Universal Journal of Public Health 10(4): 299-303, 2022 http://www.hrpub.org
DOI: 10.13189/ujph.2022.100403

Myofascial Release Therapy versus Muscle Energy Technique on Hamstring Flexibility in Physically Inactive Students – A Randomized Controlled Trial

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Received March 19, 2022; Revised June 17, 2022; Accepted July 11, 2022

Cite This Paper in the Following Citation Styles

(a): *[1] Arun Balasubramaniam, Mohan Gandhi V, Punitha Kumar R K, Rajkumar Krishnan Vasanthi, Vinosh Kumar Purushothaman , "Myofascial Release Therapy versus Muscle Energy Technique on Hamstring Flexibility in Physically Inactive Students - A Randomized Controlled Trial," Universal Journal of Public Health, Vol. 10, No. 4, pp. 299 - 303, 2022. DOI: 10.13189/ujph.2022.100403.*

(b): *Arun Balasubramaniam, Mohan Gandhi V, Punitha Kumar R K, Rajkumar Krishnan Vasanthi, Vinosh Kumar Purushothaman (2022). Myofascial Release Therapy versus Muscle Energy Technique on Hamstring Flexibility in Physically Inactive Students - A Randomized Controlled Trial. Universal Journal of Public Health, 10(4), 299 - 303. DOI: 10.13189/ujph.2022.100403.*

Abstract Physical inactivity [sedentary] is one of the significant concerns in young adults in various developing countries. College students show a marked reduction in physical activity and have adapted to the sedentary lifestyle due to the substantial transformation from school to college life. This study aims to compare myofascial release therapy versus muscle energy technique on hamstring flexibility in physically inactive college students. An experimental study design with 60 volunteers was assessed with sit & reach test and included in the study. Of twenty students, each participated in the myofascial release group (MFR), Muscle energy technique (MET) group, and passive stretching (PSG) group. All the students underwent 24 sessions of treatment in their respective groups allocated. Sit and reach test was used for measuring the hamstring length; measurements at baseline (pre-test), in the middle of the session (4th week), and at the end of the program (8th week- post-test) were taken. All the values were collected and analyzed using SPSS 24.0. One-way ANOVA was used to analyze the difference between the duration and the Tukey HSD Post Hoc test to identify the number of differences in each group with the critical value of $p < 0.05$. When comparing the MFR with MET, the Tukey HSD shows 1.18 with $p<0.43$; when comparing MFR with PSG, the Tukey HSD is 5.63 with $p=0.001$, and when compared MET with PSG, the Tukey HSD shows 5.23 with $p=0.001$. This study concludes that the Muscle energy technique and the Myofascial release therapy have shown effectiveness in improving hamstring flexibility.

Keywords Muscle Energy Technique, Myofascial Release, Hamstring Tightness, Sedentary, Students, Sit & Reach Test

1. Introduction

Physical inactivity is one of the essential factors for mortality in young individuals. Factors associated with physical inactivity are not well understood. Sedentary or physically inactive has adversely affected mental and physical health [1]. Recent researchers suggest that cellular phones make individuals more sedentary [2]. Inactive includes: Spending time on mobile, Watching television, playing video games, Using laptops or computers, Driving vehicles, and Reading for longer.

There was a steep decline in physical activity as students transitioned from high school to college, gaining greater autonomy relative to their daily living [3].

Flexibility is one of the attributes of physical fitness [4]. Flexibility is defined as the capability of the muscle to stretch and allow the joints to move through a particular range of motion. Poor flexibility becomes one of the risk factors for muscle injury [5], and there is a strong relationship between the physically inactive and muscle tightening. A sedentary lifestyle will lead to tightness in the muscles. The hamstring is one of the essential muscles in the lower limbs, which tightens during sedentary living. A two-joint muscle acts as a hip extensor and knee flexor. Tightness in the hamstring leads to hamstrings injuries, which most often occur in athletes [6].

Hamstring tightness is a common clinical musculoskeletal problem. Radford et al. [7] further reported that the lower leg muscle tightness and reduced joint range of motion were related to musculoskeletal disorders. Multiple studies have identified that hamstring muscle contracts early, resulting in tightness. Studies reported a physiological reduction in the musculotendinous unit and a reduction in the length and flexibility of the connective tissues [8]. Biomechanical analysis of the hamstring's tightness is complex due to its ability to influence the movement in multiple joints. Describing specific body movements and pathological conditions is critical for therapeutic interventions. An effective treatment should be adopted [9]. Although various therapeutic measures focus on managing hamstring tightness, all have poor success rates. Usually, cryotherapy and stretching are integral parts of managing muscle tightness [10], [11]. Various types of stretching treat hamstring tightness, including cyclic, static, PNF, and dynamic stretching.

Fascia is a rigid sheet of connective tissues that envelops the muscles and bundles [12]. Myofascial release therapy (MFR) is joint soft tissue mobilization that facilitates the fascia and the corresponding tissues for its extensibility of soft tissues through compression while restoring restricted fascia [13]. Muscle energy (MET) is a manual technique in which the person's muscle energy is used in gentle isometric contractions to relax the muscle using autogenic or reciprocal inhibition. Many studies have identified the effect of the MET, which is to inhibit the Golgi tendon reflex and the reflex from being activated during the isometric contraction of muscles and to produce a stretch in the Golgi tendon organs and reflex relaxation of the muscle [14].

Although multiple studies have been done to identify the effects of various stretching or exercise protocols to improve hamstring flexibility, none proves its effectiveness. Few studies have identified the impact of Muscle energy technique and Static stretching on hamstrings. Still, very few studies have been done on the fascia, so this study aims to compare myofascial release therapy versus muscle energy technique on hamstring in inactive college students.

2. Materials and Methods

Institutional ethical committee approval was obtained before the beginning of the study. Informed consent was received from all the participants. The recruited 75 volunteer college students selected randomly from a population of 175 students were organized into three groups as pre-test and post-test experiment study. A blinded assessor evaluated all the volunteers through sit and reach test on the flexibility. Participants with less than ten centimetres of tightness were selected for the study. Twenty-five college students participated in each group's myofascial release group (MFR), muscle energy technique (MET), and the passive stretching group (PSG). The volunteers with an age group of 17—25 years, without any history of lower limb injury, not involved in any active exercise protocols, not engaged in exercises or sports at least six months before the study, and with no signs of a hamstring injury were included. Precise details about the study and the exercises were well explained to the participants and they were advised to follow the instructions given by the researcher. For twelve weeks, the exercise program was given on alternate days a week. Five subjects [15 in total] from each group are withdrawn from the study for personal reasons. Therefore, we finished the study with 60 subjects [i.e., 20 subjects in each group].

The trained physiotherapist applied myofascial release therapy for 30 minutes based on the protocol explained by Barnes 1990 [15]. MFR was applied to every individual by a trained therapist with more than five years of experience in manual therapy. Two trained senior physiotherapists used a cross-hand technique, slowly stretching out the elastic component of the hamstring fascia with relaxed hands until the physical therapist reached a barrier. At that point, the physical therapist maintained sufficient pressure to hold the stretch at the barrier and waited 90 seconds or longer until the restriction or hindrance was released. Myofascial release was performed to stretch the cross-links and change the viscosity of the ground substance of the fascia [15].

METs were applied based on the technique described in Ballantyne et al., and MET was used on every individual by a trained therapist with more than five years of experience in manual therapy. He applied a mild isometric contraction (75% of maximum) of the hamstring muscle for 5 seconds after stretching the person's knee to the point of tightness. The technique was repeated for three times after a three-second rest period [16]. Fifteen minutes of passive stretching activities were recommended. Subjects were positioned supine lying, bent the hip and knee to 90º, and kept a towel roll under the lumbar spine to prevent excessive lordosis. Gently extend the knee to mild resistance, hold it for 20—30 seconds, and repeat ten times. The treatment session lasts for 45 mins, which has 15 mins for warming up. They all underwent 24 sessions of treatment. Sit and reach was used for measuring the hamstring length in the volunteers. The measurement was taken on the first visit (pre-test), in the middle of the session (4th week), and at the end of the program (8th week- post-test). All the values collected were analyzed using statistical tests. One-way ANOVA was used to analyze the difference between the duration, and the Tukey HSD Post hoc test was used to identify the number of differences in each group.

3. Results

The study did a statistical analysis to identify the effect of the groups. The study participants' characteristics were tabulated in Tables 1 & 2.

Table 1. Demographic characteristics of the study participants

Characteristics	Mean±SD
Male	20.58±2.62
Female	20.50±2.50
Age	20.55±2.55
Weight	79.83±11.4
Height	168.63±5.68

The values were determined at three intervals using one-way ANOVA for the analysis. The results showed significant differences between the groups and the three values. Once the ANOVA identified the differences, the post hoc test was applied to determine the number of differences in the groups. It has shown the critical value at $p < 0.05$.

Table 2. Evaluation of the treatment group

Characteristics	Mean	S.D	Value	Sig. Value
Sit & Reach test MFR	17.4	1.10		
Sit & Reach test MET	17.00	0.973	137.84	p < 0.001
Sit & Reach test PSG	12.55	0.999		
Tukey HSD Post-hoc test				
MFR vs MET	0.4	1.04	1.1804	p<0.4386
MFR vs PSG	4.85	1.05	5.6304	p=0.000
MET vs PSG	4.45	0.986	5.2304	p=0.000

*There were no differences found between the experimental groups whereas the experimental compared with the control shows differences

The findings revealed that there were substantial disparities among the groups as well as between them. One-way ANOVA showed that there were considerable differences existed between the three groups. On analysis with the post hoc test, it was found that there was a significant difference between the groups of MFR compared with PSG and MET when compared with PSG. In contrast, no significant differences were obtained between the MFR and MET groups. So, the results of this study show both groups were improved, whereas there was no considerable improvement between the MFR & MET. This study accepts the Null hypothesis.

4. Discussion

The purpose of the study was to compare the effect of the myofascial release therapy versus muscle energy technique on hamstring flexibility in physically inactive college students. The hamstring is one of the essential muscles for the locomotion of humans and the joint muscle that gets injured frequently [17]. Hamstring strains occur because of tightness in the muscle group. Generally, tightness is an adaptive shortening of the muscles and connective tissues. This tightness may be a non-pathological cause that restricts one joint's movement or multiple joints [18].

Myofascial release therapy is one of the fascial release techniques which release the fascial restrictions from the deeper layers of the fascia. MFR utilizes physical manipulation to release tension in facial tissues. Evidence suggests that MFR is safe and effective in reducing fascial tightness [19]. Similar studies have identified that fascial release at the sub occipital region has also shown significance in hamstring flexibility [20]. The fascial release over the hamstrings also increases the knee's range of motion [21]. Systematic reviews also suggest that MFR reduces hamstring pain and improves the range of motion [22]. Fascial release is very effective in the Golgi tendon organ to reduce stress, decrease pain, restore muscle length-tension, and improve function [23].

Muscle energy techniques are soft tissue therapy primarily working on active muscle relaxation. It directly facilitates and controls voluntary isometric contraction of the target muscles [24]. METs alter the connective tissues in both components [creep and plastic changes], which causes increased flexibility in the muscles. Changes in the biomechanical or neurophysiological aspects of the muscle would cause an increase in the length of the muscle [25]. Studies have shown that the immediate range of motion changes is possible due to increased tolerance to stretch, as there was no evidence of viscoelastic change [16]. Studies highlighted that METs produce an immediate effect but did not discuss their effectiveness for a longer duration.

Passive stretching has also produced improvement within the groups. Stretching has made the ability to improve muscle length. Reviews show significant changes in the activation of the Golgi tendon organ during stretching. Passive stretching creates tension on the muscle-tendon, which activates the Golgi tendon organ and produces autogenic inhibition of the muscles being stretched [26]. Literature has found that passive hamstring stretching improves the range [27]. The study experienced a few limitations, including dropouts during the Study process. A limited number of participants showed interest in taking up the exercise program. The evaluators did not strictly monitor home advice and did not modify activities of daily living.

5. Conclusions

This study concludes that the Muscle energy technique and the Myofascial release therapy have effectively improved hamstring flexibility, and there was no significant improvement between the groups. The myofascial release therapy group was significantly improved compared with the Passive stretching group, as the Muscle energy technique group showed significant improvement compared with the passive stretching group. On reaching the myofascial release therapy and muscle energy technique, both groups showed equal improvement; no significant differences were obtained between the groups.

Acknowledgments

We would like to thank the participants and THE Institute to provide this opportunity.

Conflict of Interest

None declared by the authors.

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