

**COMPARING THE EFFECTS OF MULLIGAN'S TRACTION STRAIGHT LEG RAISE AND  
BENT LEG RAISE TECHNIQUE ON HAMSTRING FLEXIBILITY AMONG THE HEALTHY  
YOUNG FEMALE STUDENTS**

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**ABSTRACT:**

**BACKGROUND:** Most important reason of pain in lower back region and legs in healthy females are tight hamstrings. Hamstrings muscles are large fast-twitch muscles present on back of thighs and a large number of individuals have tight hamstrings occur just because of prolonged sitting time or due to poor posture. For its cure different stretching techniques are used but according to researches only 10 to 15% of possible maximum length will be improved by stretching.

**AIM OF STUDY:** The aim of this study was to compare the effects of Mulligan's traction straight leg raise and bent leg raise technique on hamstring flexibility among the healthy young females.

**Hypothesis:**

**Any one of Null hypothesis:** Both treatments are equally effective. The treatment was more effective than the other in management of pain, function and quality of life in healthy females with tight hamstrings.

**Methodology:** This RCT was carried out in the setting of women Institute of Rehabilitation Sciences. Included 40 subjects were recruited, through toss & trial method, screened per inclusion criteria and divided into two groups A and B. Data was collected by self-designed questionnaire and ranges were measured through goniometer and measuring tape. Group A received straight leg raise (TSLR) & group B received traction bent leg raise (TBLR). Warm up exercises were performed prior to techniques for 10 minutes and then (TSLR) was applied to group A and (BLR) was applied to group B.

**RESULT:** In this research subject with minimum age 21 and maximum age 24 with the mean value and standard deviation of variable age was 22.95 and 0.846. After checking data normality by using Mann-Whitney U test for comparison between groups and revealed that mean and standard deviation of post treatment of variable active SLR of right leg of group A was 78.30±10.27 and left leg was 80.95±9.48 and for group B Right leg was 89.25±12.59 while left leg was 88.55±17.10 and its p-value is greater than 0.05 that is 0.09 which shows that Group B (TBLR) showed significantly improved hamstring flexibility and independent sample T test for variable sit and reach test revealed, after treatment mean and standard deviation of pretreatment and post treatment for group A was 11.68±5.067 and 9.57±5.22 and its mean difference was 2.11±0.16. Mean and standard deviation of pretreatment and post treatment for group B was 12.33±4.985 and 10.08±5.645 and its mean difference was 2.25±0.66 and its p-value 0.751 that is greater than 0.05. These values show that both techniques traction straight leg raise (TSLR) and traction bent leg raise (TBLR) were equally effective statistically as well as clinically in improving Hamstring Flexibility.

**CONCLUSION:** In conclusion, this study of Comparison of the effects of Mulligan's traction straight leg raise and bent leg raise technique on hamstring flexibility among the healthy young females confirmed that both treatments are statistically as well as clinically equally effective for decreasing hamstring tightness or improving Hamstring Flexibility. Patients can take benefit from (TBLR and TSLR) treatment and can improve range of motion (ROM) of hamstrings, can improve flexibility of these muscles, can reduce back pain due to radiculopathy and can improve their activity of daily living (ADLs).

**KEY WORDS:** Straight leg raise, bent leg raise, range of motion, activity of daily living.

**1:INTRODUCTION:**

Inability to extend the knee completely when the hip is flexed accompanied by discomfort or pain along the posterior thigh and/or knee is usually attributed to hamstring muscle tightness”(1)Knee Extension Angle (KEA) is defined as degree of knee flexion from end point of knee extension and according to this tight hamstrings is explained as this is greater than 20 degrees of normal value .(2)Hamstring tightness is also considered if person is unable to gain knee extension greater than 160 with 90 degree flexion of hip(3).Hamstring tightness is defined as a person unable to extend knee greater than 160 degree with hip flexed to 90 degree. Hamstring tightness shows high prevalence and incidence in normal population of today society because of limited activity and sedentary life style. Hamstring tightness usually occur at the age between 4 and 7 years, due to children spend prolong seating posture at school timings(6). Some scholars defined hamstring tightness as unable to perform knee extension greater than 15 degree (4). It is resulted by researchers that 75% males and 35% females’children of age ten years showed reduced flexibility of hamstrings. Different researches shows, that hundred and thousands of healthy patients suffered with back pain due to tight hamstrings, it is result of prolong sitting time, sedentary life style or wrong posture.(8)The complaint of muscle tightness also present in childhood which progress with age.The progressively increasing hamstring tightness with age has been examined due to following factors in healthy patients:

1. decrease in elasticity
2. range of motion
3. decreased level of physical activities(9).

“Muscle shortness” and “muscle stiffness” is defined as decrease in flexibility of muscle and it is anatomical cause of muscle tightness (13).A short muscle is defined as musculotendinous unit that has decrease ability to elongate because decrease in the number of sarcomeres in series’(14), or short muscle is also defined as a decrease in the length or elasticity of the connective tissues e.g. scar tissue.Physiological reason of decreased in flexibility of muscle deals with ability of muscle cells to contract. Due to the working of alpha motor neuron which increase force necessary to lengthen muscle can also cause tightness in muscles(15).Nerve irritation: Irritation of the nerves that controls the activity of hamstring muscles can cause tightness it occurs if nerve irritation is due to trauma or any congenital diseases. Dehydration: When subject is in habit to drink insufficient water, then it may cause tightness when exercises is performed in dehydrated condition, due to shifts in electrolytes and it may result muscle tightness of involved muscles. In physical examination, diagnosis can be made on basis of pain location and intensity, swelling and tightness in posterior aspect of thigh.Different tests are performed to diagnose any muscle, ligament or tendon pathologies by moving leg in different positions according to the test guidelines.Hamstring muscle length is measured by measuring angles of unilateral hip flexion with the knee extended.

**90–90 Straight Leg Raising Test:** In this test patient lies supine with 90° flexion of hips and knees after this he grasp his both thighs for stabilization of hip joint and then extends each knee, if he is unable to extend the knee within 20°, it represents positive test for tight hamstrings.

**Ely's Test:** In this test patient lies in prone position with knees in extended position after this therapist passively flexes the patients’ knee, if the hip of same side passively flexes along knee then it is positive sign for tight Rectus femoris muscle.

- Rest: Most hamstring tightness will resolve with rest, allowing the muscles to restore its anatomy.
- Stretching: stretching of the muscles can help to speed up muscle recovery. Example for hamstring stretching exercise at home is to touch your toes while keeping your legs straight.
- Massage: Massage and rolling of the muscles can help relieve hamstring tightness
- Ice or Heat: Ice packs or heat pads can help reduce hamstring tightness by relaxing the muscles.
- Medications: Tylenol or NSAIDS is used to reduce pain and discomfort of hamstring tightness.
- Hydration: Dehydration after exercise can lead to muscle cramping and tightness. So, it should be overcome by drinking sufficient water.
- Physical Therapy: The most common professional treatment for hamstring tightness is physical therapy, which involves stretches and exercises to work the muscles back into shape.
- Imaging: Imaging is rarely required for tightness but may be used to evaluate for muscle strain in the case of severe sudden-onset pain and tightness.
- IV Fluids: Intravenous fluids or electrolyte solutions may be used in the case of tightness caused by dehydration.
- Medication: Muscle relaxants can be prescribed for severe or chronic muscle spasm.
- You should seek help without delay if you have:

- Extreme difficulty or inability to walk
- Sudden-onset and severe hamstring pain during exercise
- Stretching of quadriceps muscles.
- Stretching of hamstrings by supine lying.
- For low back muscles pelvic tilt exercises.
- Strengthening of hamstring muscles with leg curls.
- Strengthening of core muscles.
- Cardio exercises for example climbing and swimming
- Ice should be applied after exercise for 20 minutes.
- Massage therapy.
- Physical therapy .(27)

**Hypothesis:**

- Any one of Null hypothesis: Both treatments are equally effective.
- the treatment was more effective than the other in management of pain, function and quality of life in healthy females with tight hamstrings

**Aims and Objective:**

- The purpose of this research is:
- Compare the effects of Mulligan's traction straight leg raise and bent Leg raise technique on hamstring flexibility among the healthy young females.

**II. Materials and methods**

Interventional study was conducted. Setting of this study was Women Institute of rehabilitation Sciences, Abbottabad. Duration of this study was six months. Data was collected within One week with 3 sessions of 3 sets of ten Repetitions. Sample size was 40 individuals (20 in each group) Simple random sampling. Randomization was through non toss and trial Method. The inclusion criteria for this study Healthy females with age limit of 20 to 30 years. The exclusion criteria for this study is patients suffering with tumors, pregnant females, male gender, females with six months previous surgical history, unconscious patients, subjects with mental disorder and subjects above 20 and below 30. Data source was WIRS Medical College Abbottabad. Healthy females of fourth and final year of DPT department of WIRS Abbottabad. Questionnaire was used, Goniometer was used for ROM. Data was entered and checked by SPSS 20.0. It is interventional study design, in this study 40 subjects were selected and randomly allocated into two groups A(TSLR) and B (BLR). Setting for this study was fourth and final year DPT of WIRS medical college Abbottabad and this study will be carried out for one week with 3 sessions in a week.

**Group A Straight leg raise traction technique:**

**Pre-physiotherapy session:** warm up exercises for 10 mints.

**Mulligan traction technique:** 3 sets of 10 repetitions.

**Group B Bent leg raise traction technique:**

**Pre-physiotherapy session:** warm up exercises for 10 mints.

**Mulligan traction technique:** 3 sets of 10 repetitions.

**Straight leg raise traction technique:** In this method patient lie supine and therapist guide him to perform active straight leg raise after taking range of motion of hip flexion ,patient holds persons leg from ankle region and raise that leg from bed by producing hip flexion after reaching a pain free range sustained traction applied to the limb with the knee extended. The therapist while performing this should bent knee before than extend knee till point reaches where pain begins, at this point traction is applied.Mention this state and take a straight leg raise as far as it will go produces no pain. If pain occurs than slightlyrotate, adduct or abduct the hip while raising the leg. Perform it three times in pain free state.

**Bent leg raise traction technique:** The procedure for performing BLR is, the subject is lying supine with the therapist in stance position laterally to the leg on which stretching technique has been applied. In this technique patients' leg is in 90 by 90 position on knee and hip and therapist hold leg on shoulder by positioning popliteal fossa. Now hold the leg from thigh and traction is applied till pain freerange, maintain this traction for 5 to seconds and then relax that leg for next session. After this again this technique is repeated with more hip flexion. It should be pain free, if occur then move leg medially or laterally to overcome it. pain free range three sessions has been taken with ten repetitions each.

**III Results:**

Normality curve of sit and reach test before treatment. Its p-value was 0.05 so both parametric and non-parametricities can be applied. Normality curve of sit and reach test after 3 sessions in this graph mean value and standard deviation is 9.81 and 5.34. As its p-value was 0.05 so due to this parametric test was applied.

Variable	Pre treatment Mean±SD	Post Treatment Mean±SD	Mean difference	p-Value
Active SLR of right leg	67.50±11.745	78.30±10.27	10.80±1.47	< 0.00
Active SLR of left leg	71.80±11.3	80.95±9.48	9.15±1.9	
Passive SLR of left leg	75.20±12.09	85.50±9.316	10.30±2.78	

Table 1: Wilcoxon Signed Rank Test with in group Analysis group A

Table#1 Wilcoxon Signed Rank Test with in group Analysis group A: Table 1 shows Wilcoxon Signed rank test with in group A. In this variable were active SLR of right leg, active SLR of left leg and passive SLR of left leg. Mean and standard deviation of pretreatment and posttreatment of variable active SLR of right leg was 67.50±11.745 and 78.30±10.27 and its mean difference was 10.80±1.47, mean and standard deviation of pretreatment and posttreatment of variable active SLR of left leg was 71.80±11.3 and 80.95±9.48 and its mean difference was 9.15±1.9 and mean and standard deviation of pretreatment and post treatment of variable passive SLR of left leg was 75.20±12.09 and 85.50±9.316 and its mean difference was 10.30±2.78. According to p-value of this table that is <0.00 which is less than 0.05 it shows that my hypothesis that bent leg raise traction is more effective than straight leg raise traction is correct. Table#2 Wilcoxon Signed Rank Test with in group Analysis group B: Wilcoxon Signed rank test with in group B. In these variables were active SLR of right leg, active SLR of left leg and passive SLR of left leg. Mean and standard deviation of pretreatment and post treatment of variable active SLR of right leg was 73.00±13.318 and 89.25±12.25 and its mean difference was 16.25±0.72, mean and standard deviation of pretreatment and post treatment of variable active SLR of left leg was 73.00±14.7 and 88.55±17.108 and its mean difference was 15.55±2.408 and mean and standard deviation of pretreatment and post treatment of variable passive SLR of left leg was 76.30±15.39 and 94.05±18.18 and its mean difference was 17.75±2.79. According to p-value of this table that is <0.00 which is less than 0.05 it shows that my hypothesis that bent leg raise traction(TBLR) is more effective than straight leg raise traction(TSLR) is correct.

Variable	Pre treatment Mean±SD	Post Treatment Mean±SD	Mean difference	p-value
Active SLR of right leg	73.00±13.318	89.25±12.59	16.25±0.72	<0.00
Active SLR of left leg	73.00±14.7	88.55±17.108	15.55±2.408	
Passive SLR of left leg	76.30±15.39	94.05±18.18	17.75±2.79	

Table#2 Wilcoxon Signed Rank Test with in group Analysis group B

Mann Whitney test between group A and B was applied at base line values, in this variables active SLR of right and left leg before treatment was considered. After applying test, mean and standard deviation of pretreatment of variable active SLR of right leg of group A was 67.50±11.745 and for group B was 73.00±13.318, its p-value is greater than 0.05 that is 0.320 and after applying test mean and standard deviation of pretreatment of variable active SLR of left leg of group A was 71.80±11.3 and for group B was 73.00±14.7 its p-value is 0.870. Mann Whitney test between group A and B was applied, in these variables active SLR of right and left leg after treatment was considered. After applying test mean and standard deviation of post treatment of variable active SLR of right leg of group A was 78.30±10.27 and for group B was 89.25±12.59 and its p-value is greater than 0.05 that is 0.09 and its mean difference is 10.95±12.32 and after applying test mean and standard deviation of pretreatment of variable active SLR of left leg of group A was 80.95±9.48 and for group B was 88.55±17.108 and its mean difference is 8.40±8.60. Its p-value is 0.109 that was greater than 0.05, so it shows that both treatments are equally effective.

### **III.DISCUSSION:**

Hamstring tightness is one of the most common cause of backache,legache and gait disturbance.To overcome this tightness many techniques are used one of them is Mulligan,techniques.As so many females are affected by this in society so this study was conducted to overcome it by applying Mulligan bent leg raise and straight leg raise traction techniques. In this study 40 subjects were examined with age limit of above 20 and below 30.The purpose of this study was to compare the effect of Mulligan's traction straight leg raise and bent Leg raise technique on hamstring flexibility among the healthy young females.Result of our study that both techniques are equally effective in improving SLR and results of this study is supported by research of Dr. Amrutkuvar H. Pawar and Dr. SantoshMetgud.In his study, the age limit of the individuals selected was 25 to 71 years.The conclusion of his research showed a dominant improvement in straight leg raise (SLR) angle within groups before and after intervention. According to the result of his research , before session and after session values between the groups remain the same, which shows that both techniques are equally effective in gaining more range of SLR and can also be used in the prevention of back pain in lower region which occurs just because of radiculopathy as a result of prolapsed intervertebral disc (PIVD) and or lumbar spondylosis (L.S).(41).According to his study ageism shows an important part to cause cellular pathologies, which cause vertebral discharges and tight muscles.Due to age factor it has been proved that compression and bulging of the spine and occur due to decrease in height of disc , it also occur due to tight muscles and it can be improved by these techniques in old adults.(42),(43),(44)Another study that support our research's result is Favio,s study who proved that both traction techniques are equally effective in hamstring tightness. However in this study traction straight leg raise, would stretch and mobilize the sciatic nerve did produce pain relief, due to this technique no neural symptoms were worsened.(45) . This research occurs to compare the effectiveness of Mulligan's straight leg raise traction and bent leg raise on hamstring tightness proved that both possible mechanisms in which static stretching took place relief pain and decrease hamstrings tightness.Another research that does not support this research is DrSejalSathe and DrGauri M Afle,research. In his research he compares the effect of Mulligans bent leg raise and straight leg raise on hamstring flexibility in young adult population.In this research he took 60 subjects in which 38 were females and rest of them were males.In this research exclusion criteria were any subject with musculoskeletal disorders or any life-threatening diseases. According to the result of his study both techniques improve hamstring flexibility but bent leg raise was more significant than straight leg raise traction for improving flexibility of hamstring in adults(46) Another study that does not support the results of this study was carried out by Pratishta, K and his colleagues they compare the effects of two Mulligan techniques (TSLR and BLR that is Traction Straight Leg Raise and Bend Leg Raise) in improving the biceps femoris muscle function,decrease tightness and improve pelvic rotation. In this research 90 female subjects with age limit of 18 to 30 years were taken. Hence proved that Mulligan TSLR stretch is more effective than BLR .(47)

This study showed that Mulligan Bent Leg Raise and Traction straight leg raise both increases the improvement in Sit and reach Test measurement for hamstring flexibility and this study is favored by the study of Patel, R.he compared passive stretching and Mulligan's Bent Leg Raise (BLR) on Hamstring flexibility of young Healthy adults, he revealed that both are equally effective in increasing hamstrings length. (48)

And is opposed by a research of Sathe, which was published recently in 2018 proved that there was a prominent difference in both the groups post intervention. Mulligan Bent leg raise has shown significant improvement in flexibility on the Back saver sit and reach test score as compared with Traction straight leg raise.(49)

Following can be recommended to Compare the effects of Mulligan's traction straight leg raise and bent Leg raise technique on hamstring flexibility among the healthy young females.The research shows that there is a lot of capacity for more researches on male gender because males were excluded in this research.This study was carried on students of DPT department so in future can be applied on other students of other departments.The limitation of this study is that the subjects of both groups A(TSLR) and B(BLR) will not follow up after the data has been collected.Standard goniometer was used for ROM of joints(hip,knee) and to measure results after sessions.Goniometer was operated manually,so due to this human errors was not avoided.This study was applied only on females, males were excluded due to this result can be altered.

### **IV CONCLUSIONS:**

In conclusion, this study of Comparison of the effects of Mulligan's traction straight leg raise and bent Leg raise technique on hamstring flexibility among the healthy young females confirmed that both treatments are equally effective statistically as well as clinically for tight hamstring muscles . Patients can take benefit from (TBLR and TSLR) treatment and can improve range of motion (ROM) of hamstrings, can improve flexibility of these muscles, can reduce back pain due to radiculopathy and can improve their activity of daily living (ADLs).

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