



## Carryover effect of Mulligan Traction straight leg raise in individuals with hamstring tightness

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### ABSTRACT

The tightness of hamstring muscles is a major factor hindering performance in daily activities. The purpose of this study is to find out the immediate and carryover effect (24 hours) of Mulligan Traction straight leg raise in increasing range of motion and flexibility.

**Materials and Methodology:** 50 individuals with hamstring tightness fulfilling inclusion criteria were taken and given three repetitions of single intervention of the technique. Active knee extension test and Sit and reach test were used as outcome measure at pre intervention, immediately post intervention and 24 hours post intervention.

**RESULTS:** Mulligan Traction straight leg raise showed significant improvement in Active knee extension ( $P < 0.01$ ) and Sit and reach test ( $P < 0.001$ ) immediately and at 24 hours.

**Conclusion:** From this study it can be concluded that Mulligan traction straight leg raise technique is effective in maintaining or sustaining the stretch.

**KEYWORDS :** Hamstring tightness, Mulligan Traction Straight leg raise, carryover effect.

### INTRODUCTION

The term 'Hamstrings' comprises of a group of three separate muscles located in the posterior compartment of the thigh. It consists of - Biceps Femoris (which includes two components, a Long head and a Short head), Semitendinosus and Semimembranosus.<sup>1</sup>

Muscle tightness is caused by a diminished ability of the muscle to deform, which results in the reduction of the range of motion at the joint on which it acts.<sup>2,3,4</sup> The term has also been used to denote a slight to moderate reduction in muscle length; usually it happens that the movement in the direction of the elongating muscle is limited.<sup>2</sup> Tight hamstring muscles add to the patellofemoral compressive force because of the increased passive resistance during the swing phase of ambulation and running.<sup>2</sup>

Hamstrings are extensors of the hip and flexors of the knee.<sup>2,3</sup> This group performs a major role in the antero-posterior pelvic tilt, in some way affecting lumbar lordosis.<sup>4</sup> As a result, altered flexibility of the Hamstrings may create significant postural deviations and affect the functionality of the hip joint and lumbar spine.<sup>4</sup>

Flexibility is "the capacity of a muscle to lengthen, allowing one joint (or more than one joint in a series) to move throughout a range of motion."<sup>5</sup> Good muscle flexibility will allow muscle tissue to accommodate to forced stress more easily and allow efficient and effective movement.

Inadequate flexibility predisposes a person to several musculoskeletal overuse injuries and thus significantly affect a person's level of function.<sup>5</sup>

Tests for measuring hamstring muscle tightness reported in the literature are variations of the Straight Leg Raise (SLR) test.<sup>6,7</sup> These variations include

The passive bilateral SLR test<sup>8</sup>, passive toe-touch test<sup>9</sup>, active unilateral SLR test, and passive unilateral SLR test.<sup>10</sup>

All of these tests find out hamstring tightness by the angle of hip flexion with the knee extended.

Apart from being used to calculate hamstring tightness, the SLR tests are also widely used as neurological tests; hence they do not give valid measures of hamstring tightness because of pelvic

rotation that occurs during the tests. The Active Knee Extension Test (AKT) measures hamstring tightness by the angle obtained by knee flexion after a maximum active knee extension, with the hip stabilized at 90 degrees. The test-retest reliability coefficient for the AKT was reported to be 0.99 for both lower limbs and this has been accredited to the strict body stabilization method, the well-defined end point of motion and precise instrument placement of the test.<sup>11</sup>

Previous studies have defined hamstring tightness at different arbitrarily set levels of active extension lag. Some researchers have defined it as at least 15° loss of active knee extension while others have defined it as equivalent to or greater than 30° loss of active knee extension with the femur held at 90 degrees of hip flexion.<sup>9</sup>

A range of stretching activities has been presented in the literature in order to return to or maintain muscle flexibility and stay away from a decrease in range of motion (ROM) that can damage functional activities in an individual.

Some techniques used to increase flexibility in muscle include the ballistic stretch, the static stretch, and proprioceptive neuromuscular facilitation.

Brian Mulligan has developed a most ingenious and inventive compilation of manual techniques. Techniques are performed in symptom free or painfree range of motion a factor that possibly makes it, safer than many other manual therapy approaches.<sup>12</sup>

Mulligan has described various techniques such as Bent Leg Raise, Compression Straight Leg Raise and Traction Straight Leg Raise (TSLR), which is said to develop the range of straight leg raise (SLR) in patients.<sup>12</sup>

This process involves the therapist imparting traction to the leg during lifting the limb through a painfree range of SLR.

This study was carried out to compare the immediate and carryover (24 hours) Mulligan traction straight leg raise technique.

### METHOD:

This study with 50 normal individuals was conducted at Dr.D.Y.Patil College of Physiotherapy. Approval to carryout this study was obtained by ethical committee of Dr D Y Patil Vidyapeeth. All the participants read and signed an informed consent form and explanation of the study was done. Inclusion criteria for

participants are subjects with 20 degree active knee extension loss with hip in 90 degrees flexion. Age group is 20-35 years.

**PROCEDURE**

50 normal individuals of Dr. D. Y. Patil Vidyapeeth were included in the study. They were selected according to the inclusion and exclusion criteria Subjects were assessed for hamstring tightness using the Active Knee Extension test. Pre intervention, Immediate post intervention and 24 hours later the intervention data was collected of Active knee extension test and Sit and Reach test.

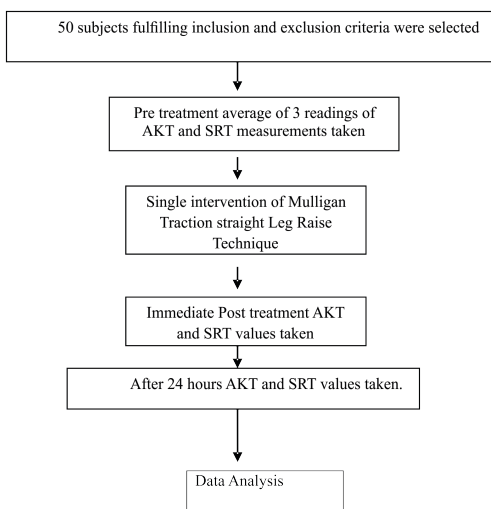
All the subjects received three repetitions of single intervention of Mulligan Traction straight leg raise. The subjects were supine lying on the floor. And the therapist stood on the side of right extremity. Therapist grasped the subject's lower leg and raised it off the bed. Elbow of the other hand was locked over the distal leg and hand that grasped the malleolus was held proximally. Therapist applied longitudinal traction along long axis of the leg. Traction was sustained and leg was raised as far as possible in pain free range. This position was held for 2s0 seconds and the traction was not relieved until the leg returned to starting position.

Active knee extension test and Sit and reach test were performed before the intervention, immediately after and 24 hours of the intervention

**OUTCOME MEASURE:**

Active Knee extension Test (AKT) and Sit and Reach Test (SRT) were used as outcome measures. **Active Knee extension test:** The subjects were placed in supine position with hips flexed 90° and knee flexed. The testing was done on the right lower extremity. The subjects were then asked to extend the right lower extremity as much as possible until a mild stretch was felt. Three repetitions were performed and an average was taken as a final reading of the angle.

**Sit and Reach test:** The subjects were asked to sit on the floor with legs stretched ahead. The soles of the feet were placed flat on the box. Both knees were locked and pressed on the floor. With the palms facing downwards and placed over each other, The subjects held that position for one or two seconds and the measurements were recorded. Three repetitions were performed and an average was taken as a final reading.

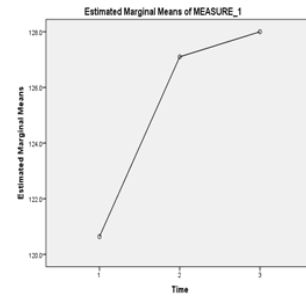


**STATISTICAL ANALYSIS**

Dependent variables include Active knee Extension Test (AKT), and Sit and Reach Test (SRT). Data was obtained and analysis for pre and immediate post was done using paired T test and Repeated measures ANOVA was used for pre treatment, immediate post and post 24 hours comparison with SPSS software

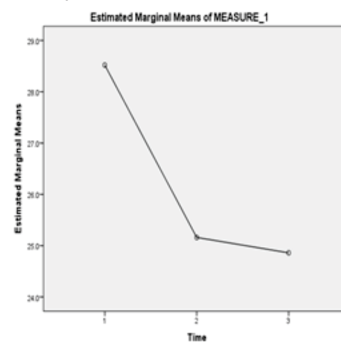
**GRAPH 1:** Linear diagram representing AKT values at pre,

immediate post and post 24 hours of intervention.



Above graph shows that AKT range immediately post treatment increased from 120.64° to 127.10° that is 6.46° and after 24 hours, the AKT range from 127.10° was 128.00 that is a further increase of 0.9°.

**GRAPH 2:** Linear diagram representing SRT values at pre, immediate post and post 24 hours of intervention.



The above graph represents SRT values which decreased immediate post intervention from 28.52cm to 25.16 that is 3.36. whereas after 24 hours, the SRT values were sustained and further decreased from 25.16cm to 24.86cm that is 0.3cm.

**DISCUSSION**

This study was done to assess the immediate and sustained (24 hours) effect of Mulligan traction straight leg raise using Active knee extension test and Sit and reach test. 50 subjects were selected. Significant differences were seen in the values immediately and after 24 hours of intervention.

The study shows that, Mulligan traction straight leg raise is effective in sustaining its effect 24 hours later.

Our results also supports the study done by Pratisha et al who found out that Mulligan traction straight leg raise increases Biceps femoris muscle performance, flexibility, pelvic rotation and decreases EMG activity.

The increase in range and the maintenance of the increased range maybe due to the fact that during traction Straight leg raise stretch, an inhibitory response is exerted by various receptors on lower limb alpha motor neuron activity. Various segmental reflex pathways get initiated by golgi tendon organs around knee, hip and spine during traction of the limb. Similarly golgi tendon organs are activated, during large amplitude stretching movements such as Traction Straight leg raise. Hence traction straight leg raise shows improvement in the active knee extension range and this might be directly related to inhibition of hamstring muscles than the change due to stress tolerance.

**CONCLUSION**

From this study, it can be concluded that a single intervention of Mulligan Traction straight leg raise technique is effective in improving Active knee extension angle and Sit and Reach flexibility

measurements. Infact ,it has shown improvements in sustaining and maintaining the increased ROM and hamstring flexibility even after 24 hours in normal individuals.

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