

# EFFECT OF MOBILIZATION TECHNIQUE ON HAMSTRING FLEXIBILITY AMONG YOUNG HEALTH ADULTS - AN EXPERIMENTAL COMPARATIVE STUDY

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## Abstract

**Aim:** To compare the effect of Mulligan's traction straight leg raise (TSLR) and dynamic soft tissue mobilization technique (DSTM) on hamstring flexibility among the healthy young adults. **Methods:** Forty healthy young adults aged between 18 and 30 years were recruited by purposive sampling technique for the experimental study. They were allocated into two groups by block randomisation. Subjects in the group 1 received TSLR technique and group 2 was provided with DSTM. Passive SLR and Active Knee Extension was measured in pre and post intervention using standard 360° goniometer. Measurements are taken on 1<sup>st</sup> day (before and after intervention) and end of 3<sup>rd</sup> session. Each session was carried out every alternate day. Mean difference in both groups at the end of 3<sup>rd</sup> session were noted for analysis. **Data analysis:** Descriptive statistics were reported as mean (Standard deviation) and range. Friedman test and Kruskal-Wallis test were used to report significance difference within and between groups. For all the analysis, the significance level was set at  $P < 0.05$ . **Result:** Mean difference in Group 1 (TSLR), Passive SLR ROM is 28.25° and AKE ROM is 30.5° while in Group 2 (DYSM), Passive SLR is 20.45° and AKE ROM is 25.05° which are significant at difference at  $p < 0.001$ . **Conclusion:** TSLR group is more effective than DYSM group in increasing hamstring flexibility among healthy young adults.

**Keywords:** Adults; Block randomization; Flexibility; Hamstring; Straight leg raise; Soft tissue mobilization.

## INTRODUCTION

Ability of a muscle to lengthen by allowing one joint (or more than one joint in series) to move throughout its range of motion is termed as flexibility of muscle. Flexibility is an essential component of physical fitness, required for the normal biomechanical functioning of human body and is often evaluated from the joint range of motion (ROM).<sup>(1,2)</sup> Also plays an important role in the efficiency and effectiveness of human movement.<sup>(2,3)</sup>

The reduction in flexibility of muscle leads to muscle tightness which may result from sedentary lifestyle, inadequate or low levels of physical activity which leads to decrease in the ability of the muscle to deform, resulting in a decrease in the range of motion at the joint on which it acts.<sup>(4,5)</sup> A shortened muscle anatomically shows the reduced number of sarcomeres in series,<sup>(6,7)</sup> and physiologically demonstrates reduced muscle extensibility related to the contractility of the muscle cells.<sup>(2)</sup> The increased muscle tightness has a high incidence of lower extremity injury.<sup>(8)</sup> The loss of flexibility will limit the range of motion. This causes both biochemical changes in the musculo-tendinous unit (MTU) and mechanical factors in the underlying skeletal structure. Prolonged immobilization declines the collagen solubility and increased tropocollagen cross-linking results in reduction in tensile strength and the promotion of tendon rigidity. Hence the decline in flexibility can significantly impair an individual's ability to perform his daily activities.

One of the important muscle groups which encounter the problems of flexibility is the hamstrings. It consists of three large muscles, namely the semitendinosus, semimembranosus, and biceps femoris. They are originated from the ischial tuberosity and situated in the back of the hip, thigh and knee joints, they cause extension movement of the hip, flexion of the knee.<sup>(10)</sup> The hamstring muscle is a part of the superficial back line which is a continuity of fascia fabric from the bottom of the foot to the forehead. Therefore any of the structural involvement has a positive effect on the entire line itself.<sup>(9,11)</sup>

The tightened hamstring leads to increased susceptibility for the injury of the musculo-tendinous unit, increased resistance to various anatomical structures may cause overuse syndrome.<sup>(12)</sup> It also precipitates the patella tendinopathy and patellofemoral pain,<sup>(13,14)</sup> hamstring strain injury,<sup>(11)</sup> and symptoms of muscle damage following eccentric exercise.<sup>(15)</sup> Tight hamstring is also responsible for the postural and other back complications (posterior pelvic tilt), and in the case of long running it can possibly influence the sacroiliac and lumbar spine dysfunction by suppressing the lumbar lordosis.<sup>(16,17,18,19,20)</sup>

The hamstring tightness can be lessened by providing the adequate hip flexion either by actively or by passively. Leaning back over the bed with long sitting which is believed to lessen the likelihood of development of low back pain.<sup>(8)</sup> Traction straight leg raise (TSLR) described by Mulligan is said to improve straight leg raise (SLR) range effectively & decrease the extent of impairment by improving the muscle performance, flexibility of biceps femoris and pelvic rotation.<sup>(21)</sup> The factor limiting normal mobility of SLR may elicit the mechano-sensitive receptors of lumbar neural tissues, that means TSLR may suppress the mechano-receptor activity. As the rule goes with all Mulligan techniques, it is only indicated if it works and if it is 100% pain free (other than stretch). Pratihtha et al in their study concluded that TSLR Mulligan stretch is better than BLR Mulligan stretch in improving the biceps femoris muscle performance, flexibility and pelvic rotation.<sup>(22)</sup>

Dynamic soft tissue mobilization (DSTM) is a technique that combines with the delivery of manual treatment, such as joint and soft tissue positioning and movements (passive or active) involving concentric or eccentric muscle activity. Increasing the muscle length is a preliminary aim of DSTM and it includes the techniques of classical massage followed by a dynamic component, where the limb is moved throughout its range. Recent studies have proved that DSTM significantly increases the

hamstring flexibility.<sup>(23)</sup> It is also hypothesized that the DSTM may increase muscle perfusion and decrease muscle stiffness.<sup>(24)</sup> Present study is aimed to compare effects of Mulligan TSLR and DSTM Technique on Hamstring flexibility among healthy Adults.

## METHOD

The study was an experimental in nature done to know the effect of two treatment programs Mulligan TSLR and DSTM on Hamstring flexibility among healthy people who are divided in two different groups to know the effect of individual to treatment approach. Ethical approval for the study has been obtained from the university ethics committee (UEC) and the protocol has been approved by the institution research committee (IRC). The written consent was obtained from all participants prior to the initiation of study, followed by joint active and passive ROM was calculated. By means of purposive sampling we selected 40 healthy young adults who satisfies the including criteria such as

healthy adult with 18 to 30 years of age positive Active knee extension test and Passive Straight leg raise (SLR) of between 40° and 70.

Active knee Extension was measured in supine with flexion of hip and knee 90 degree. Non-measuring Lower extremity was secured with table by strap across the thigh and pelvis was stabilised by Another strap at the anterior superior spines of the ilia. A line drawn from fibular head to lateral malleolus becomes the longitudinal axis and Lateral joint line becomes fulcrum of goniometer. Instruct the patient to elevate leg slowly. The measurements were taken at the end of straightening with goniometer and recorded by the investigator.<sup>(25)</sup> Passive SLR range was measured pre and post intervention using standard 360° goniometer.<sup>(26)</sup> The subject was laying Supine at the edge of the couch with pelvis stabilized by a strap. The axis of goniometer was rest on the hip joint. The subject's right leg was slowly raised by Researcher with full knee extension and plantar flexion of ankle. Measurements were taken when the patient reports an uncomfortable stretch and an average calculated by repeating the procedure for 3 times.<sup>(27)</sup>



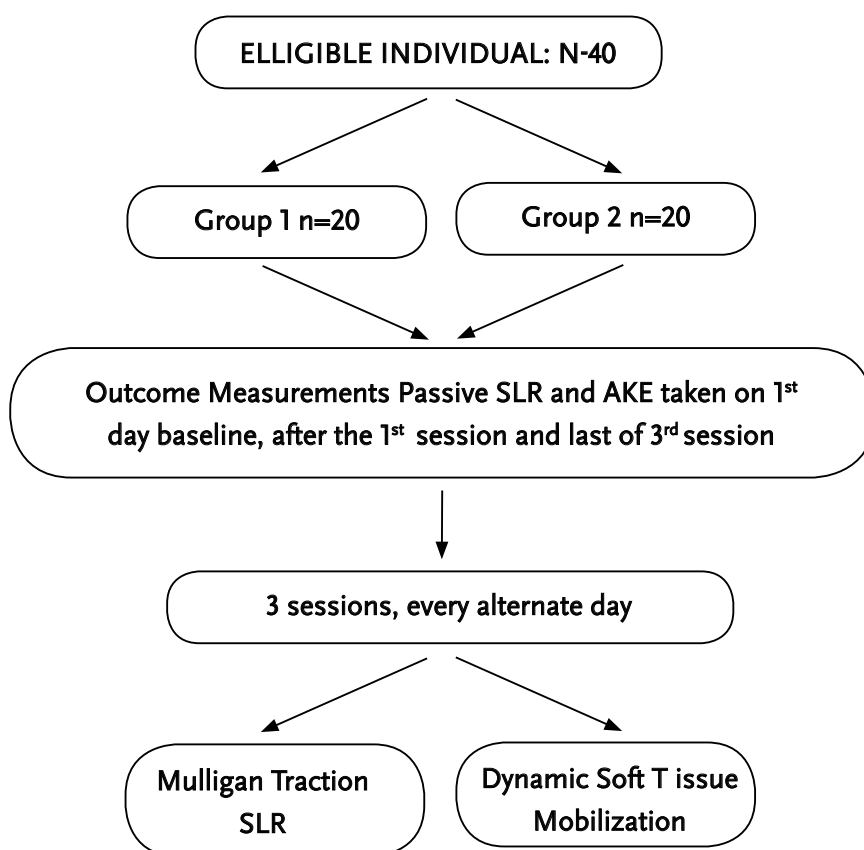
**Figure 1** - Therapist performing Traction straight leg raise (TSLR) technique

Followed by this total number of subjects were classified into two groups namely group 1 and group 2 by means of block randomisation. Subjects

in the group 1 received TSLR technique and group2 was provided with DSTM. TSLR was performed in supine lying on a very low bed or on the floor

and therapist stand facing patient's affected side. Technique involves sustained longitudinal traction by therapist to the lower limb with extended knee during pain free SLR as displayed in Figure 1. In case pain slightly rotate, abduct or adduct the hip while raising the leg.<sup>(28)</sup> Passive SLR and Active Knee Extension was measured pre and post intervention using standard 360° goniometer. Measurements are taken on 1<sup>st</sup> day (before and after intervention) and end of 3<sup>rd</sup> session. Each session was carried out every alternate day. The second group was provided with Dynamic Soft Tissue Mobilization

for hamstrings. Here subjects received the same classic massage in prone relaxed position for 5 min. a deep longitudinal strokes were applied to this entire muscle group to specify the area of hamstring muscle tightness was located (taut band or trigger point), then the subject was moved into a supine position with the hip and knee flexed to 90 treatment was limited to this target area for 3 min. The hamstring muscle group receives progressive dynamic techniques that work in synchrony as the muscle moves to the end ROM. Final technique eccentrically works at



**Figure 2** - Study flow chart

functional length of hamstring muscle and optimizes the flexibility. These specific changes occurred within an 8 min time frame.

## DATA ANALYSIS

Statistical Package for Social Sciences, version-20 (IBM® SPSS® v20) was used for the analysis

of data. Kolmogorov Smirnov Z test was used to establish the normality of the collected data and it was found that the data does not follow normal distribution; hence, we used non-parametric test. Descriptive statistics were reported as mean (Standard deviation) and range. Friedman test was used to check the overall effect of treatment order in the three times of measurements in each group and between the two groups by Kruskal-Wallis test.

For all the analysis, the significance level was set at  $P < 0.05$ .

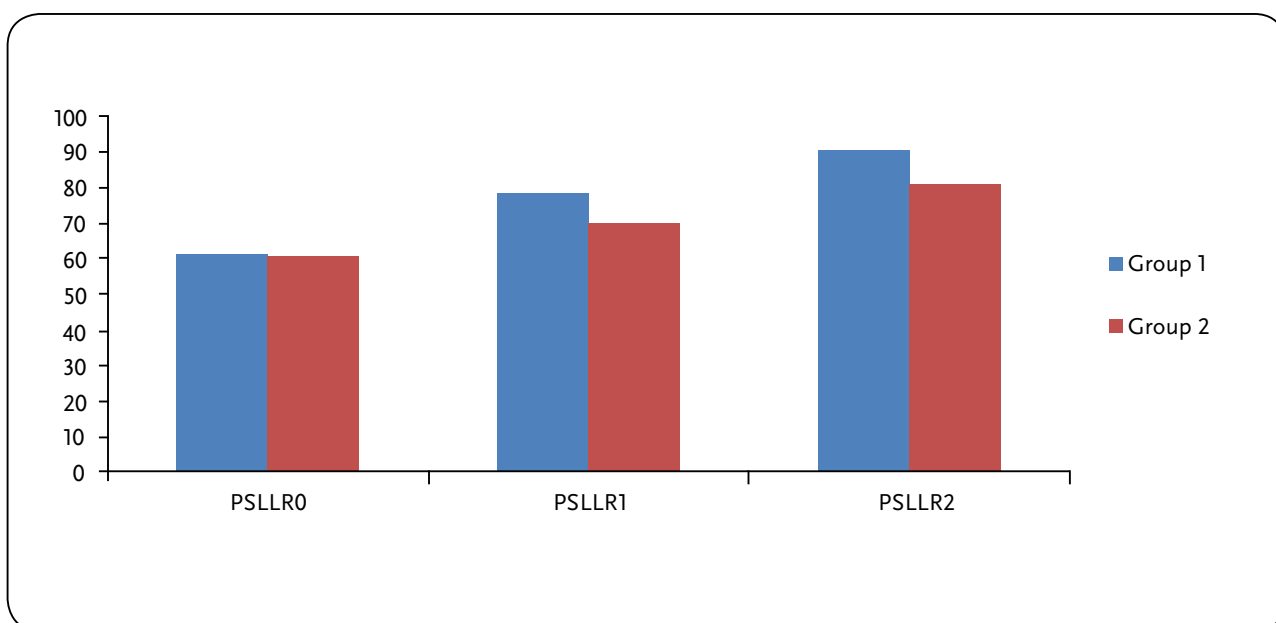
## RESULT

In present study 40 adults with hamstring tightness, mean age  $23.87 \pm 2.22$  years, height of  $166.55 \pm 7.62$  cm and weight of  $67.25 \pm 8.85$  kg were equally divided in two groups, group 1 (TSLR) and group 2 (DSTM) respectively. The demographic characteristic of the individuals recruited in both groups were displaced in table 1 and there were no significant

difference ( $p > 0.05$ ) between them. Trend in ROM changes were reported in Figure 2 and 3, of baseline, 1<sup>st</sup> day after treatment and 3<sup>rd</sup> day after treatment assessment in both the groups. There is no significant difference between group 1 and 2 in their baseline ROM. But further assessment at 1<sup>st</sup> day after treatment and 3<sup>rd</sup> day after treatment showed significant difference at  $p < 0.05$  from Friedman test. Figure 4 displayed between group differences in ROM. Group 1 showed significant improvement ( $p < 0.05$ ) in ROM when compared to group 2 from Kruskal-Wallis test.

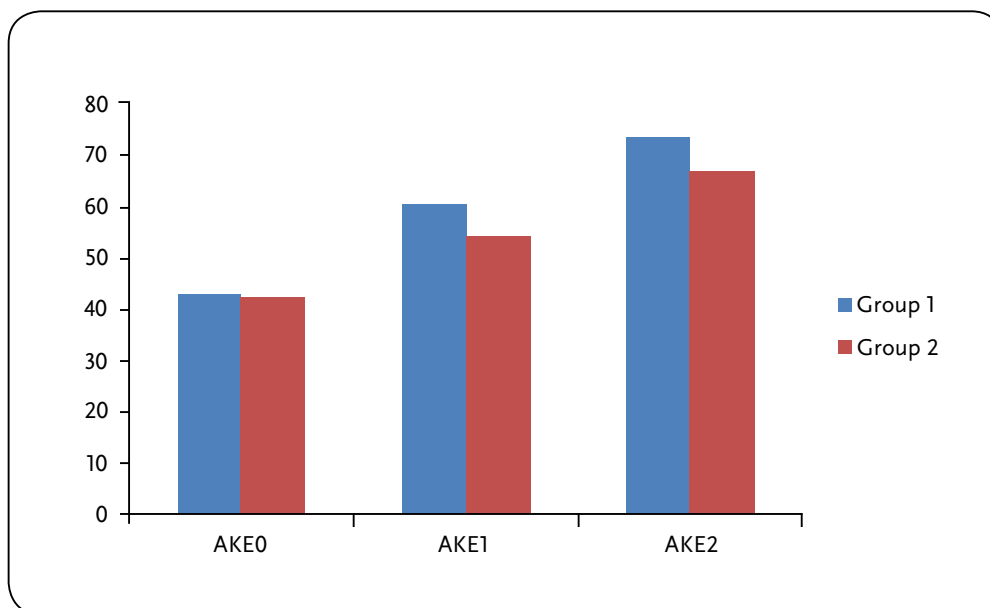
**Table 1** - Demographic characteristic of the subject allocated in group 1 and group 2

PARAMETER	GROUP 1	GROUP 2	P-VALUE
MALE : FEMALE	13 : 7	14 : 6	-
AGE (YEARS)	23.9 ffl 2.2 (19-29)	24.3 ffl 1.2 (18-30)	0.98
HEIGHT (CM)	166.6 ffl 7.6 (150-178)	163.8 ffl 9.2 (147-179)	0.92
WEIGHT (KG)	67.3 ffl 8.9 (42-80)	68.7 ffl 5.4 (41-82)	0.95



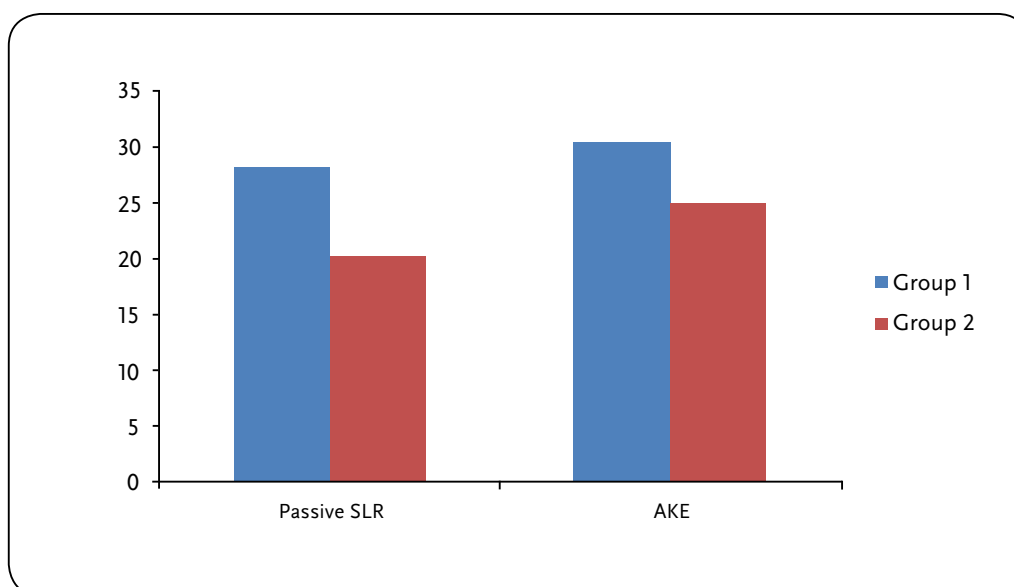
Abbreviations: SLR - Straight leg raise; ROM - Range of motion.

**Figure 3** - Mean Passive SLR ROM of Group 1 and group 2 motion in their baseline, 1<sup>st</sup> day after treatment and 3<sup>rd</sup> day after treatment



Abbreviations: AKE - Active Knee Extension; ROM - Range of motion.

**Figure 4** - Mean Active Knee Extension ROM of Group 1 and group 2 motion in their baseline, 1<sup>st</sup> day after treatment and 3<sup>rd</sup> day after treatment



Abbreviations: AKE - Active Knee Extension; SLR - Straight leg raise; ROM - Range of motion.

**Figure 5** - Mean difference of Passive SLR and AKE ROM on 3<sup>rd</sup> day after treatment between group 1 and group 2

## DISCUSSION

Flexibility is key components for injury prevention and rehabilitation, which promotes performance, lessen the post-exercise soreness, and also improves coordination.<sup>(29)</sup> As we know Hamstring flexibility leads to development of hamstring strain,<sup>(7)</sup> patella tendinopathy,<sup>(13)</sup> patella-femoral pain, low back pain with altered posture,<sup>(16)</sup> and symptoms of muscle damage following eccentric exercise.<sup>(15)</sup>

Flexibility can be achieved by many static and ballistic stretching as well as proprioceptive neuromuscular facilitation.<sup>(30)</sup> Also there are other new interventions like mulligan TSLR and DSTM gives a new way to facilitates flexibility. As there will be limited count of literatures that proves the effect of Mulligan TSLR on Hamstring tightness and its comparison with other stretching techniques. This makes us to compare the effectiveness of mulligan TSLR and DSTM in hamstring flexibility among the healthy adult individual.

Study Result demonstrates the significant improvement in hamstring flexibility in both groups. Group 1 with Mulligan TSLR Shows a mean increment in passive SLR ROM (28.25°) and AKE ROM (30.5°), whereas DSTM demonstrates improvement in Passive SLR (20.45°), AKE ROM is (25.05°) and reduces the tightness, taut band and trigger point in specific area of muscle.

Long-time effects of mulligan TSLR and DSTM in hamstring flexibility individual with larger sample size makes a future milestone for this study

## CONCLUSION

Mulligan TSLR and DSTM are effective in improving the hamstring muscle flexibility by increasing ROM significantly over the period of 1 week. But Mulligan TSLR found to be more beneficial than DSTM. Whereas DSTM reduces the tightness, taut band and trigger point in specific area of muscle.

## ACKNOWLEDGEMENTS

Special thanks to Dr. S Rajasekar, Principal, Srinivas College of Physiotherapy, Mangalore, Karnataka and Dr. Senthil P Kumar, Principal, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, Maharishi Markandeshwar University, Haryana for providing continuous support towards completion of the study.

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