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Original Research Article

Effectiveness of Plantar Fascia Mobilization and Passive Stretching on Hamstring Muscle Flexibility

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ABSTRACT

Background- Due to various occupational set up people are adapting several bad postures for a long time leading to development of tightness or less flexibility of hamstring muscle. Development of efficient techniques is necessary to relieve hamstring tightness and maintain its flexibility.
Purpose- To examine the effects of using roller massager on plantar fascia to increase hamstring flexibility.
Methodology- A sample of 24young female adults were recruited by simple random sampling and were divided into control and experimental groups. The control group was treated with passive stretching of hamstring muscle and the experimental group with passive stretching and golf ball rolling, 3 sets of 30 seconds for 3 days .Their hamstring flexibility was tested using active knee extension test before and after the intervention respectively.
Results- The experimental group has shown to have more significant increase in the hamstrings flexibility than the control group ($p<0.001$).
Conclusion- Use of plantar fascia mobilization in form of roller massager like golf ball can be used to enhance the hamstrings flexibility along with other conventional techniques for better results.

Key Words: Self myofascial release, golf ball, plantar fascia mobilization, hamstring flexibility

INTRODUCTION

Musculoskeletal health benefits from flexibility training and maintaining a functional, or sport specific, range of motion (ROM) is important to one's overall fitness. [1,2] Flexibility may be hindered for a number of reasons, one of which is fascial restrictions. [2,3] Fascia is connective tissue that surrounds muscles, nerves, blood vessels and connects structures of the body. [4] Fascia can become restricted due to injury, disease, inactivity, or inflammation. [2]

These restrictions can decrease flexibility, strength, endurance, motor coordination and lead to high amounts of physical pain. [2] Literature has continued to provide insight into the connectivity and continuity of fascial systems that course through the body and affect often distant and unrelated body parts. A schematic understanding of this complex system has been presented as "Anatomy trains". [5] The anatomy train suspected as being the most involved for hamstring and lumbar spine is known as the superficial back line which terminates in the plantar fascia and short toe flexors. [6]

An array of myofascial release techniques are currently being used in order to alleviate the effects of fascia restrictions. [3] Devices are currently being created and tested to be used to replicate myofascial release techniques so that individuals can do

their own assisted fascial releases at home without the aid of a therapist.

Self-Myofascial Release (SMR) techniques have become highly popularized within the fitness and rehabilitation communities as a holistic means to both prevent and treat pathology. Self Myofascial Release methods including foam roller and roller massage sticks have not only been shown to increase flexibility but also to reduce arterial stiffness, improve arterial function and improve vascular endothelial function and reduce soreness, which makes their use particularly interesting for both athletes and the general population. This study aims on finding the effect of plantar fascia mobilization on hamstring flexibility using the concept of "anatomy trains" as compared with passive stretching of hamstring muscle using a golf ball as self myofascial release method.

MATERIAL AND METHODOLOGY

INCLUSION CRITERIA-

- Young female adults
- Age group between18-25 yrs.
- Subjects having hamstring tightness, lacking at least 25 degrees of active knee extension with the hip flexed to 90 degrees. [7]

Right dominant leg

EXCLUSION CRITERIA

- Subjects with back pain
- Lower limb injuries (within three months)
- Any wound in the sole of the foot
- No surgical procedures done in the back or lower limb.

This experimental study was conducted in out- patient department of Alva's college of physiotherapy, Moodbidri. Using convenience sampling and random table method, 24 subjects selected on basis of inclusion and exclusion criteria were randomly divided in to two groups.

Group A (control group) and Group B (experiment group) with 12 subjects in each group. The subjects were explained about the study. Informed consent was taken from all the subjects.

Active knee extension was used as outcome measurement for hamstring flexibility.

The subject was then asked to extend the testing lower extremity as far as possible until a stretch sensation was felt. A goniometer was used to measure the angle of knee flexion. Three readings were performed and an average of three was taken as the final reading. [7-9]

The Group A were treated with passive hamstring stretching of 3 sets of 30secs for consecutive 3 days. The Group B were treated with passive hamstring stretching of 3sets of 30 secs for consecutive 3 days as well, along with that the subjects were asked to roll a golf ball under their right leg in standing position, from the sole of the foot from behind the metatarsal heads to the heel concentrating on the medial arch for 2 minutes, pressure as they could, pushing into discomfort but not pain, [10] moving it to and fro.

Pre and post-test measurements of right hamstring muscle flexibility with active knee extension test was taken on and after three days of intervention for both the groups.

Fig. 1 Ball start position

Fig.2 Ball end position

STATISTIAL ANALYSIS

The statistics were done using SPSS (version 16.0). The distribution was

assessed using Shapiro-Wilk test and the data followed normal distribution. Hence parametric tests were used.

Differences were considered significant at an alpha level of 0.05. Independent t test were done within the groups and paired t test was done between the two groups. . Descriptive statistics were reported for reference, including means and standard deviation (Mean ± SD).

RESULTS

Table 1-Demographic data of subjects

SAMPLE SIZE	MEAN AGE (YEARS)	SD	VARIANCE
24	21.166	1.880	3.536

There was a significant effect in the pre-test for the control group from (12.7±3.1) to post- test (5.1±3.2) with a mean difference of (7.6±3.2) with p<0.001.

Table 2-Within group comparison

GROUP	Mean ± SD (PRE)	Mean ± SD (POST)	P VALUE
A	12.7 ±3.1	5.1±3.2	<0.001
B	14.9±4.5	4.5±4.3	<0.001

There was also a trend effect in the pre-test the experimental group from (14.9±4.5) to post-test (4.5±4.3) with a mean difference of (10.4±1.9) with p<0.001.

Table 3-Between group comparison

GROUP	Mean ± SD	P VALUE
A	5.1±3.2	0.17
B	4.5±4.3	0.71

DISCUSSION

Stretching has long been used as a method for improving range of motion measures. Static stretching is known to improve range of motion, but it can also have significant negative effects on neuromuscular performance. [11-13] In general, most stretching recommendations suggest stretching each muscle for 15-30s to achieve significant changes in range of motion. [14]

The roller-massager in form of golf ball was developed as a portable tool for Myofascial release and deep tissue massage, designed to target superficial and deep tissue mobilization while providing a massage-like experience. [1]

It is hypothesized that during the rolling, direct and sweeping pressure is exerted on the soft tissue causing the fascia to stretch and increase range of motion. [14]

Friction is also created during the rolling movement and this friction causes the fascia to increase in temperature and possibly change to a more fluid like state. This change in state allows for the breaking apart of fibrous adhesions between the different layers of the fascia and restores the soft tissue extensibility. [3]

Thera-Band claims that the roller-massager is used to “help increase blood flow and circulation in targeted areas, while also helping to increase muscle flexibility and joint range of motion. [2] The most prevalent finding of the present study was Hyong and Kang (2013) in a randomised control trial showed that passive hamstring stretching exercises along the superficial back line do have positive influence on cervical spine range of motion and balance. [15]

Kuruma H et al (2013) studied effects of myofascial release and stretching technique on range of motion and reaction time, concluded that Myofascial release (MFR), has been identified in increasing quadriceps and hamstrings range of motion [16] that the roller-massager increased the sit and reach test for hamstrings' flexibility 4.3% without any significant voluntary performance detriment. In addition, hamstrings' flexibility increased with just 10s of rolling. [2]

The experimental group who received roller massage showed significant increase in the active knee extension test than the control group who received passive stretching only. Hence it indicates that application of roller massager can give an additional enhancement to the flexibility. In the present study also the mobilization of plantar fascia proved to show significant changes in the flexibility of hamstrings muscles. Thus such tools can be used to

improve the length with other conventional techniques for better results.

The limitations of the study were firstly that it was conducted on a small sample group so further it can be done on larger sample size. The study can be done on athletic population.

CONCLUSION

This study concludes that use of plantar fascia mobilization in form of roller massager like golf ball can be used to enhance the hamstrings flexibility of young female adults along with other conventional techniques like passive stretching for better results.

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