

Effect of Mulligan's Bent Leg Raise Technique Versus Self Hamstring Myofascial Release On Non-Specific Low Back Pain And Hamstring Tightness Among Young Adults - A Comparative Study

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Abstract:

BACKGROUND:

Non-specific low back pain is defined as low back pain not owing to a known specific cause / pathology. 90% LBP patients are having Non-specific causes. Low back is very essential in our daily activities like - lifting, carrying, supporting upright posture which is essential for every person out there regardless of the job they are serving. As there is high prevalence of having tight hamstring in patients complaining of low back pain. So, the purpose of study was to investigate the comparative Effect of "Mulligan's BLR and Self hamstring MFR in young adults with non-specific low back pain".

METHODOLOGY:

A comparative study was conducted on 46 elderly subjects. Subjects were selected according to inclusion criteria & exclusion criteria. The pre assessment was taken before intervention & post assessment was taken after intervention by using NPRS, SLR, QBPDS and AKET. Participants were randomly divided into two groups with n=23 in each group. Group A received Mulligan BLR technique while Group B received Self Hamstring MFR. The treatment was given for 6 days. Statistical analysis was carried out using paired & unpaired t test.

RESULTS:

Mulligan BLR technique & Self Hamstring MFR was effective on improving NPRS, SLR, QBPDS and AKET in young adults. On intergroup comparison using unpaired t test, there was no significant difference between effect of Mulligan BLR technique & Self Hamstring MFR (NPRS p value = 0.706), (QBPDS p value= 0.275), which implies both exercises were equally effective on improving NPRS, SLR, QBPDS and AKET in young adults.

CONCLUSION: Mulligan BLR technique & Self Hamstring MFR were equally effective in reducing pain and improving functional disability in young adults having nonspecific low back pain with hamstring tightness.

Keywords: Hamstring tightness, Mulligan BLR technique, Nonspecific low back pain, Self Hamstring MFR, Young adults.

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I. Introduction

Non-specific low back pain is defined as low back pain not owing to a known specific cause / pathology (osteoporosis, infection, tumor, lumbar spine fracture, structural deformity, inflammatory disorder, radicular syndrome or cauda equina syndrome). It's the pain that's localized between 12th thoracic vertebrae and inferior gluteal fold, with none of leg pain. Supported by the etiology, LBP is divided as Specific and Non-specific LBP. 90% LBP patients are having Non-specific causes. Speaking of non-specific pain, it's mainly associated to mechanical origin. Low back ache has incorporated a life prevalence of 60-85%, where at given point only 15% of adult have LBP. The incidence is usually highest in third decade of life, and also the prevalence increases to 60-65% and gradually decreases¹. Sudhir Ganesan et al. concluded that Prevalence of Non-specific low back pain in young adults is 42.4%.⁴

Low back pain is often caused due to number of reasons not only physiological, or anatomical but also mechanical. It has been seen that in some cases the cause might be a sprain of a ligament or muscle. Although, it appears that alteration in biomechanical properties of the disk structure, sensitization of nerve endings by release of chemical mediators, and neurovascular ingrowth into the degenerated disks all may contribute to increase in pain. Degenerated disks may have notable ingrowth of nerve fibers and blood vessels within the inner annulus fibrosus and nucleus pulposus⁸. The loss of disk structure also changes the loading response and alignment

of the rest of the spinal column, including that of the facet joints, ligaments, and paraspinal muscles, which eventually may become additional pain generators.

Furthermore, during the clinical evaluation, a clinician has got to consider that LBP might be influenced by psychological factors, like stress, depression, and/or anxiety. History should also include substance use exposure, detailed health history, work, habits, and psychosocial factors.^[10] Clinical information is that the leading element that drives the initial impression, while the MRI should be considered only if there is presence of clinical elements that aren't definitely clear or within the presence of neurological deficits or other medical conditions.^[12]

Lumbopelvic rhythm or the hip-spine coordination refers to the way during which the lumbar spine, moves along with the pelvis. It's the kinematic relationship between lumbar spine and the hip joints during sagittal plane movements. The primary part of bending forward consists of lumbosacral flexion followed by anterior tilting of pelvis at hip joints. The muscles present within the lower back named as- erector spinae, contract eccentrically to regulate the movement against gravity while trunk flexes and pelvis tilts anteriorly.

When return to the erect posture, this rhythm is reversed. It is initiated by posterior tilting of pelvis at the hip, followed by extension of lumbar spine. If the muscles are weak or fatigued, the body's own weight is enough to overload the muscles that causes strain. And while the body is returning to its neutral position, if the hip flexors are tight or the extensors are too weak to initiate posterior pelvic rotation, the spinal extensors get overloaded, causing injury and pain. Hamstring is a set of three posterior thigh muscle named as- semitendinosus, semimembranosus, bicep femoris. It is a 2 joint muscle spanning both hip and knee joint, while working as major muscle for hip extension, knee flexion. As hams (bicep femoris) is firmly connected to Sacro tuberos ligament along with femoris longus fascia so, any tightness or abrupt functioning may cause LBP^[6]. As per previous study by Bellew, Ford reduced hamstring flexibility further reduces pelvic mobility which may further cause low back pain. Individuals with shortened hams may show abnormal gait pattern and pelvic movement and might increase risk of fall because the hamstring and lumbar extensors shares origin at pelvis. Main factor for inducing a chronic pain is individual factor, psychological factor, socio-professional factor; where socio-professional factor is more influential than physical factor.^[10] Mulligan's Bent Leg Raise technique is employed basically to extend the range of SLR in patient with LBP. Whereas, Myofascial release (MFR) is commonly utilized manual technique to facilitate stretching of corresponding tissue continuity and its extensibility by restoring soft tissue length. Self MFR is implemented by individual itself with a tool rather than the therapist, which eases patient with their pain.^[2] It is very often people complaining of their lower back pain, due to their sedentary life style. Low back is very essential in our daily activities like - lifting, carrying, supporting upright posture which is essential for every person out there regardless of the job they are serving. Apart from these lack of self-care and ignorance to body physique may lead to further problem like impaired gait, posture. As there has been shown a high prevalence of having tight hamstring in patients complaining of low back pain. As no study was yet investigated to see the comparative study of both Mulligan's BLR (Bend Leg Raise) and Self MFR (Myofascial release) for hamstring. So, the purpose of study was to investigate the comparative Effect of "Mulligan's BLR and Self hamstring MFR in young adults with non-specific low back pain".

II. Methodology

Study Design: Comparative Study

Study Population: Young Adults with Non-Specific LBP

Sampling Technique: Simple random Sampling Using lottery Method.

Sample Size: 46 $N = 2Z^2 \frac{S^2}{D^2}$

Study Duration: 6 Months

Place Of Study: Dr. Ulhas Patil College Of Physiotherapy, Jalgaon.

Materials: Patient Evaluation Sheet, Pen, Goniometer, QBPDS Questionnaire, Treatment Couch, Stabilizing Belt, Foam Roller, Yoga Mat.

Inclusion criteria

1. Subject with nonspecific LBP
2. Male and female subjects who are willing to participate
3. Age 18-30
4. Hamstring tightness- [AKET] (>20° knee extension lag),

Exclusion criteria

1. Subjects with LBP with trauma
2. Patient with specific LBP such as radiating pain, neurological deficits,
3. Tumors of the spine, Infection of spine or TB of spine

4. Any structural or congenital spinal deformity
5. History of recent Abdominal , or Lumbar spine surgerie

Outcome Measures

1. NPRS (Numerical pain rating scale)
2. AKET (Active Knee Extension Test)
3. QBPDS (Quebec Back Pain Disability Scale)
4. SLR (Straight Leg Raise)

III. Procedure

To conduct the study Permission from Institutional ethical committee & concerned hospital was taken. Subjects were selected according to the inclusion and exclusion criteria by simple random sampling Technique. A written consent was taken from subjects for participating in study. Procedure was thoroughly explained to the subjects selected for the study.

Earlier the demographic data of each and every individual were taken in consideration, Later, were divided in two equal groups using lottery method, Group A and Group B respectively. Pre treatment evaluation of NPRS, SLR, QBPDS and AKET was done before intervention. Group A was given Mulligan's BLR, while Group B was taught Self hamstring MFR for 6 days & Post intervention evaluation was done.

Group A-Mulligan's BLR -- Therapist stands at the limited hamstrings flexibility side of the supine subject on the plinth. Therapist place the subject's flexed knee over his (therapist's) shoulder and now longitudinal traction is applied along the long axis of femur, now therapist takes into hip flexion until first resistance is felt, then asks the subject to push the therapists shoulder gently (contract relax) maintain for 5 sec. now take the hip in further range, Sustain this stretch for 20 seconds and then lower the leg to the plinth and repeat for 3 repetitions, and 1 minute rest between each stretch. And same procedure is done for the other side of limited hamstrings flexibility.



Mulligan's Bent leg raise

Group B- Self hamstring MFR --Subjects performed self hamstring MFR technique using foam roller. The subject should be in long sitting position on a firm and even surface by placing the arms backward and loading body weight on the palms. A foam roller was placed under the hamstrings and is slowly moved back and forth from the ischial tuberosity to the popliteus, by applying pressure for 4 min for 3 reps with a rest of 1 min.



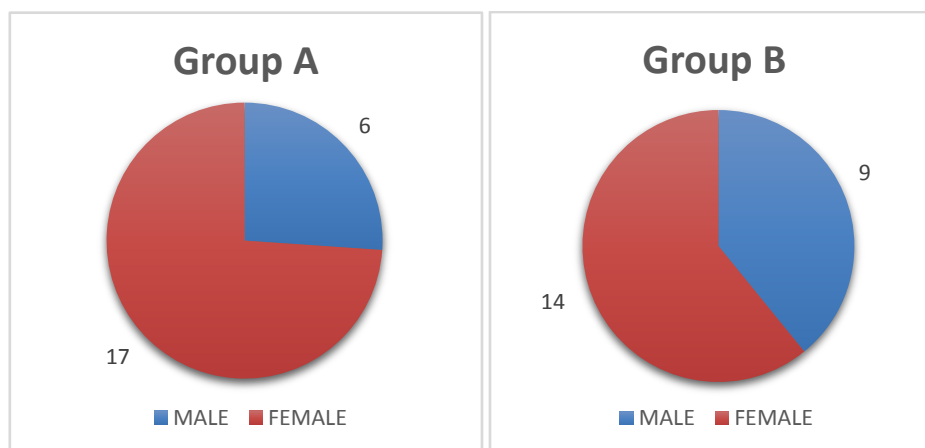
Self Hamstring MFR

STATISTICAL ANALYSIS

Statistical analysis was done using statistical package of social science (SPSS) version 28.0.0.1. Shapiro-Wilk test was done to test the normal distribution. As a result, $p > 0.05$, meaning the sample are normally distributed therefore all the further test done are parametric tests.

IV. Results

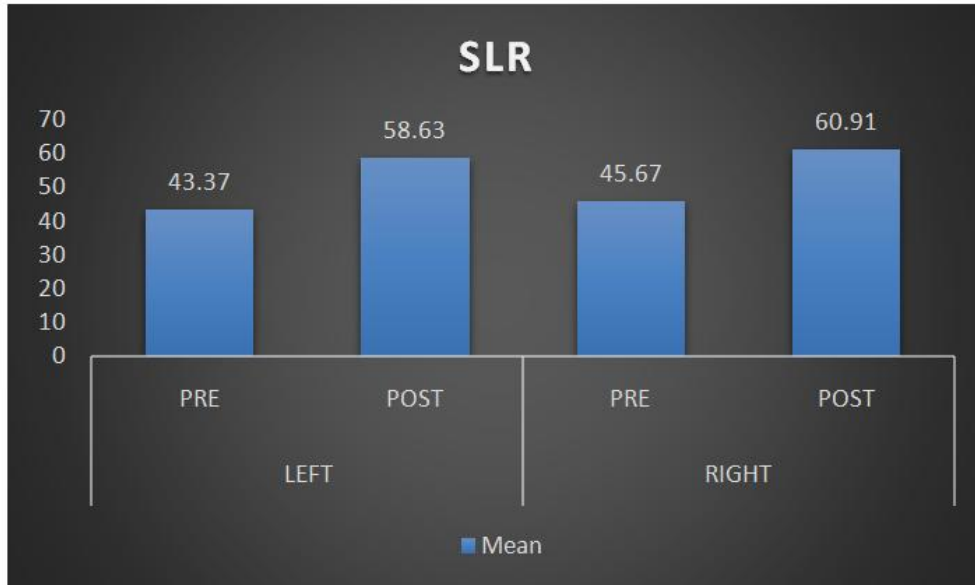
1. Age wise distribution of Group A & Group B:



- Group A mean age of was $23.13 + 2.646$, with 6 male and 17 females.
- Group B mean age was $23.78 + 1.99$, with 9 male and 14 females.

2. Group A Pre-Post Comparison of SLR.

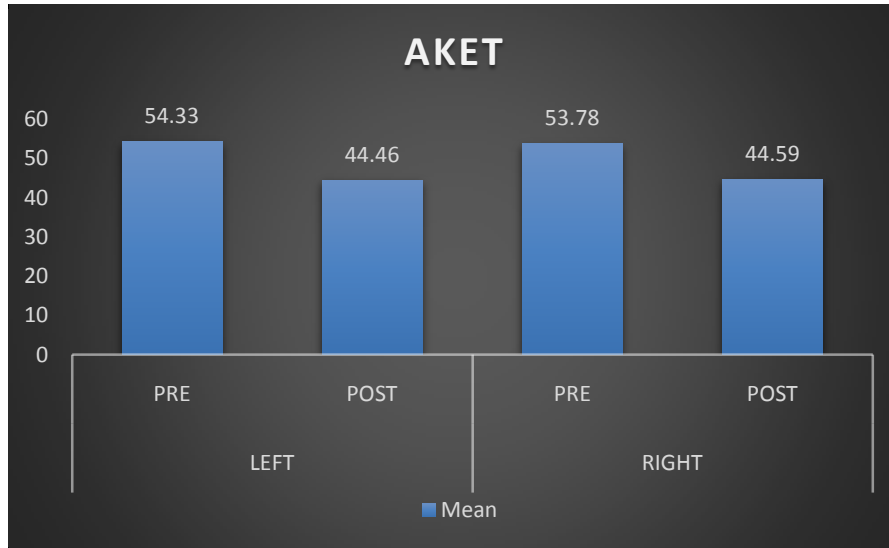
SLR		Mean	Std. Deviation	p Value
Left	Pre	43.37	8.205	<0.001
	Post	58.63	10.256	
Right	Pre	45.67	6.785	<0.001
	Post	60.91	8.951	



- SLR (Left) – on pre-post comparison using paired t test, Mulligan’s BLR is statistically effective on improving left leg SLR(p value <0.001).
- SLR (Right) – on pre-post comparison using paired t test, Mulligan’s BLR is statistically effective on improving right leg SLR(p value <0.001).

3. Group A Pre-Post Comparison of AKET.

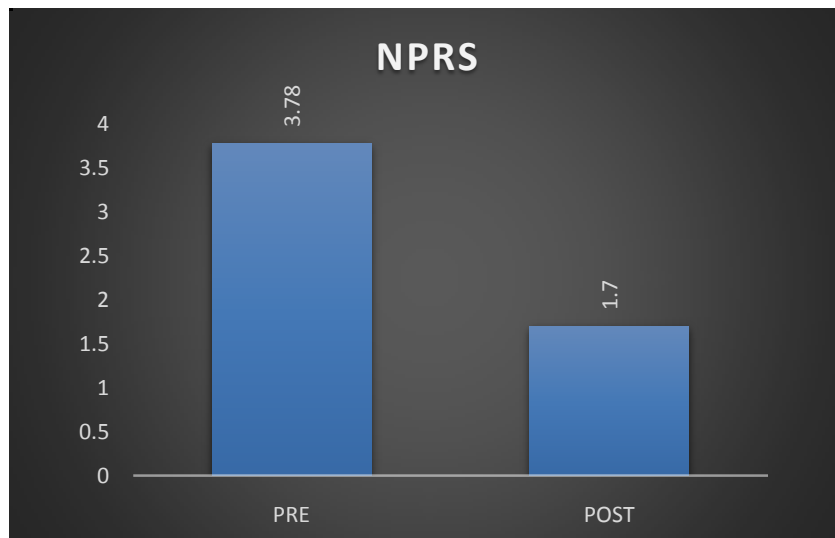
AKET		Mean	Std. Deviation	p value
Left	Pre	54.33	6.962	<0.001
	Post	44.46	8.143	
Right	Pre	53.78	6.732	<0.001
	Post	44.59	7.678	



- AKET (Left) – on pre-post comparison using paired t test Mulligan’s BLR is statistically effective on improving left AKET (p value <0.001).
- AKET (Right) – on pre-post comparison using paired t test Mulligan’s BLR is statistically effective on improving right AKET (p value <0.001).

4. Group A-Pre-Post Comparison of NPRS of Non-specific low-back pain

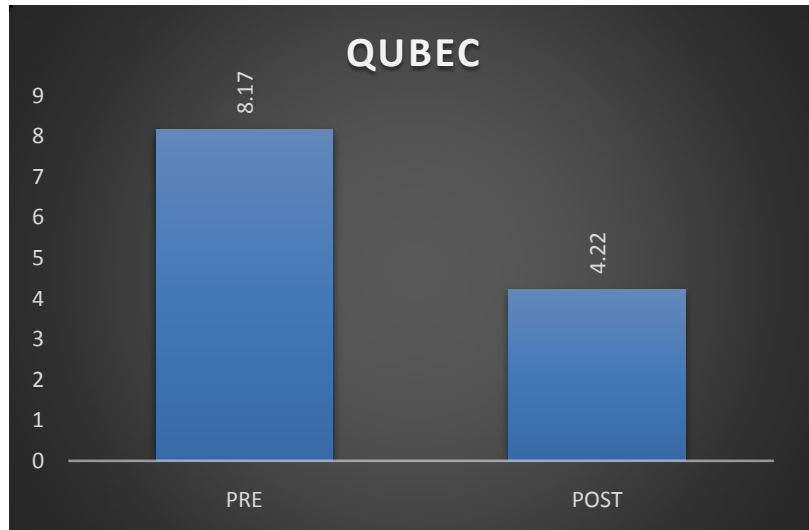
NPRS	N	Mean	Std. Deviation	p value
Pre	23	3.78	1.445	<0.001
Post	23	1.7	1.869	



- NPRS –On intra group comparison using paired t test Mulligan’s BLR is statistically effective on reducing pain i.e NPRS (p value <0.001).

5. Group A Pre-Post QBPDS of Non-specific low-back pain

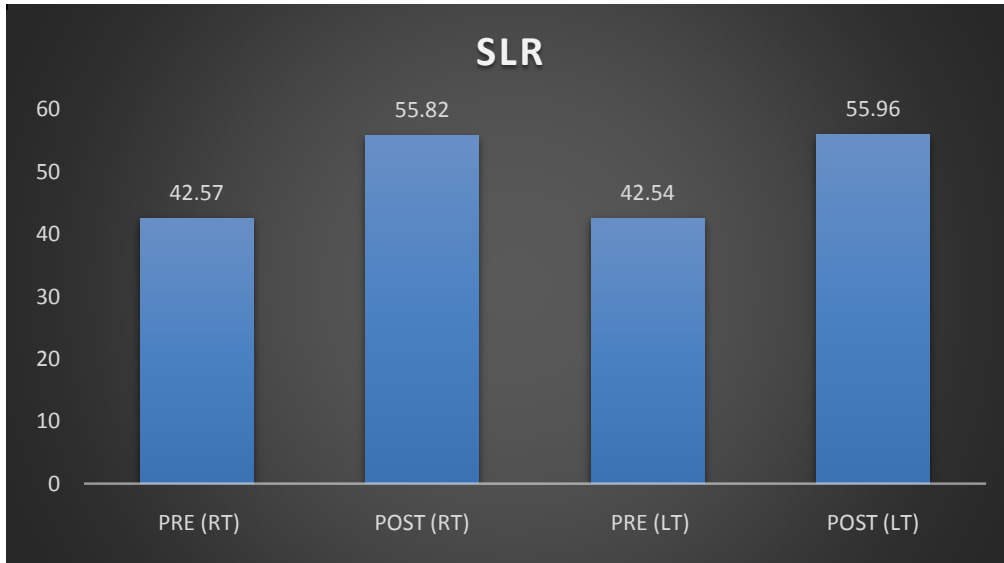
QBPDs	N	Mean	Std. Deviation	p value
PRE	23	8.17	3.499	<0.001
POST	23	4.22	3.592	



► QBPDs Scale – on intra group comparison using paired t test Mulligan’s BLR is statistically effective on reducing functional disability among non specific LBP individuals (p value <0.001).

6. Group B Pre-Post SLR of Right & Left Leg

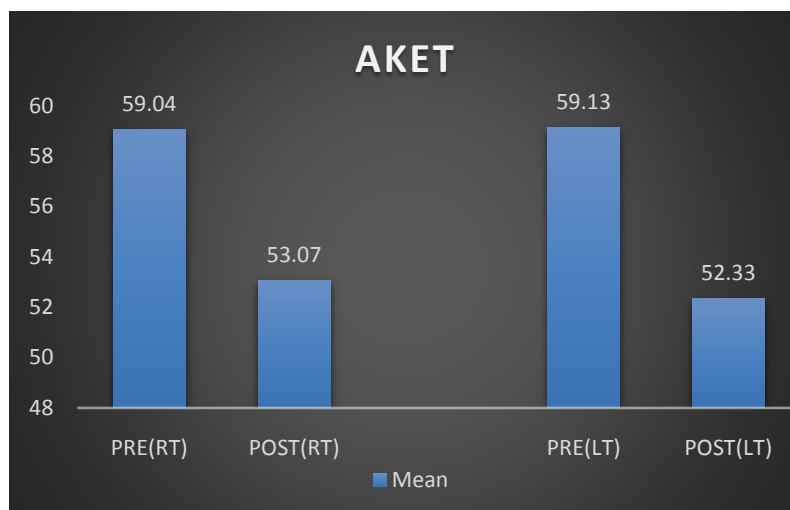
SLR		Mean	Std. Deviation	p value
Right	Pre	42.57	6.978	<0.001
	Post	55.82	7.443	
Left	Pre	42.54	7.347	<0.001
	Post	55.96	7.055	



- SLR (Left) – on intra group comparison using paired t test MFR is statistically effective on improving left leg SLR(p value <0.001).
- SLR (Right) – on intra group comparison using paired t test MFR is statistically effective on improving right leg SLR (p value <0.001).

7. **Group B Pre-Post AKET of Right & Left Leg**

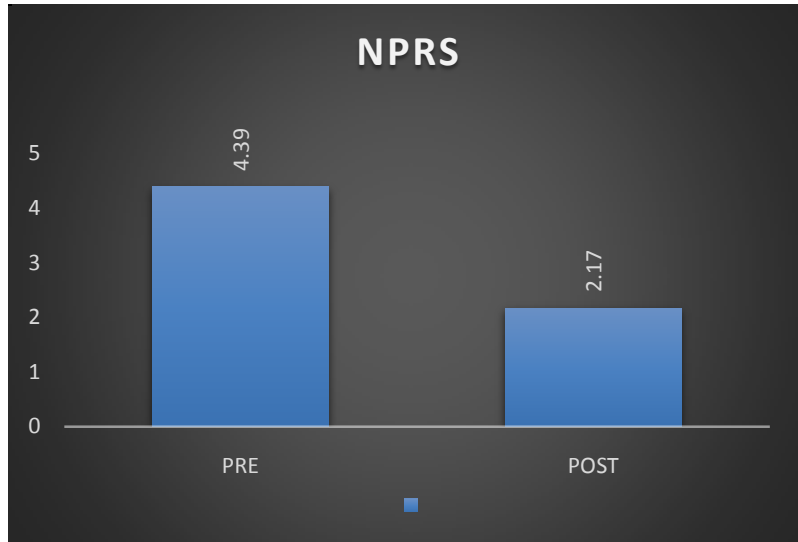
AKET		Mean	Std. Deviation	p value
Right	Pre	59.04	4.472	<0.001
	Post	53.07	4.725	
Left	Pre	59.13	4.224	<0.001
	Post	52.33	4.87	



- AKET (Left) – on intra group comparison using paired t test MFR is statistically effective on improving left AKET (p value <0.001).
- AKET (Right) – on intra group comparison using paired t test MFR is statistically effective on improving right AKET (p value <0.001).

8. Group B Pre-Post NPRS of Low-back Pain

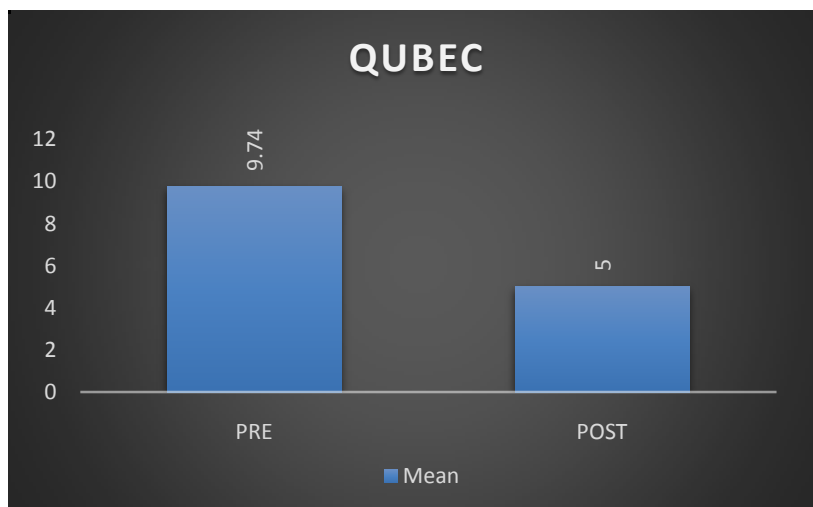
NPRS	Mean	Std. Deviation	p value
PRE	4.39	1.033	<0.001
POST	2.17	1.267	



► NPRS – On intra group comparison using paired t test MFR is statistically effective on reducing pain i.e NPRS (p value <0.001).

9. Group B Pre-Post QBPDS of Non-specific low-back pain

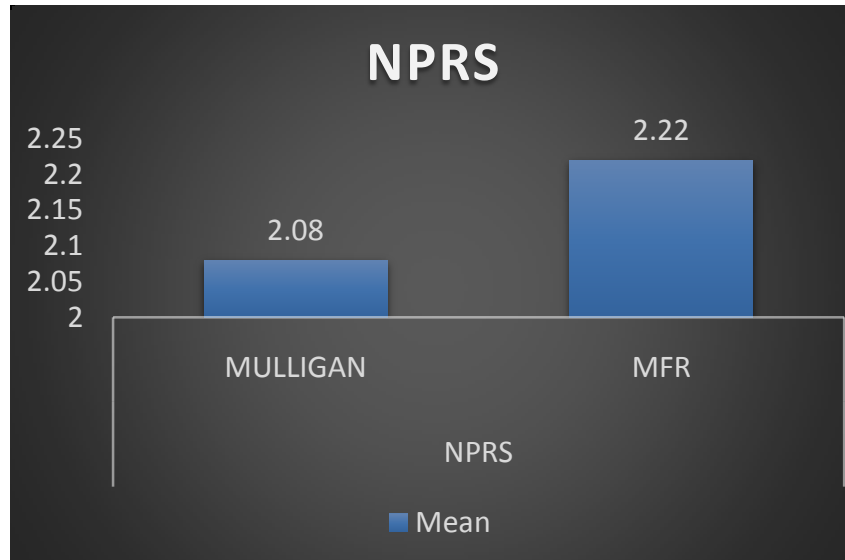
QBPDs	Mean	Std. Deviation	p value
PRE	9.74	3.347	<0.001
POST	5	2.174	



► QBPDs Scale – on intra group comparison using paired t test MFR is statistically effective on reducing functional disability among non specific LBP individuals (p value <0.001).

10. Comparison of mean difference of NPRS between Group A & Group B

NPRS	n	Mean	Std. Deviation	p value
Group A Mulligan	23	2.08	1.869	0.706
Group B MFR	23	2.22	1.267	

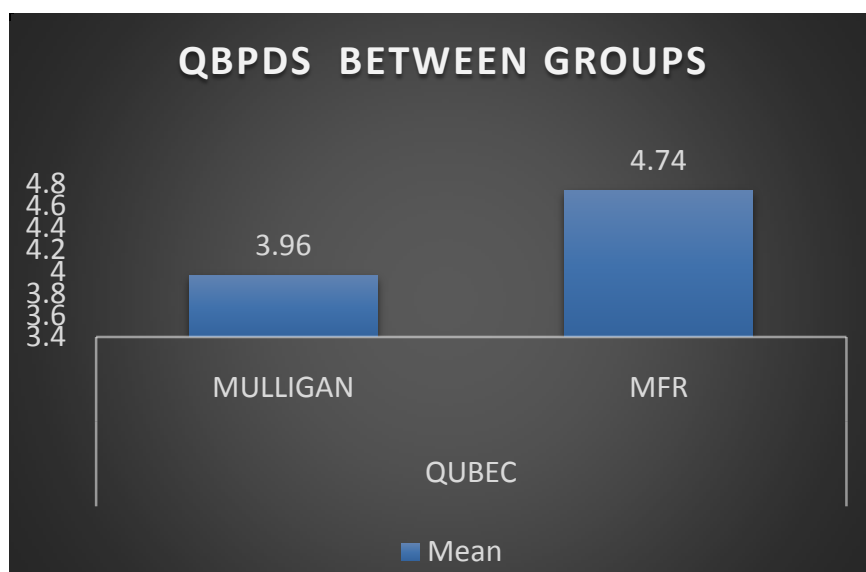


► NPRS: The mean of difference between pre and post treatment score in Group A (Mulligan’s BLR) was 2.08, whereas in Group B (Self hamstring MFR) was 2.22. With p value of >0.05, which was statistically not significant between the groups.

► This implies that Group A (Mulligan’s BLR) statistically was more effective than group B (Self hamstring MFR).

11. Comparison of mean difference of QBPDS between Group A & Group B

QBPDS	N	Mean	Std. Deviation	p value
Group A Mulligan	23	3.96	5.597	0.275
Group B MFR	23	4.74	2.174	



► QBPDS Scale : The mean of difference between the pre and post score in Group A (Mulligan’s BLR) was 3.96, whereas in Group B (Self hamstring MFR) was 4.74 With p value of >0.05 ,which makes it statistically not significant between the groups respectively

V. Discussion

The study here was conducted to compare the effectiveness of Mulligan's BLR versus Self hamstring MFR in young adults having nonspecific low back pain. It concludes the effectiveness of Mulligan's BLR and Self hamstring MFR in relieving pain and improving functional disability in young adults with nonspecific low back pain. Which proves both the technique can be individually be given to alleviate pain and improving functional disability in patients having nonspecific low back pain.

The study included subjects with mean age of $23.12 + 2.64$ in Group A, and with mean age of $23.78 + 1.99$ in Group B. In this study, subjects showed significant increase in hamstring flexibility after performing Mulligan's BLR and Self hamstring MFR. As the mean SLR was 45.67 and 43.37 for right and left leg for Group A participants before intervention which later were 60.91 and 58.63 respectively. Similarly, the mean pre-AKET score for Group A was 53.78 and 54.33 for right and left which later reduced to 44.59 and 44.46. Similar results were found in Group B participants as the mean pre SLR for right and left leg was 42.57 and 42.54 which, later increased to 55.82 and 55.96 respectively. The mean pre-AKET score was 59.04 and 59.13 for right and left leg respectively which later reduced to 53.07 and 52.33 respectively.

Studies done by Sanjana. K. S, AnandHegganvaret.al and Heradet.al respectively showed that there was an improvement in hamstring flexibility in terms of SLR and AKET in both lower limbs. Which might be due to the prolonged stretch to muscle spindles inhibited their afferent activity, which might decrease muscle tension^[15]. In BLR there's stretching of gluteus maximus and adductor part of hamstring muscle, which helps in breaking the adhesions between the muscles thereby it improves hip flexion range of motion i.e SLR

In ambulation, hamstring reduces velocity of knee extension to avoid hip and knee joint damage while providing dynamic stability. Interaction with hamstring provides correct knee movement and stability. Hamstring muscle plays important role in stability that affects postural balance. In addition, hamstring flexibility is crucial in maintaining full range of motion (ROM) of joint and musculoskeletal function while avoiding injuries.

Once flexibility decreases, risks of muscular and postural imbalance grow higher along with the risk of muscular sprain of the hamstring. As the study earlier conducted by Hasrang and Jayawardhana et al. the hamstring flexibility is of significant clinical interest in treatment of low back pain, especially because of probable involvement of hamstring flexibility in occurrence of low back pain and its flexibility is significantly reduced in patients having low back pain^[5]. In this study the pain intensity was significantly reduced in both the groups with pre mean score of 3.78 and 4.79 for Group A and Group B respectively which later reduced to 1.7 and 2.17 post interventions. As this might be due to the technique triggers the neurophysiological responses influencing the muscle stretch tolerance. As also seen in study by Toby Hall there was increase in posterior pelvic tilt, which results in increased lumbar flexion. As the flexible hamstrings reduces the stress over the lumbar tissues.^[9] The functional disability was seen improving in both the groups as the mean pre score 8.17 and 9.74 were reduced to 4.22 and 5 for Group A and Group B respectively. And when compared between the Groups, there was no statistically significant reduction in pain and functional disability in subjects when treated with Mulligan's BLR and self hamstring MFR. As p values were 0.706 and 0.275 respectively. Which implements both techniques were equally effective, regarding the ease in pain due to Mulligan's BLR could be due to the inhibitory effect of Golgi tendon, which reduces motor neuronal discharge that causes pain and hence, the eases in pain and allows relaxation by resetting the resting length. These reflexes will allow relaxation of musculotendinous unit and hence reduces pain and improving functional disability.

Many individuals involved in sport, exercise, or in any kind of fitness perform self-myofascial release (SMR) via foam/wooden roller, which helps in restoring muscles, tendons, ligaments, fascia, and soft-tissue extensibility. Increasing hamstring flexibility may help to extend the motion of the pelvis, which might successively take tension off the low back helping to decrease the low back pain. The study done byBellew et al. (2010) states that hamstring flexibility was strongly correlated with pelvic rotation and forward bending range, it may affect the lumbar region and, in some study, there's a strong correlation between hamstring flexibility and low back pain. Decreased flexibility was observed in limited rotation.^[14]

VI. Conclusion

The study showed that there was a significant reduction in pain, increased SLR range and reduced AKET range and improved functional disability (QBPDs) after the intervention of Mulligan's BLR technique and Self hamstring MFR. It implements that, both the techniques Mulligan's BLR (Group A) and Self hamstring MFR (Group B) were equally effective in reducing pain and improving functional disability in young adults having nonspecific low back pain with hamstring tightness.

LIMITATIONS

1. Sample size was limited.
2. Duration of pain wasn't considered.
3. Unequal distribution of gender.

4. Study duration was only for 6 days.
5. No follow up was taken after the intervention period

CONFLICT OF INTEREST: None

SOURCE OF FUNDING: Not required

ETHICAL APPROVAL: Ethical Approval was taken from institutional ethical committee of Dr.UlhasPatil College Of Physiotherapy, Jalgaon.

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