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**ORIGINAL ARTICLE**

# Effects of Mulligan's Bent Leg Raise Technique on Hamstring Flexibility and Lumbar Spine Mobility in Healthy Females

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## ABSTRACT

**Objective:** To assess the effects of Mulligan's bent leg raise technique on hamstring flexibility and lumbar spine mobility in healthy females.

**Methodology:** A randomized controlled trial with ClinicalTrials.gov ID: NCT04716205 was conducted. The 48 participants were split into two groups. Mulligan's bent leg raise (BLR) technique and static stretching were given to the experimental group, while only static stretching was given to the control group. The outcome variables were modified Schober's (MST) and active knee extension tests (AKET). The assessment was completed at the outset, and post-treatment values were obtained after the first and second weeks of therapy.

**Results:** Mean value of MST in the Control group pre-treatment was 3.27±0.33 and 4.11±0.37 at 1st-week post-treatment and 4.81±0.32 at the 2nd-week post-treatment, which was less significant than the experimental group. The findings revealed that the experimental group had significantly higher mean values for both the active knee extension test and the modified Schober's test than did the control group.

**Conclusion:** This research concluded that Mulligan's bent leg raise technique combined with static stretching is more effective than static stretching alone in treating hamstring flexibility and spinal mobility.

**Keywords:** Hamstring tightness, Mulligan BLR, Static stretching, flexibility

## INTRODUCTION

Muscular flexibility is a key component of healthy human body working, supporting a person's abilities and motor capacity. Physical fitness must include flexibility because it is a key component of being able to move easily and securely (1). Contrarily, tightness is an adaptive reduction of the muscle's contractile and non-contractile components (2). All body muscles must be flexible for a person to carry out typical functions, but the hamstring muscles' flexibility is particularly notable. Even under typical conditions, the hamstrings, which are bi-articular postural muscles, have a tendency to be short (3).

Pelvic posture, which is under high or mild tension, affects hamstring flexibility (4). So, extensibility of the back of thigh muscles is crucial for sustaining the full arc joint motion, the activity of the locomotors system and uniformity of postural balance of lower back and upper thigh muscles that are provided by hamstrings muscles to maintain forceful movement in anteroposterior planes (adduction and abduction) (5). Many physiotherapy techniques, such as various electrical agents and manual therapy treatments, are available to treat hamstring tightness. Manual techniques included positional release techniques, stretching techniques, myofascial release techniques, and muscle energy techniques. One of the newer treatment techniques recently developed to manage hamstring flexibility is Mulligan's BLR technique. BLR technique is a painless stretching technique that could be effective if utilized to deal with hamstring tightness with limited Straight Leg Raise (SLR) and restricted spinal mobility (6, 7).

Previous studies were conducted using different techniques and modalities to improve hamstring flexibility, but there was limited literature found comparing Mulligan's newer technique BLR with static stretching. Previous literature exists on the effects of Mulligan's BLR techniques in contrast with Mulligan's TSR technique, Post isometric relaxation PNF techniques or METs Myofascial release techniques, and agonist contraction method. This current study aimed to prove the effects of Mulligan's bent leg raise technique with static stretching versus static stretching alone on hamstring flexibility and spinal mobility and determine which is markedly effective in improving hamstring flexibility and spinal mobility.

## METHODOLOGY

This was a randomized controlled trial registered with ClinicalTrials.gov ID: NCT04716205. The study was conducted at King's Rehab center, king's college of Health Sciences, Bahawalpur, within six months after the approval of the synopsis from the Research Ethical committee REC/RCRS/20/1042. The approach of convenience sampling was used to identify potential participants. Healthy females with normal BMI (Body Mass Index), age ranging from 18-24 years, having positive hip active knee extension test (hamstring muscle tightness 90-90) were included in the study, while patients with any infectious or traumatic condition, neurological symptoms, knee and hip joint related deformities and pathologies, participants performing stretching or regular exercise were excluded from the study. Written informed consent was taken from the patients to be part of this study.

The sample size was 44, calculated by the online EPITOOL sample size calculator (1). After adding a 10% Attrition rate, a sample size of 48 was calculated. Participants were randomly allocated to groups A and B. Each participant was asked to pick a card from the box containing 48 cards, 24 labeled with the number one and 24 marked with the number two. Participants who drew a card with the number one were assigned to group A, while those who received a card with the number two were assigned to group B as shown in Figure I. It was single-blind research in which the assessor was unaware of the treatment group. Group A was an experimental group and treated with Mulligan's BLR with static stretching, while group B was the control group and treated with Static stretching only. Outcome measuring tools were the active knee extension test (AKET) and modified Schober's Test (MST).

At the beginning of therapy, baseline measurements of the lumbar spine and hamstring flexibility were obtained. For two weeks, the intervention was administered five days a week. After the fifth session, post-intervention measurements were collected, and then at the conclusion of the tenth session.

The SPSS 25 version was used to evaluate the data. The Shapiro-Wilk test was used to assess normality. Since the data was normal and the test's significance level was greater than 0.05, parametric analysis tests were used. Repeated measure ANOVA was used to identify variations between pre-and post-treatment values within the same groups. To identify differences between the groups under study, Mixed Model ANOVA was used.

## RESULTS

This research included a total of 44 participants. In the experimental group mean age of participants was 21.63±1.73. The mean age of participants in the control group was 21.14±2.21. The mean BMI in the experimental group was 20.85±1.31 kg/m². The mean BMI of participants in the control group was 20.44±0.83 kg/m². In the experimental group, 10 participants were involved with the right side of the leg and 12 with the left side. 9 participants in the control group had leg involvement on the right side and 13 had leg involvement on the left side. Table I showed that the mean value of pre-treatment AKET was 46.31 ±3.45 and 57.59 ±3.09 in 1st week post-treatment and 69.77 ±1.54 in the 2nd week post-treatment in the Experimental group.

Table I: Within-group comparison of AKET (Repeated Measure ANOVA)

| | Group A mean ±SD | | Group B mean ±SD | |
|---|---|---|---|---|
| Pre-treatment AKET | 46.31 ±3.45 | | 45.63 ±3.71 | |
| Post-treatment I AKET (week-I) | 57.59 ±3.09 | | 49.22 ±3.17 | |
| Post-treatment II AKET ( week-2) | 69.77 ±1.54 | | 52.72 ±2.52 | |
| | Mean (I-J) Difference | P value | Mean (I-J) Difference | P value |
| Pre-treatment AKET - Post-treatment 1 AKET (week-I) | 11.28 | <0.05 | 3.59 | <0.05 |
| Post-treatment 1 AKET (week- I) - Post-treatment II AKET (week-2) | 12.18 | <0.05 | 3.50 | <0.05 |
| Post-treatment II AKET (week- 2) - Pre-treatment AKET | 23.46 | <0.05 | 7.09 | <0.05 |

Table II: Across the group comparison of AKET (Mixed Model ANOVA)

| | Mean | Standard Error |
|---|---|---|
| Pre-treatment AKET | 45.97 | 0.50 |
| Post-treatment I AKET (week-I ) | 53.40 | 0.44 |
| Post-treatment II AKET (week-2) | 61.25 | 0.31 |
| | Mean (I-J) Diff | P value |
| Pre-treatment AKET - Post-treatment I AKET (week-I) | 7.43 | <0.05 |
| Post-treatment I AKET (week-I) – Post-treatment II AKET (week-2) | 7.85 | <0.05 |
| Post-treatment II AKET (week-2) - Pre-treatment AKET | 15.28 | <0.05 |

Table III: Within group comparison of MST (Repeated Measure ANOVA)

| | Group A mean difference | | Group B mean difference | |
|---|---|---|---|---|
| Pre-treatment MST | 3.36 ±0.44 | | 3.27 ±0.33 | |
| Post-treatment I MST (week-1) | 4.84 ±0.23 | | 4.11 ±0.37 | |
| Post-treatment II MST (week-2) | 5.84 ±0.41 | | 4.81 ±0.32 | |
| | Mean (I-J) Diff | P value | Mean (I-J) Diff | P value |
| Pre-treatment MST- Post-treatment I MST (week-1) | 1.48 | <0.05 | 0.84 | <0.05 |
| Post-treatment I MST (week-1)- Post-treatment II MST (week-2) | 1.00 | <0.05 | 0.70 | <0.05 |
| Post-treatment II MST (week-1)- Pre-treatment MST | 2.48 | <0.05 | 1.54 | <0.05 |

Table IV: Across the group comparison of MST (Mixed Model ANOVA)

| | Mean | Standard Error |
|---|---|---|
| Pre-treatment MST | 3.31 | 0.05 |
| Post-treatment I MST (week-1) | 4.47 | 0.04 |
| Post-treatment II MST (week-2) | 5.33 | 0.05 |
| | Mean (I-J) Diff | P value |
| Pre-treatment MST - Post-treatment 1 AKET (week-1) | 1.16 | <0.01 |
| Post-treatment 1 MST (week-1) – Post-treatment II MST (week-2) | 0.86 | <0.01 |
| Post-treatment II MST (week-2) - Pre-treatment MST | 2.02 | <0.01 |

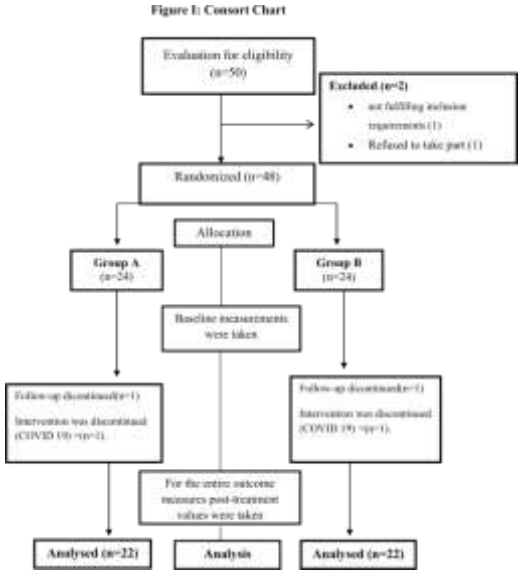


Figure I: Consort Chart

The results revealed that the mean value of AKET in the control group pre-treatment was 45.63 ±3.71 and 49.22 ±3.17 in 1st week post-treatment and 52.72 ±2.52 in the 2nd week post-treatment, which was less evident than the experimental group. There was a significant Mean (I-J) Difference between pre-treatment and post-treatment in the experimental group in the 1st week and 2nd week. Less than 0.05 was the p-value. Since the p-value for the control group was less than 0.05, the mean (I-J) differential was less significant. Across the group comparison of AKET (Mixed Model ANOVA) is presented in table II. Table III indicated that within-group comparison of the mean value of MST pre-treatment was 3.36 ±0.44 and 4.84 ±0.23 at 1st week post-treatment and 5.84 ±0.41at 2nd week post-treatment in the experimental group. P value was less than 0.05, which was significant and showed that BLR with static stretching enhanced the spinal ROM by improving hamstring flexibility. In comparison to the study group, the mean value of MST in the control group was less pronounced. Table IV depicts the Mean difference of MST using mixed model ANOVA across the group comparison was 45.97 at Pre-treatment, 53.40 at 1st week and 61.25 2nd weeks post-treatment.

## DISCUSSION

Muscular flexibility is one of the key physical fitness units to maintaining optimal physical activities or move smoothly. Primarily,

hamstring flexibility is also associated with a healthy lower back. The Mulligan bent leg raise approach is one of the cutting-edge methods used today to increase the range of straight leg raise in individuals with hamstring tightness. It has previously been observed that this method works better than the majority of manual techniques. A study by Rajal B. Sukhiyaji et al. (2019) aimed to determine the six weeks of plyometric training and BLR stretching and strength training in basketball players. This study concluded that six weeks of plyometric training and Mulligan's bent leg raise stretching and strength training were equally effective in improving vertical jump height and agility in basketball players (8).

Another technique used to increase flexibility is static stretching. Its efficacy has been documented in the literature, as demonstrated by a prior investigation into the impact of static stretching on hamstring flexibility in healthy young adults. Results proved that static stretching significantly improved hamstring flexibility (9). In order to evaluate the short-term effects of neurodynamic and static stretching techniques in healthy male subjects, Adel Rashad Ahmed et al. performed an RCT in 2016.The results of neurodynamic stretching were better and more significant in revealing hamstring tightness in healthy males than static stretching (10). All of these research studies revealed that hamstring muscle-tendon stiffness decreases regardless of duration and suggested that static stretching effectively improves the strength and flexibility of the hamstrings.

Muhammad reza pourahmadi et al 2018's systemic review also examined the effectiveness of mobilization with movement (MWM) for treating low back pain; the findings of this research did not provide a clear, conclusive answer, but they did show that Mulligan's methods have moderate to short-term therapeutic effects on pain relief and an improvement in low back pain-related disability (11). The current study's findings overwhelmingly favor using Mulligan's bent leg raise technique over static stretching alone. In order to improve hamstring flexibility and lumbar spine mobility, the current research found that Mulligan's BLR technique was superior to straight traction leg raises and static stretching (12). The Modified Schober's test's functional outcome score—which actually indicates increased spinal mobility—and hamstring flexibility were both improved by using BLR in combination with static stretching.

Another previous study was conducted by kanza Masood et al. (2020) to determine the effect of dynamic oscillatory stretch versus static stretching in asymptomatic hamstring tightness to improve hamstring extensibility in healthy individuals (13) while in the current study along with static stretching technique Mulligan's Bent leg raise technique was used which proved to be more beneficial to improve the flexibility of hamstrings and lumbar spine in healthy females.

## CONCLUSION

This research concluded that Mulligan's bent leg raise technique combined with static stretching is more effective than static stretching alone in treating hamstring flexibility and spinal mobility.

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