International Journal of Health Sciences and Research
DOI: https://doi.org/10.52403/ijhsr.20211122
Vol.11; Issue: 11; November 2021
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

The Effect of Static Stretch and Dynamic Range of Motion Training on the Flexibility of the Hamstring Muscle

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ABSTRACT

Introduction: A normal flexibility is required for an appropriate posture and entire activity in daily life. Hamstring is the muscle that is more prone for tightness. It present in all age groups and it increases with age and more over it is the muscle that is most prone to injuries during sporting activities. With regard to various methods that contribute to increasing flexibility of hamstring muscles, the current study aimed at investigating immediate effects of static stretching and dynamic range of motion training on hamstring flexibility increasing muscle flexibility.
Methodology: 30 patients, age range 21-50 years, diagnosed with the Population who had hamstring tightness and divided equally into two groups-Group A and Group B. In Group B-Static Stretch exercise and in Group A-Dynamic Range of Motion Training exercise.
Result: Pre and post evaluation of active knee extension test was taken. Result shows that there was significant improvement noted in both the groups (GROUP A: P value .000, t value:-17.9) and (GROUP B: P value: .000, t value:-17.6)
Conclusion: Both the static stretch and dynamic exercise can be considered as an effective method for increasing flexibility and improving functions with hamstring tightness patients.

Keywords: Hamstring flexibility, Dynamic range of motion, and static stretch.

INTRODUCTION

Muscle flexibility is the ability of a muscle to lengthen and to allowing joints move to a full range. [1] The range of motion available in a joint or a group of joints that is influenced by muscles, tendons, ligaments and bones. [2] The hamstrings are a group of three muscles which predominantly act to flexing the knee. The hamstring muscles become more active than any other muscle in lower extremity. [3] The increased flexibility resulting from stretching activities may decrease the incidence of musculotendinous injuries. [4] The high intensity exercises may create hamstring injuries and this is the most common musculotendinous injuries in the lower extremity. [5] To accommodate to imposed stress more easily and allow efficient and effective movement good muscle flexibility is needed. The decreased hamstring flexibility is a risk factor for the development of patella tendinopathy and patellofemoral pain, hamstring strain injury, and symptoms of muscle damage. [4] It difficult for clinicians to identify the best clinical strategies for improving hamstring flexibility. [6] Various stretching techniques have been used in an attempt to improve hamstring flexibility and avoid a decrease in (ROM) that can impair functional activities in an individual. [7-8]

Static stretching is one of the most commonly performed stretching methods

used to increase muscle length. To avoid eliciting a stretch reflex the stretch has to be applied with a constant force in a slow manner. The resultant increase in muscle length is related to viscoelastic behaviour. [5] The static stretching results in increased ROM, no matter is how long stretches should be held to get maximum benefits. [9] Single episode of stretching and after several weeks of stretching has been observed the Increased ROM. An increase in maximal joint ROM occurs during a single episode of the static stretch, it has been demonstrated that a 30-second hamstring stretch performed once a day is sufficient to increase knee joint ROM. Proposed mechanisms for the benefits derived from static stretching for several weeks include an actual increase in musculotendinous length and also a high tolerance to stretch. [10]

DS has been shown to improve several performance factors. [7] The DROM technique is an active self-stretching Technic during which, a contraction by the antagonist muscle causes the joint crossed by the agonist muscle to move through the full ROM in a controlled manner. DROM exercises is a technique that takes advantage of reciprocal innervation. Here it begins from a neutral position, followed by a slow movement for about 4-5 seconds of the limb to end range, a brief hold at end range 4-5 seconds and eventually, slowly 4-5 seconds moving the limb back to the original neutral position using an eccentric contraction. Most studies on DROM are concentrated on its short and long term effect on hamstring flexibility. [11] This dynamic action is carried out in a controlled manner and is repeated for a specified period of time. [12] The effect of DS protocols on muscle performance had been investigated, which generally have a positive relationship. [13] Using AKE Test the Subjects were assessed for hamstring tightness. Hence this study is conducted to find out which technic is more effective static stretching and dynamic range of motion.

NEED OF THE STUDY

A normal flexibility is necessary for a subject. Hamstring tightness is present in all age groups and most prone to injuries during sporting activities. The various methods are there to increasing flexibility of hamstring muscles, the current study aimed at investigating immediate effects of static stretching and dynamic range of motion training on hamstring flexibility increasing muscle flexibility. Therefore, the purpose of the study was to compare the effects of DROM and static stretching of the hamstring muscles with increasing hamstring flexibility as measured by AKE ROM.

OBJECTIVE

The Effectiveness of Static Stretch and Dynamic Range of Motion Training on the Flexibility of the Hamstring muscle.

To compare the effect of static stretch and dynamic range of motion training on the flexibility of hamstring muscle.

To measure the improvement in knee extension by using active knee extension test.

MATERIAL AND METHODOLOGY

An observational study was done on 30 patients with age group between 21 to 50 years. Expect the difference of 7.1 units in the gain with standard deviation of 6, using 95% confidence interval and 90 percentage power. The sample size for the estimated study is 15 subjects each group. Hence a total of 30 individuals is included in this study.

$$n = \frac{\{[Z_1 - \alpha/2 + Z_1 - \beta]^2\ 2\ S_1\}^2}{[Mean\ difference]^2}$$

Outcome measurement: Active Knee Extension Test was used. Inclusion criteria were as follows: Aged between 21-50 years of age, both genders, tight hamstring. Exclusion criteria were as follows: Acute or chronic low back pain, Acute or chronic hamstring injury, any lower limb surgical history. Material used in the study were goniometer, paper and pen. Data for this

study was obtained from Tertiary Care Hospital. Patients were randomly selected, detail explanation regarding study was given to the patients. Consent was taken by the patients. An ethical Approval was obtained from the respective institutional ethical committee for conducting the study. Total 30 patients were included in the study, 15 in each group and were further divide into two groups. In the Group A was given DROM by lying supine and holding their hip in 90" of flexion. The subject was extended the leg actively for 5 seconds, then held the leg at the end range of knee extension for 5 seconds, and eventually lowered the leg 5 seconds, which was considered one repetition. Each timed each step for six repetitions. DROM performing for six repetitions of 5 seconds and actual stretching time is allowed each for 30 seconds and later it could be compared with 30- seconds of performed static stretch. Group B was given static stretching exercise by standing in an erect posture with left foot planted on the floor and pointing straight ahead with no internal or external rotation of the hip. The right hamstring muscles were stretched by placing the right calcaneal aspect on an elevated surface with the knee fully extended position and toes pointed to the ceiling. Hip should be flex forward and the spine should maintain a neutral position, while reaching the arms forward until a gentle stretch was felt in the posterior thigh. Once this position was attained, the stretch was sustained for 30 seconds. Each was treated once daily and for 5 weeks. AKE Test was measured before and after the completion of treatment. Six month was the total duration of the study.

STATISTICAL ANALYSIS

SPSS version 20 was used for analysis. Paired T Test and Students T Test was used to compare the outcome measure of the effect of static and dynamic range of motion training on the flexibility of hamstring muscle. Paired T Test was used to test the mean difference between the groups and Student T Test was used to compares the means of two independent groups. Significance level was fixed at $p<0.05$.

RESULTS

Paired T Test was applied for used to test the mean difference between the groups. Result shows significance difference in AKE Test before and after the intervention in both the groups and Student T Test was used to compares the means of two independent groups. AKE Test shows significant difference in both groups. Hence, there is statistically significant improvement in ROM in this study

Table: 1 pre and post Active knee extension range in groups A and group B

OUT COME MEASURE	GROUPS	PRE (Mean±SD)	POST(Mean±SD)	DIFFERENCE	P-value	T-value
AKE	GROUP A	44.8±10.3	76.2±9.6	-31.4±6.7	.000	-71.9
	GROUP B	47.1±11.7	57.0±10.6	-9.8±2.1	.000	-17.6

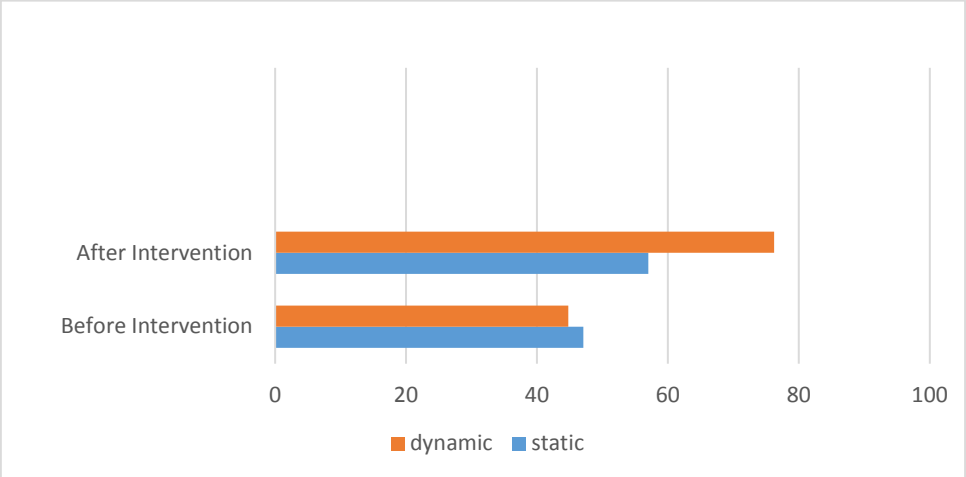

Chart: the mean of before and after intervention of outcome measures

Table; 2 the difference of Active knee extension Range of motion in groups A and group B

OUTCOME MEASURES	GROUPS	Mean±SD	Mean Difference	t-value	SIGNIFICANCE
AKE	GROUP A	31.2±6.6	21.3	11.8	.000
	GROUP B	9.8±2.1			

DISCUSSION

The current study was conducted to determine the effect of static stretch and dynamic range of motion training on the flexibility of the hamstring muscles. The hamstring muscles is the most active muscle than any other muscle in lower extremity. The stretching activities increased flexibility of the muscle and it helps to decreases the musculotendinous injuries. Here both the Static stretching and DROM Training helps to increase the length of the hamstring muscle. Results shows that there was significant improvement noted within the groups and also comparing between the groups. Comparing Group B, Group A shows more significant improvement in range of motion of hamstring flexibility.

William D. Bandy et al, in their study on the optimal time and frequency of static stretching to improve hamstring muscles flexibility, reported that 30-second duration is an effective amount of time to sustain a hamstring muscle stretch in order to increase ROM. [1] Adel Rashad Ahmed, in their comparative study on dynamic stretching and muscle energy technique suggest that both increases the hamstring flexibility in healthy adults. [13]

Limitation of the study was that above 50 years of age was not considered and moreover patients having back pain were not included.

CONCLUSION

Both the static stretch and dynamic exercise can be considered as an effective method for increasing flexibility and improving functions with hamstring tightness patients

ACKNOWLEDGEMENT

Thanks to all the subjects who participated in the study to make this study successful. I want to thanks my parents and friends for motivation and their help throughout my study.

Conflict of Interest: None

Source of Funding: None

Ethical Approval: Approved

REFERENCES

1. William D Bandy, Jean M, Irion Michelle Briggler et al. The Effect of Time and Frequency of Static Stretching on Flexibility of the Hamstring Muscles. Physical Therapy. 1997 Oct: 77(10); 1090-6.
2. William D Bandy, Jean M lrion et al. The Effect of Time on Static Stretch on the Flexibility of the Hamstring Muscles. Physical Therapy 1994 Sep; 74(9); 845-50.
3. Teddy W. Worrell, Troy I. Smith, Lason Winegardner et al, Effect of Hamstring Stretching on Hamstring Muscle Performance. JOSPT 1994 Sep;20(3) ;154-9
4. D Hopper, S Deacon, S Das et al, Dynamic soft tissue mobilisation increases hamstring flexibility in healthy male subjects. Br J Sports Med 2005; 39:594–598.
5. Volker C. de Weijer, Gerard C Gorniak, Eric Shamus et al, The Effect of Static Stretch and Warm-up Exercise on Hamstring Length Over the Course of 24 Hours. g. J Orthop Sports Phys Ther 2003; 33:727-733.
6. Laura C. Decoster, Joshua Cleland, Carolann Altieri et al, The Effects of Hamstring Stretching on Range of Motion: A Systematic Literature Review, J Orthop Sports Phys Ther 2005;35:377-387.
7. Alain j. Aguilar, Lindsay j. Distefano, Cathleen n. brown. A dynamic warm-up model increases quadriceps strength and hamstring flexibility. J Strength Cond Res.2012 Apr; 26(4); 1130-41.
8. William G. Webright, Billie Jane Randolph, David H. Perrin .Comparison of Non ballistic Active Knee Extension in Neural Slump Position and Static Stretch Techniques on am string Flexibility. JOSFT – 1997 July, 26 (1); 7-13.

9. Jennifer M Roberts, K Wilson. Effect of stretching duration on active and passive range of motion in the lower extremity. Br J Sports Med 1999; 33:259–263.
10. Richard W Willy, Bryan A. Kyle, Shawn A. Moore, et al. Effect of Cessation and Resumption of Static Hamstring Muscle stretching on Joint Range of Motion. Journal of Orthopaedic & Sports Physical Therapy 2001; 31(3): 138-144.
11. Ana ferri-caruana, Noelia roig-ballester, Romagnoli et al, effect of dynamic range of motion and static stretching techniques on flexibility, strength and jump performance in female gymnasts. Science of Gymnastics Journal, 2020 July; 87 – 100.
12. Kieran O'Sullivan et al. The effect of warm-up, static stretching and dynamic stretching on hamstring flexibility in previously injured subjects. BMC Musculoskeletal Disorders 2009, 10-37.
13. Adel Rashad Ahamed, A comparative study of Muscle Energy Technique and Dynamic Stretching on Hamstring Flexibility in Healthy Adults. Bulletin of Faculty of Physical therapy 2011; 16(1).

How to cite this article: Nair VK, Priya S, Jishana S. The effect of static stretch and dynamic range of motion training on the flexibility of the hamstring muscle. *Int J Health Sci Res.* 2021; 11(11): 166-170. DOI: *https://doi.org/10.52403/ijhsr.20211122*

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