“EFFECTIVENESS OF MULLIGAN BENT LEG RAISE TECHNIQUE (MBLR) VS DYNAMIC SOFT TISSUE MOBILIZATION TECHNIQUE (DSTM) TO IMPROVE HAMSTRING MUSCLE FLEXIBILITY IN NORMAL INDIVIDUAL” - A COMPARATIVE STUDY.

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ABSTRACT:
Background: Muscular flexibility is an important aspect of normal human function. Limited flexibility has been shown to predispose a person to several musculoskeletal overuse injuries and significantly affect a person’s level of function. Flexibility helps in prevention of injuries and significantly affect a person’s level of function. Flexibility helps in prevention of muscular and postural imbalance and maintenance of full range of joint movement, optimal musculoskeletal function and enhanced performance in day to day activities. There are different therapies available for correcting the tightness of hamstring muscles. Method: 30 subjects with perceived hamstring tightness aged between18-35 years were included for the study and then randomly divided into two groups. Group A (n=15) were given MBLR Technique whereas Group B (n=15) were given DSTM Technique. Active Knee Extension Test (AKET) & Straight Leg Raise Test (SLRT) were used to measure the hamstring tightness which was done before and after the treatment. Treatment was given for 3 weeks. Results: The results of this study show that MEAN difference of AKET of right side of Group A and Group B is 17.33 and 14 respectively while MEAN difference of AKET of left side of Group A and Group B is 17.66 and 14.66 respectively. Whereas, MEAN difference of SLRT of right side of Group A and Group B is 14.00 and 11.33 respectively while MEAN difference of left side of Group A and Group B is 13.33 and 10.00 respectively. Conclusion: Present study concludes that MBLR Technique and DSTM Technique both are effective for improving flexibility of hamstring muscle, but DSTM Technique is clinically more effective compared to MBLR Technique.

Index Terms - : Hamstring flexibility, Mulligan Bent Leg Raise (MBLR) Technique, Dynamic Soft Tissue Mobilization (DSTM) Technique.

1. INTRODUCTION

Being a two-joint muscle, its important characteristic is that hamstrings plays a crucial role in many daily activities such as walking, running, jumping, and controlling some movement of the trunk. In gait cycle, hamstrings play an important role in stance phase. [1]

Flexibility is an indisputable component of fitness, defined as the ability to move a joint through a normal range of motion without producing stress to the musculotendinous unit. [2] The advantages of having flexibility include increase in ROM, improve joint function, enhance muscle performances, and prevent muscle injury and decreases post exercise soreness. Flexibility increases body awareness, better posture and enhances performance of skill movements. [3] Hamstrings tightness is a common condition found in both symptomatic and asymptomatic subjects. [7] It is the inability to stretch the muscle through full range of amplitude. [8] Loss of flexibility is also defined as a decrease in the ability of a muscle to deform. [9] Some studies have shown that decreased hamstring flexibility is a risk factor for the development of patella tendinopathy and patellofemoral pain [10-11], hamstring strain injury [11], and symptoms of muscle damage following eccentric exercise. [12] Limited flexibility has been shown to predispose a person to several musculoskeletal overuse injuries and significantly affects a person’s level of function. [13] Prevalence & incidence of Hamstrings tightness in normal individuals in day today life is high due to limited activity and lack of regular exercise. Tight Hamstrings usually start at the age of 5 or 6 years, when children start their seated school careers. [15] The commonest muscle to always go for tightness is the Hamstring muscle. The incidence of tightness of hamstring muscle is higher in males than females. [16-17] Hamstrings muscle is a postural muscle and as it is biarticular, it has tendency to shorten even under normal circumstances. [18] Since it is a superficial two joint muscle, they tend to become very tight leading to a muscle imbalance, which can give rise to number of postural problems and leave us open to muscle injury. [19] Running long distance causes the active muscle to become strong and less flexible whereas opposing muscles which are relatively underused become weaker. Immobilization for prolonged period also causes muscle tightness as the muscle is not used for longer time.
Slow muscle fibers maintain posture; they activate more easily and are capable of more sustained contraction and tend to become shortened and tight. In females, wearing high heels for long period of time causes hamstrings tightness. [20]

With age, muscles go through a shortening process due to lack of physical activity and loss in elasticity in the connective tissue surrounding the muscle.[21] A sedentary life style often results in diminished flexibility. [22]

Student population in age group of 17-23 years as they have the posture of sitting with hip and knee flexion at 90 degree which predisposes them to hamstring tightness [20]. Normal hamstring flexibility is affected by numerous factors which includes age, gender, race, tissue temperature, strength training, stiffness, awkward posture and reduced warm up period during exercise [23].

Various Physiotherapy treatment techniques like manual therapy and electrical agents are available to treat hamstring tightness. The techniques namely include various types of stretching techniques, muscle energy technique, position release technique, myofascial release techniques. [24]

2. PROCEDURE

2.1 Materials used

- Informed consent form
- Assessment form
- Universal Goniometer
- Pen
- Pencil
- Black marker
- Eraser
- Pillow
- Towel

2.2 Methodology

Subjects were taken from nearby areas. Subjects were assessed for hamstring tightness and after finding their suitability as per inclusion and exclusion criteria, they were included in the study. Total 30 subjects with perceived hamstring tightness were selected. All procedures were explained to the subjects prior to any measurements. Written consent was taken from all the subjects for their voluntary participation in this study.

The subjects selected for the study were randomly assigned into 2 groups (Group A & Group B) by simple random sampling method using computer generated random numbers.

Group A (n=15) subjects were treated with Mulligan Bent Leg Raise (MBLR) Technique, whereas Group B (n=15) subjects were treated with Dynamic Soft Tissue Mobilization (DSTM).

The treatment was given on alternate days for 3 weeks.

2.3 Outcome measure/ evaluation tools:

Subjects were assessed for hamstring tightness by measuring popliteal angle i.e. Active Knee extension Test (AKET) & Straight Leg Raise Test (SLRT) which were done before and after the treatment.

2.4 Method:

First group of 15 students was given bilateral MBLR. This technique consists of gentle isometric stretching of hamstring in specific directions in progressively greater positions of hip flexions; the expecting results were increased flexibility of hamstring muscle with increased ROM of active knee extension. Therapist placed subject’s flexed knee over her shoulder, the popliteal fossa of the subject’s knee rest on therapist’s shoulder. A distraction (longitudinal traction force along the long axis of femur) was applied at the lower end of femur and the subject was asked to push the therapist’s shoulder with his/her leg followed by voluntary relaxation.

At this point of relaxation, the therapist pushes the bent knee up as far as possible in the direction of shoulder on the same side in a pain free range. This stretch was sustained for 5 to 10 seconds and then relaxed. Each hamstring stretch was repeated 3 times per session, on alternate day for 3 weeks.

To execute the dynamic intervention, the subject was made to move into a supine position with the hip and knee flexed to 90°. In this position, all dynamic techniques worked the hamstrings muscle length from three quarter to end ROM. Deep longitudinal strokes were applied in a distal to proximal direction to the area of hamstrings tightness when the leg was passively being moved to the hamstrings lengthened position. 5 strokes were applied and 20 seconds of shaking were performed at the completion of this technique. Overall, the time to complete the combination of both classic and dynamic intervention is approximately 8 minutes. Intervention was given on alternative days for 3 weeks.
3. **INCLUSION CRITERIA:**

- Aged between 18-35 years of age
- Gender: Both male and female
- Stretch end feel at end range
- Participants who want to participate willingly.
- Tight hamstring (Inability to achieve >70 degree of hip flexion with knee extended and/or inability to achieve >160 degree of knee extension with hip at 90 degree of flexion)

4. **EXCLUSION CRITERIA:**

- Acute or chronic low back pain
- Acute or chronic hamstring injury
- Hypo mobility of L.L joints. - Fracture or dislocation of L.L - Implantation in femur
- Infective conditions
- Any contractures or deformities
- Neuromuscular and cardiovascular disorders
- Psychological factors
- Pregnancy

5. **RESULTS AND DISCUSSION**

5.1 **RESULTS**

**TABLE 1: Analysis of AKET within Group A & Group B (Right side)**

<table>
<thead>
<tr>
<th></th>
<th>PRE MEAN±SD</th>
<th>POST MEAN±SD</th>
<th>T value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
<td>136.67±8.32</td>
<td>150±9.1</td>
<td>16.66</td>
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<tr>
<td>GROUP B</td>
<td>136.33±8.61</td>
<td>154.33±8.06</td>
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**TABLE:2 Analysis of AKET within Group A & Group B (Left side)**

<table>
<thead>
<tr>
<th></th>
<th>PRE MEAN±SD</th>
<th>POST MEAN±SD</th>
<th>T value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
<td>137±7.02</td>
<td>149±6.31</td>
<td>23.17</td>
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<tr>
<td>GROUP B</td>
<td>136.33±7.00</td>
<td>155±6.81</td>
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**TABLE:3 Analysis of SLRT within Group A & Group B (Right side)**

<table>
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<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
<td>55.67±7.01</td>
<td>69.33±6.81</td>
<td>16.66</td>
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<td>GROUP B</td>
<td>55.67±9.21</td>
<td>75±8.45</td>
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TABLE 4: Analysis of SLRT within Group A & Group B (Left side)

<table>
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<td>GROUP-B</td>
<td>54.33±8.23</td>
<td>74±7.12</td>
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TABLE 5: Comparison of pre-test & post-test difference of AKET in Group A and Group B (Right side)

<table>
<thead>
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<td>GROUP-A</td>
<td>13.33</td>
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<td>GROUP-B</td>
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TABLE 6: Comparison of pre-test & post-test difference of AKET in Group A and Group B (Left side)

<table>
<thead>
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<tbody>
<tr>
<td>GROUP-A</td>
<td>12.07</td>
<td>3.18</td>
<td>5.95</td>
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<td>GROUP-B</td>
<td>18.67</td>
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TABLE 7: Comparison of pre-test & post-test difference of SLRT in Group A and Group B (Right side)

<table>
<thead>
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<tr>
<td>GROUP-B</td>
<td>19.33</td>
<td>4.59</td>
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TABLE 8: Comparison of pre-test & post-test difference of SLRT in Group A and Group B (Left side)

<table>
<thead>
<tr>
<th></th>
<th>PRE MEAN</th>
<th>POST MEAN</th>
<th>T value</th>
<th>p value</th>
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<tbody>
<tr>
<td>GROUP-A</td>
<td>12.67</td>
<td>3.18</td>
<td>5.32</td>
<td>0.0001</td>
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<tr>
<td>GROUP-B</td>
<td>19.67</td>
<td>3.98</td>
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5.2 GRAPHS

Graph 1: Analysis of AKET within Group A & Group B (Right Side)

Graph 2: Analysis of AKET within Group A & Group B (Left Side)
Graph 3: Analysis of SLRT within Group A & Group B (Right side)

Graph 4: Analysis of SLRT within Group A & Group B (Left side)

Graph 5: Comparison of pre-test & post-test difference of AKET in Group A and Group B (Rightside)
GRAPH 6: Comparison of pre-test & post-test difference of AKET in Group A and Group B (Left side)

Comparison of pre-test & post-test difference of AKET in Group A and Group B (Left side)

GROUP-A

GROUP-B

PRE

POST

12.07

3.18

2.27

18.67

GRAPH 7: Comparison of pre-test & post-test difference of SLRT in Group A and Group B (Right side)

Comparison of pre-test & post-test difference of SLRT in Group A and Group B (Right side)

GROUP-A

GROUP-B

PRE

POST

12.67

2.27

19.67

4.59
5.3 DISCUSSION

The present study was conducted to check the effectiveness of Mulligan Bent Leg Raise (MBLR) Technique and Dynamic Soft Tissue Mobilization (DSTM) on hamstring muscle flexibility inNormal Individual with perceived hamstring tightness. The study was conducted on 30 subjects fulfilling the inclusion criteria with perceived hamstring tightness. They were assigned into two groups. Group A (n=15) were treated with MBLR whereas Group B (n=15) were treated with DSTM. Baseline measurements were Active Knee Extension Test (AKET) and Straight Leg Raise Test (SLRT) were taken on 1st day and post treatment data were collected after 3 weeks.

In both the groups, baseline demographic characteristics were similar and there was no statistical difference in both the groups and so they were comparable.

Here, the null hypothesis was accepted that there is no significant difference between MBLR and DSTM on hamstring muscle flexibility in healthy subjects with perceived hamstring tightness.

Although both the techniques, MBLR and DSTM were effective for hamstring flexibility, DSTM was more effective than MBLR for hamstring muscle flexibility in normal individual with perceived hamstring tightness.

MBLR also involves isometric contraction of hip extensors followed by stretch of the same muscles also referred to as ‘Post Isometric Relaxation’. Post-isometric relaxation refers to the assumed effect of reduced tone experienced by a muscle or a group of muscles after brief periods following an isometric contraction. Improvements noted in Group A (MBLR group) could also be attributed to the effect of isometric contraction on the connective tissues. Combination of contraction and stretches may be responsible for improving the viscoelasticity which in turn improves tissue extensibility. [29]

Various research over Mulligan’s BLR method suggest it as contract relax method where contract relax cycles applied to hamstrings provide peripheral somatic input to the contracting muscle. [30] According to Lewit and Simons the post-isometric relaxation achieved during the technique is effective in reducing Trigger point sensitivity and pain intensity. The technique involved stretching the muscle containing the Trigger point, followed by an isometric contraction against minimal resistance. After the contraction, the muscle was first allowed to relax, and then it was stretched Post-isometric relaxation is claimed to be an effective method for acute tension in soft tissue problems, reduces muscle spasm, reduces pain and lengthen the tightened muscles.

DSTM is a specific structured technique in which the therapist identifies a target area of muscle tightness and focuses the treatment on that specific area whilst moving it longitudinally under different muscle contraction parameters.

In the DSTM component, the hamstring muscle group receives progressive dynamic techniques that work in synchrony as the muscle moves to the end ROM. The final technique eccentrically works the muscle at its functional length with the result that hamstring flexibility is optimised.

DSTM had improved range of motion (Group-B) because of following mechanisms: In dynamic soft tissue mobilization, incorporating active contraction into a massage protocol might increase muscle perfusion and decreased muscle stiffness. DSTM induced improve metabolic process in muscle cells which in turn caused an increased in temperature that led to decreased muscle viscosity and allowed for a smoother contraction. Muscles were more pliable and accommodating to forces placed on the muscle leading to increased flexibility. DSTM might have improved the mobility by releasing trigger points and loosen adhesion in connective tissue that could bind muscles.[30] In Dynamic Soft Tissue Mobilization, it is hypothesized that incorporating active contraction into a massage protocol may increase muscle perfusion and decrease muscle stiffness. DSTM involves physiological mechanisms like autogenic inhibition via recruitment of the Golgi tendon organs and reciprocal inhibition which caused inhibition of the target muscle following the contraction of the opposing muscle. This stretching leads to relaxation or inhibition of the stretched muscle and thus led to increased hamstrings flexibility. The present study was supported by the following studies. [31]
6. CONCLUSION

The present study concludes that statistically, MBLR and DSTM both are effective for improving flexibility of the hamstring muscle in normal individual with perceived hamstring tightness. But clinically, DSTM is more effective than MBLR for improving flexibility of the hamstring muscle in normal individual with perceived hamstring tightness.

7. FURTHER RECOMMENDATION

The study can be done with large samples.
The study can be done with longer duration.
The study can be compared with other techniques.
The study can further be extended on to athletic populations.

8. SUMMARY

The present study was carried out to know effectiveness of MBLR and DSTM to improve hamstring muscle flexibility in normal individual.
The study consisted of 30 subjects of both sexes aged between 18-35 years.
Subjects were assessed for hamstring tightness and after finding their suitability as per inclusion and exclusion criteria, they were included in the study. All procedures were explained to the subjects prior to any measurements. Written consent was taken from all the subjects for their voluntary participation in this study.
Then treatment protocol was given to both groups.
This study concluded that statistically, MBLR and DSTM both are effective for improving flexibility of the hamstring muscle in normal individual. But clinically, DSTM is more effective than MBLR for improving flexibility of the hamstring muscle in healthy subjects with perceived hamstring tightness.

9. ACKNOWLEDGEMENT

First and foremost we would like to dedicate this work to all those who contributed to various researches and studies done earlier in the field of physiotherapy and to all those who contributed a lot to add to my knowledge of Physiotherapy.
We express our thanks to our colleagues in Parul Institute of Physiotherapy for their help and valuable suggestions.
We owe this to our lovely parents for their constant support, care and motivation through their blessings.
Last but not the least we would like to thank all the subjects of our study without whom this task would not have been possible. We thank all those who have helped us all the while.

10. REFERENCES


27. Mulligan BR. Manual therapy: Nags, Snags, MWMs, etc. 5th edition 2006; 70-73.


