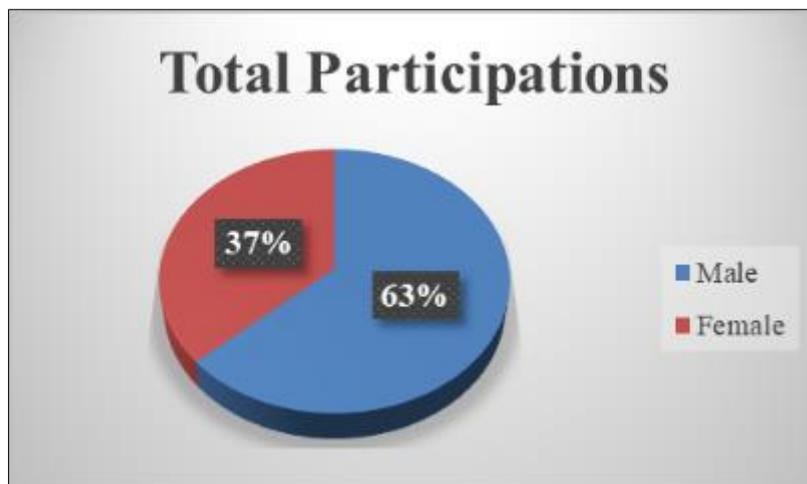
Appropriate breathing instructions were given. The leg was then extended at the knee to its new hamstring limit. After that, the passive stretch should be held for 30 seconds, followed by relaxation. This should be given with a 5-second rest interval in between each set <sup>(9,11,12)</sup>.

**Repetitions:** 10 Repetitions/Session, **Session:** 3 Sets/Session, 6 Times/Week.

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#### 4. Statistical analysis and result

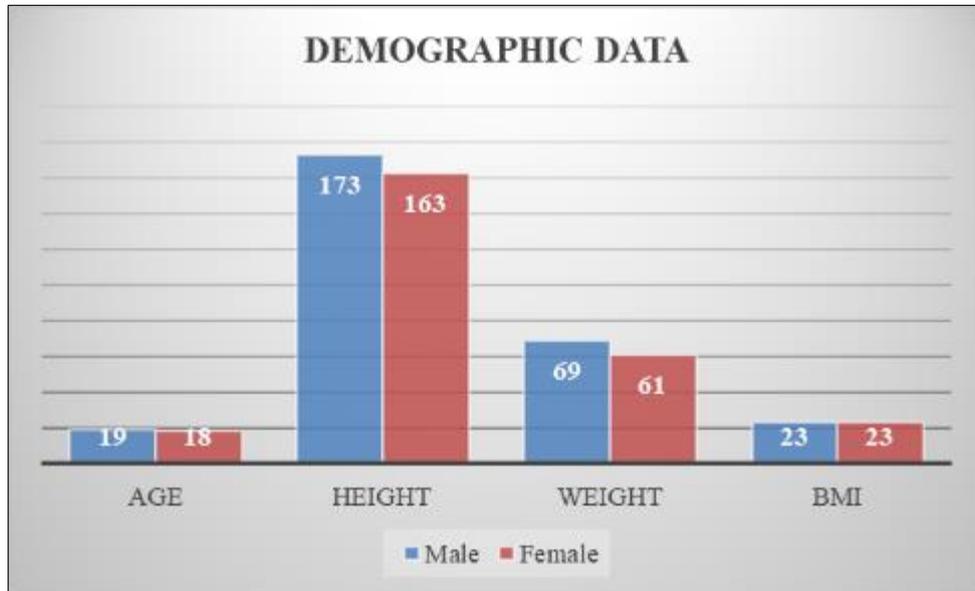
The participants were 30 basketball players, 11 females, and 19 males.



**Figure 3** Represents the demographic data of the total participants in the study

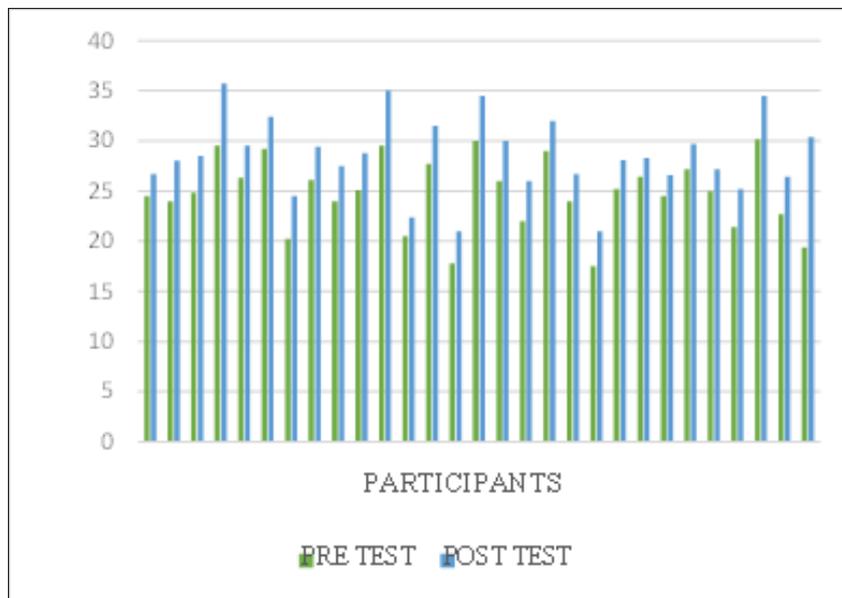
**Table 1** Demographic data

CHARACTERISTICS	MALE	FEMALE
AGE	19.47 ± 2.22	18.09 ± 0.94
HEIGHT	173.21 ± 8.56	163.18 ± 8.23
WEIGHT	69.23 ± 11.09	61.45 ± 8.23
BMI	23.13 ± 3.65	23 ± 5.12



**Figure 4** Represents the Age, Height, Weight, BMI data of the total participants in the study

OBJECTIVE: To investigate the effect of the muscle energy technique on hamstring flexibility in basketball players



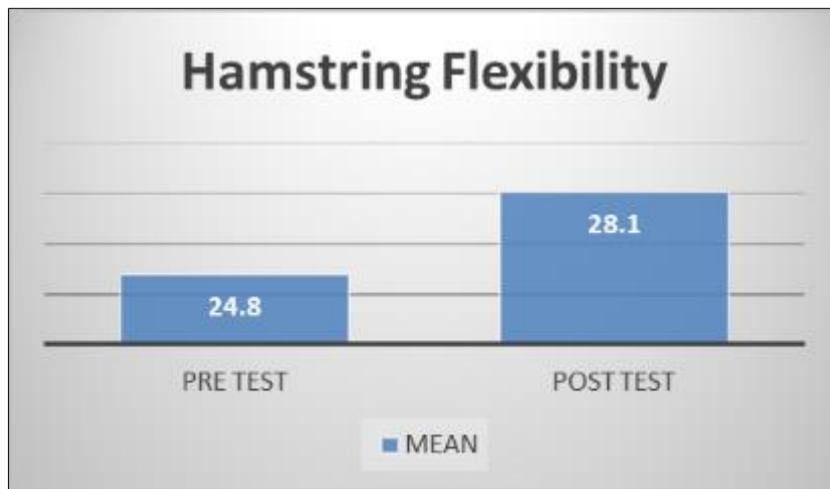
**Figure 5** Represents the pre-test and post-test descriptive statistics

#### 4.1. Within the group analysis

**Table 2** within-group analysis of hamstring flexibility using paired 't' test

WITHIN THE GROUP ANALYSIS	MEAN	STANDARD DEVIATION	t- VALUE	p-VALUE
PRE TEST	24.890	3.530	14.2267	<0.0001
POST TEST	28.180	3.882		

The value of  $t$  is 14.2267. The value of  $p$  is <0.0001. The result is significant at  $p < 0.0001$ .



**Figure 6** Represents the pre-test and post-test mean value of hamstring flexibility

The  $p$ -value of the hamstring flexibility for the group is <0.0001, considered extremely significant.

The obtained data were analysed by using the paired  $t$ -test. Comparison of the mean values of pre-test and post-test of hamstring flexibility.

In Within the group analysis, the mean for hamstring flexibility is 24.890 and 28.180 for pre-test and post-test, respectively. The paired ' $t$ ' value of the hamstring flexibility is 14.2267, respectively, and the  $p$  value is <0.0001. Since all the calculated ' $t$ ' values are more than the ' $t$ ' table value, there is a significant difference between pre- and post-test scores sit and reach test. After the statistical analysis, the result of the study shows that the pre-test and post-test values of the  $t$ -test for the hamstring flexibility show significant improvement in the experimental group.

## 5. Discussion

This study was to investigate the effect of the muscle energy technique on the hamstring flexibility in basketball players.

Overall, 30 subjects in the age group between 18 to 28 years were selected based on the inclusion criteria. Both male and female basketball players with hamstring tightness have been included in this study. The pre-test was taken by 30 subjects using the sit and reach box. After 6 days of the treatment, a post-test was taken for the subjects.

Hazal Genç, (2024) discussed in their study that the hamstring muscle is not the primary propulsive muscle for vertical jump, but hamstring shortness may limit hip flexion and knee extension, resulting in reduced jumping skills. So, targeting the hamstring flexibility may contribute to better athletic performance and injury prevention in this population<sup>1</sup>. So, in this study we focused on the hamstring flexibility to prevent the hamstring injury.

Yeh-Hyun Kang et al., (2023) discussed in their study that muscle energy technique is a manual therapy approach frequently used in osteopathic practice, involving the active isometric contraction of targeted muscles. It functions similarly to proprioceptive neuromuscular facilitating and has greater effectiveness in lengthening tight muscles than standard static stretching or joint mobilisation. Beyond enhancing muscle flexibility, MET also contributes to muscle strengthening, promotes the circulation of lymph and venous blood and assists in improving joint mobility

where motion is limited. MET is more effective for hamstring flexibility than stretching alone or no intervention, as indicated by results from the sit and reach test. In contrast, when using the Active knee extension test, there is no significant difference in effectiveness between MET and other manual therapy approaches. In MET, there is incorporation of both isometric contraction and stretching; this combination is not typically present in other techniques. This technique has no adverse effect, so it is safe and beneficial for enhancing the hamstring flexibility in clinical practice<sup>4</sup>. So, in this study, we used the sit and reach test as a outcome tool to assess the hamstring flexibility and MET technique to improve the flexibility.

The statistical result of this study showed that there is a significant difference in the hamstring flexibility of the subject's pre-test and post-test who underwent the muscle energy technique. The muscle energy technique has a significant effect on improving the hamstring flexibility in basketball players.

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## 6. Conclusion

This study concludes that the muscle energy technique is an effective intervention for improving hamstring flexibility among basketball players. Limitations are: The sample size is small, Treatment duration is short, only ages between 17-27 were taken, only basketball players were taken, Hamstring flexibility is only assessed by the sit and reach test. Recommendations are: Other than the sit and reach test, further more outcome tool recommended, In various team sports, this technique is recommended for hamstring flexibility, Significance of the muscle energy technique could be studied in detail.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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