



IMMEDIATE EFFECTIVENESS OF SURYANAMASKAR, MULLIGAN BENT LEG RAISE TECHNIQUE AND STATIC STRETCHING ON HAMSTRING TIGHTNESS, MUSCLE PERFORMANCE AND PELVIC TILT ANGLES IN ASYMPTOMATIC INDIVIDUALS – A PRE AND POST-TEST DESIGN – A RANDOMIZED PILOT STUDY.

Sayali Khairnar

Post Graduate Student of Department Musculoskeletal Physiotherapy, DVVPF's College of Physiotherapy, Ahmednagar, Maharashtra, India.

Deepak Anap

Professor and HOD of Department Musculoskeletal Physiotherapy, DVVPF's College of Ahmednagar, Maharashtra, India.

ABSTRACT

Hamstring tightness is very common among asymptomatic individuals. It might be due to deskbound lifestyle, physical inactivity, or deposition of fat around the joints restricting the complete Range of motion. It may result in Low Back Pain and SI Joint Dysfunction. So this study aims to compare the immediate effectiveness of the three interventions on hamstring flexibility, muscle performance and pelvic tilt angles. Fifteen individuals of age 18-26 years having hamstring tightness were divided into 3 groups of 5 individuals each and were given a single intervention of Suryanamaskar, Mulligan Bent Leg Raise technique and Static Stretching respectively. Sit and Reach test, Single Hop for Distance Test and Pelvic Tilt Angle were assessed pre-intervention and immediate post-intervention. A significant difference was found in Mulligan Bent Leg Raise for Sit and Reach Test (p-value <0.005). Clinically there was no significant difference between the values of the Single Hop for Distance Test and Pelvic Tilt angles (p-value >0.005). It was concluded that Mulligan Bent Leg Raise and Suryanamaskar is effective in maintaining the flexibility of hamstring in asymptomatic individuals with Hamstrings Tightness.

KEYWORDS : Hamstring Tightness, Suryanamaskar, Mulligan Bent Leg Raise, Sit and Reach

INTRODUCTION

In a study conducted, prevalence of hamstring tightness was concluded to be 96% and was more in females than in males.^{[1][2]} Hamstring tightness is defined as the inability to extend the knee completely when the hip is flexed, associated with pain along the posterior thigh and this is found in asymptomatic normal individuals.^[3] Factors affecting hamstring flexibility are age, gender, tissue temperature, strength, stiffness, awkward posture, occupation, physical inactivity and reduced warm up^[4] Various biomechanical changes in joints and altered postures can be attributed to Hamstring tightness. Hence flexibility is required to perform activities of daily living with ease and to prevent Musculoskeletal Disorders.^[5]

Hamstring muscle attaches to the ischial tuberosity, increased hamstring tightness may result in decrease in the anterior pelvic tilt.^[6] This deficit is likely to negatively affect energy transfer, resulting in compensating movement strategies of adjacent segments with concomitant increased muscle load.^[7] The flexibility of the hamstring muscles plays a major role in the prevention of injury and muscular imbalance, maintenance of a full range of joint movement, optimal musculoskeletal function, and enhanced performance in sports.^[8] Since hamstrings are not used on a regular basis, so both athletes and non-athletes are not well noticed if they are short.^[9]

Suryanamaskar or salutation to the sun is an ancient method which is practiced in India, in Yoga. It consists of series of 12 physical postures - Pranamasana, hasta uthasana, padahasthasana, ashwa sanchalasana, parvatasana, ashtanga namaskara, bhujangasana. These asanas causes stretching and contraction of the muscles in a systematic manner leading to increase flexibility and strength of muscles. These postures encompass periodic forward and backward bending along with deep exhalation and inhalation respectively^[3] Straight leg raise (SLR) range can be improved with Mulligan Mobilization Techniques.^[10] Toby hall and his companions observed a significant result of mulligan BLR technique for hamstring flexibility.^[10]

Worrell et al. determined that a regular hamstring stretching program in subjects with limited hamstring flexibility improved hamstring flexibility and eccentric and concentric isokinetic hamstring torque production.^[11] Static stretching is one of the most popular method used in clinical practices for

improving flexibility.^[12] In young adults of age-group 17-28 years, hamstring tightness though not apparent or problematic, persists. These changes can result in alterations of lower limb kinematics, Low Back Pain and reduction in Muscle Performance.^[13]

Since hamstring muscle is an important component bridging the biomechanics of pelvis, spine and lower limb, the study of hamstring flexibility and its relation with pelvic tilt angle is important. So there is need to compare the techniques, like in this study – Suryanamaskar and Mulligan Bent leg raise technique. The aim of this study is to find out the immediate effectiveness of Suryanamaskar, Mulligan Bent Leg Raise Technique and static stretching on the hamstring tightness, Muscle performance and Pelvic Tilt Angles in asymptomatic individuals

Procedure

Recruitment of samples:

15 Participants were recruited from Dr. Vithalrao Vikhe Patil Foundation's College of Physiotherapy. This study's purpose and test method were fully explained to potential subjects and those who volunteered to participate were included. Samples is recruited according to inclusion and exclusion criteria.

Participants received intervention, Group A: Suryanamaskar + Warm-up program, Group B: Mulligan bent leg raise (MBLR) + Warm-up program and C: Static Stretching + Warm-up program^[28]. 15 Subjects, 5 in each group, included in the study were normal asymptomatic subjects with hamstring tightness, both male and female subjects, age group between 18 to 26 years, subjects with Sit and reach test value ≤ 26 cm, who were willing to participate and signed a consent form. Subjects were excluded with low back pain, history of hamstring injury in past years, history of neurological disease or peripheral neuropathy, history of orthopedic disorder affecting lower limb (e.g. femoral fracture, meniscal injury etc.) Intervention was given once to 3 groups.

Outcome Measure

Materials used:

Sit and reach test box, Tape measure and PALM meter Pre-test values will be taken, and immediately after intervention post-test values will be taken.

Sit and Reach Test:

It is used to assess hamstring extensibility as a linear measurement (cm) and has a moderate mean criterion-related validity ($r_p = 0.46-0.67$).^[27] The test-retest reliability has been found excellent in men ($r = 0.97$) and women ($r = 0.98$)^[17]



Figure 1: Sit and Reach Test

Single Hop for Distance Test:

It is used to assess the muscle performance of the lower extremity. The ICC – for women = 0.80, for men = 0.80^[19] The criterion-related validity for the test is $r = 0.26 - 0.58$ (Good Validity)^[28]

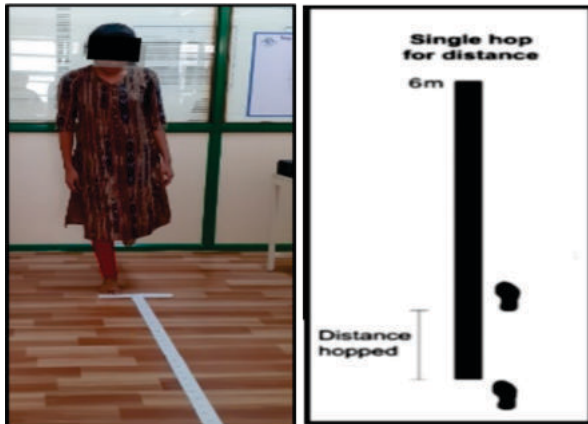


Figure 2: Single Hop for Distance Test

Pelvic Tilt Angles:

A hand-held Palm meter is used to assess the pelvic tilt angles, having an intra-rater reliability ($ICC = 0.87$).^[18] The criterion-related validity for measuring overall pelvic tilt angles is $r = 0.508$, changes in anterior pelvic tilt is $r = 0.67$.^[18]



Figure 3: Pelvic Tilt Angle - PALM Meter

Intervention



Figure 4: Group A – Suryanamaskar



Figure 5: Group B - Mulligan Bent Leg Raise



Figure 6: Group C - Static Stretching

RESULT

Statistical Analysis was done using GraphPad Instat Version 3.06. Shapiro Wilk test was used to check the normal distribution. Since the data was normally distributed – One-way ANOVA was used to analyze data within group and between the groups

Table no. 1: Descriptive and test statistics of Sit and Reach Test

	Group	N	Mean $\pm$ SD	P-Value	Result
Post-test (Sit and Reach test)	A	5	31.4 $\pm$ 2.302	0.0461	Significant
	B	5	34.2 $\pm$ 3.271		
	C	5	27.2 $\pm$ 5.507		

Table no. 2: Descriptive and test statistics of Pelvic Tilt Angle

	Group	N	Mean $\pm$ SD	P-Value	Result
Post-test (Pelvic-tilt: Anterior/ Posterior)	A	5	4.8 $\pm$ 3.421	0.0213	Significant
	B	5	8.2 $\pm$ 1.095		
	C	5	10 $\pm$ 2.55		

The result for pre and post values of Single Hop for Distance test is not significant

Table no. 3: Between group data analysis for Sit and Reach Test

Comparison	Mean Difference	P- value	Result
A vs B	-2.8	>0.05	Not Significant

A vs C	4.2	>0.05	Not Significant
B vs C	7	<0.05	Significant

Comparison between the three groups was done using one-way Anova. A Significant difference was observed in comparison between Group B (MBLR) and Group C (Static stretching). Therefore, MBLR had significant difference in improving the hamstring flexibility as compared with Suryanamaskar and Static Stretching.

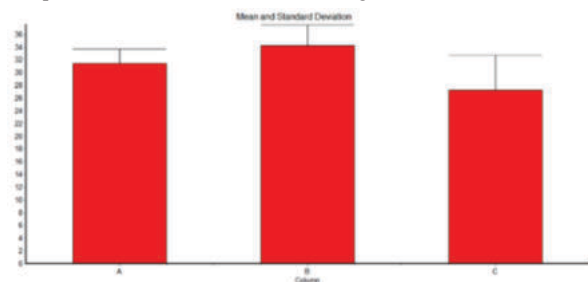


Figure 7: Between group analysis for Sit & Reach Test

Table no. 4: Between Group data analysis for Pelvic Tilt Angles

Comparison	Mean Difference	P- value	Result
A vs B	-3.4	>0.05	Not Significant
A vs C	-5.2	<0.05	Significant
B vs C	-1.8	>0.05	Not Significant

Comparison between the three groups was done using one-way Anova. A significant difference was observed between comparison of Group A (Suryanamaskar) and Group C (Static Stretching). Therefore, Static Stretching had significant difference in improving the anterior pelvic tilt Range of motion

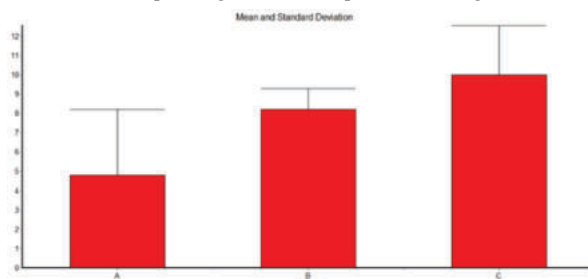


Figure 8: Between Group Analysis for Pelvic Tilt Angles

DISCUSSION

The purpose of the present study was to find out the effectiveness of Suryanamaskar, Mulligan Bent Leg Raise Technique and Static stretching on Hamstring Tightness, Muscle performance and Pelvic Tilt Angles in asymptomatic individuals. The Hamstring Tightness was assessed using Sit and Reach test, Muscle Performance was assessed using Single Hop for Distance Test and Pelvic Tilt Angle was assessed using PALM meter. Three intervention were given to the respective groups. The outcome measure values were taken at baseline and immediately after the intervention. In this study, significant results were observed in hamstring flexibility and pelvic tilt angles.

In a study conducted by Deepak Raghav et al in 2014, they studied the effect of mulligan bent leg raise technique in subjects with hamstring trigger point, in which it was concluded that BLR is effective in decreasing pain and improving ROM in subjects with hamstring trigger points.^[24] Vinod Babu et al in 2015, conducted a study in which they compared the immediate effectiveness of neurodynamic sliding technique and mulligan bent leg raise technique on hamstring flexibility in asymptomatic individuals, in which they concluded that both NDST and MBLR technique are effective in improving hamstring flexibility for asymptomatic individuals with limited SLR ROM.^[10] Same results were found

in the study conducted by Muhammad Adnan et al in 2022, who compared the bent leg raise technique and neurodynamics in patients with radiating low back pain.^[22] There was also a study comparing the effectiveness of Mulligan Techniques in improving Straight Leg Raise in subjects with hamstring Tightness, in this study it was concluded that all techniques were effective in improving pain score and straight leg raise range of motion but bent leg raise technique was most effective among all.^[23] In this study the increase in hamstring flexibility was observed more in MBLR group as compared to Suryanamaskar and Static Stretching groups. These results are in conjunction with all the previously studies. There are different schools of thoughts for improvement in SLR range with the use of Mulligan bent leg raise technique but this might be due to change in stretch tolerance of hamstring that is change in 'perceived hamstring tightness' with triggering neurophysiological responses with the use of BLR technique.^[22] Mobilization of nervous tissue has been considered as one of the causes for improvements seen after BLR technique. The movement of neural structures could be effective in dispersing intraneural edema, leading in restoring pressure gradients and relieving hypoxia.^[22] Improved mechanics of the neural structures would be one of the mechanisms for improvements after BLR.^[22]

In 2018, Dinesh Sorani et al, conducted a study on measuring the immediate effects of Surya Namaskar on Trunk and Hip flexibility among young college going students and it was concluded that Suryanamaskar shows immediate effect on improving flexibility of the muscles and can be recommended to improve flexibility component of physical fitness.^[5] Rajani et al in 2020 conducted a study on exploration of muscle activity using surface electromyography while performing suryanamaskar, in which it was concluded that suryanamaskar elicited high-to-moderate muscle activation of postural muscles of the trunk and lower extremity during altering flexion-extension of the spine.^[21] Since Suranamaskar involves a sequential postures of forward and backward bends, there is overall stretching, which was observed in the trunk and extremity muscles as well as the fascia. Due to this mechanism it can be concluded that there might be slight increase in the pelvic mobility which is evident in the Suryanamaskar group in this study.

CONCLUSION

Mulligan Bent Leg Raise Technique and Suryanamaskar are effective in improving the flexibility of hamstrings in asymptomatic individuals with hamstring tightness as compared to Static Stretching. Also Suryanamaskar is effective in improving the pelvic mobility as compared to MBLR and static stretching. Thus Suryanamaskar can be used clinically as an alternative for improving hamstring flexibility and pelvic mobility.

Limitation & Suggestions

The present study was only limited to age group 18 to 26 years. Future studies can be performed on both the gender and on healthy and elderly populations. In addition, the effects of Suryanamaskar, Mulligan Bent Leg Raise Technique and Static Stretching needs to be further investigated in long term study. Suryanamaskar can be further investigated as a tool to enhance physical fitness and quality of life dimensions in various diseased conditions

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