International Journal of Physical Education, Sports and Health 2023; 10(1): 389-393

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.38
IJPESH 2023; 10(1): 389-393

www.kheljournal.com
Received: 12-11-2022
Accepted: 19-12-2022

Sujithlal SJ
Post-Graduate Student, Yenepoya Physiotherapy College, Yenepoya Deemed to be University, Derlakatte, Mangalore, Karnataka, India

Nigat Fathima PA
Associate Professor, Yenepoya Physiotherapy College, Yenepoya Deemed to be University, Derlakatte, Mangalore, Karnataka, India

Corresponding Author:
Nigat Fathima PA
Associate Professor, Yenepoya Physiotherapy College, Yenepoya Deemed to be University, Derlakatte, Mangalore, Karnataka, India

Immediate effect of static stretching versus instrument assisted soft tissue mobilization on hamstring flexibility in healthy young individuals with hamstring tightness

Sujithlal SJ and Nigat Fathima PA

Abstract
Background: The hamstring muscle is a two joint muscle which easily get injured. There are many techniques to improve the flexibility of hamstring muscle, among them static stretching is the commonly used technique. Recently instrument assisted soft tissue mobilization has been reported to be effective in promoting the extensibility of the shortened hamstring. There was no data available for the immediate effect of instrument assisted soft tissue mobilization and stretching on hamstring flexibility.
Objective of the study: To investigate and compare the effects of static stretching and IASTM over hamstring flexibility using active knee extension test.
Study Design: Comparative study.
Materials and Methods: A total 90 participants aged between 18-25 years were included in the study. Participants were randomly allocated into two groups. Group A received instrument assisted soft tissue mobilization (IASTM). Group B received static stretching. Pre and Post intervention value of active knee extension (AKE) test were measured.
Result: The results showed within group improvement in static stretching and IASTM which was statistically significant (p<0.05) but between group comparison showed no significant difference between static trenching and IASTM
Conclusion: In this study both the groups treated either with static stretching or IASTM had a significant effect on hamstring flexibility among healthy young individuals with hamstring tightness but when effects compared between the two groups, there was no significant difference found.

Keywords: Static stretching, Instrument assisted soft tissue mobilization, AKE

Introduction
The movements of the human body are controlled by muscular system [1]. There are many factor which result in decreased range of motion in synovial joint among them muscular tightness is very common [2]. A reduction in muscular flexibility causes damage to skeletal system there by reducing him functional level. Due to large functional exertion and high percentage of fast twitch fibers multi joint muscle are prone to such damage [3].
For improving the performance of physical activities and for most targeted musculoskeletal functioning, flexibility is an important factor of fitness.[4] A major problem accepted by common man as well as sportspersons, are flexibility dysfunction, mainly in case of hamstring group of muscles [5, 6].
Muscle tightness affects the length tension relationship of muscle as well as shock absorbing ability of the limbs. Reduction in flexibility will results in the decrease of range of motion and postural problems. Reduction of optimal performance also occurs by muscle tightness due to the compression of blood vessels [7].
The hamstring muscle is a two joint muscle and it is easily subjected to large length changes as compared to muscles crossing only one joint, hence hamstring is frequently injured [8]. In normal day to day activities full contraction of hamstring rarely occur. So there are chances of getting tightness and usually occurs in individual who do not stretch regularly [9]. The prevalence of hamstring tightness is more among individuals of age 18-25 years [10]. The risk of damage to the musculoskeletal system can be caused by the reduction of hamstrings flexibility [11, 12]. For general health and physical fitness, flexibility of the hamstring is important [13, 6]. The hamstring muscle are most prevalent for the tightness in the body [14].

Poor hamstring flexibility contributes to the lower extremity injuries and low back aches [15-16]. Tight hamstring not only disturb the biomechanics at knee joint but also reaction forces and mechanics of hip and ankle joint. Reduced range of motion due to hamstring tightness can lead to several musculoskeletal problems [17]. During spinal flexion, higher compressive loads on the lumbar spine occurs due to the increased tension in muscle and ligaments in the lumbar region by the limited anterior pelvic tilt due to hamstring tightness [18]. Stability of sacroiliac joint is also affected by the postural changes associated with tightness of hamstrings in an indirect way [19]. Hence, the hamstring flexibility plays a critical role for overall well-being and optimal physical fitness [20].

Normal length and strength of hamstring is required for the unaffected functional activities. There are many techniques to improve the flexibility of hamstring muscle and among them static stretching is the commonly used technique [21-23]. Static stretching and dynamic stretching are the two types of stretching. Both techniques improve flexibility and range of motion but the static stretching is the most fruitful technique in improving flexibility [24].

Recently instrument assisted soft tissue mobilization has been reported to be effective in promoting the extensibility of the shortened hamstring [25]. It is one of the method of soft tissue mobilization. It was based on the mechanism that it generates mechanical micro traumatic damage to the treated area. Healing process and restoration of flexible normal tissue was achieved by creating an inflammatory response. Inhibiting the adhesions of tissue, increasing the number of fibroblasts and promoting collagen synthesis are the therapeutic effects of IASTM [26].

Hence this study is intended to compare the effects between the static stretching and IASTM on hamstring flexibility of young individuals with hamstring tightness.

Methodology

Study Design: comparative study

Study Setting: YMCH, Mangalore.

Source of data: Students of private medical college Mangalore.

Method of data collection: 90 subjects including both male and female were recruited and screened for exclusion and inclusion criteria. Eligible subjects were randomized by lottery method to Group-A and Group B.

Inclusion criteria

1. 1 Participants having hamstring tightness.
2. 2 AKE angle < 20°.
3. Age group between 18 to 25 years.

Exclusion criteria

1. History of hamstring injury.
2. Individuals undergoing flexibility, strengthening, or any other program which can affect the study.
3. Any neurological disorders affecting lower limb.
4. Recent fractures and surgeries of lower limb.
5. 5 Patient who can't tolerate the stretch.

Sampling Method: Random sampling.

Sampling Size: Using independent t-test effect size 0.6% level of significance 5%power 80% the minimum sample size required is 45 in each group.

Population: Students of age group between 18 to 25 years.

Outcome Measures: Hamstring flexibility - Active knee extension test.

Procedure

Written consent was taken from subject who fulfil the inclusion and exclusion criteria and who volunteered to participate in the study. Subjects demographic data age, gender were recorded. Subjects who met the inclusion criteria were assigned into two groups based on convenient sampling. A pre-treatment active knee extension test was performed by a physiotherapist who have 2 year of experience for evaluating the tightness of hamstring. The subjects were assigned into two groups: Group A (n=45) that received instrument assisted soft tissue mobilization. Group B (n=45): that received passive static stretching.

Instrument Assisted Soft Tissue Mobilization Technique

The patients were made to lie prone with foot outside the couch and in the center of the bed. The therapist was stand on same side of the extremity to be treated beside the thigh and placed the treatment EDGE tool on posterior aspect of thigh. Gel was applied to the posterior aspect of thigh with the blade. Adhesions were assessed with the blade in both upward and downward direction, whichever felt better was used for the treatment. 30 strokes was given for the area consisting of maximum adhesions. The plane was held in 45° position on the treatment area. The treatment was done by certified IASTM practitioner. After the Instrument Assisted Soft Tissue Mobilization treatment immediate effect was measured by the same physiotherapist who were performing the screening using active knee extension test.

Static stretching

The participant was made to lie in a supine used to stabilize the participant's contra lateral limb and pelvis to the plinth. To perform static stretching, hip and knee was taken into 90-90 position and knee was slowly extended until the therapist felt maximum resistance. The stretch was maintained for 30 s and repeated thrice with a rest interval of 15 s between each repetition. The passive stretching was performed by another physiotherapist. After the static stretching the immediate effect were measured by the same physiotherapist who were performing the screening using active knee extension test

Materials and Tools

1. Paper.
2. Pen.
3. Universal goniometer.
4. Gel and cotton.

Statistical Analysis

Sample data were analysed with SPSS version 20.0. Variables are described as mean and standard deviation (SD) for normally distributed continuous variables. Paired t test was used to analyze the within group AKE angles from pre and post interventions. Independent t-test was used to study differences between two groups.

Results

For this study ninety (n=90) subjects were selected to

compare the effect of IASTM against static stretching, the demographic data was shown in table 1.

Table 1: Demographic Characteristics

Characteristics	Values (Group 1)	Values (Group 2)
Age (Mean ± SD)	21.37 ± 1.13	21.13 ± 1.09
Gender (No., Percentage)		
Male	30.,67%	18., 40%
Female	15.,33%	27., 60%

Interpretation

The mean and standard deviation of age in group1 and 2 are 21.37 +1.13 and 21.13 +1.09 respectively. Group 1 contain. 80% males and 20% females. Group 2 contains 28% males and 72% females.

Table 2: Comparison of pre-test and post-test values of AKT in group 1 by paired t test

IASTM	Mean	Standard deviation	T Value	P Value	95% Confidence interval
Pre	65.78	4.52	18.96	0.000*	12.52 to 15.48
Post	51.78	6.23			

*p<0.05 is considered as significant

Interpretation

Within group analysis of group 1shows statically significant difference in AKT angles p<0.05

Table 3: Comparison of pre-test and post-test values of AKT in group 2 using paired t test

Static stretching	Mean	Standard deviation	T Value	P Value	95% Confidence interval
Pre	64.67	7.49	19.259	0.000*	9.25 to 11.41
Post	54.33	8.57			

*p<0.05 is considered as significant

Interpretation

Within group analysis of group 1shows statically significant difference in AKT angles p<0.05.

Table 4: Comparison between group-1 and group-2 using independent t test

Intervention	N	Mean	Standard deviation	T Value	P Value	Mean Difference	95% Confidence Interval
IASTM	45	51.77	6.23	1.618	0.109	2.55	-0.58 to 5.69
Static Stretching	45	54.33	8.56				

*p<0.05 is considered as significant

Interpretation

There was no statistical significant difference between the static stretching and instrument assisted soft tissue mobilization in improving the hamstring flexibility.

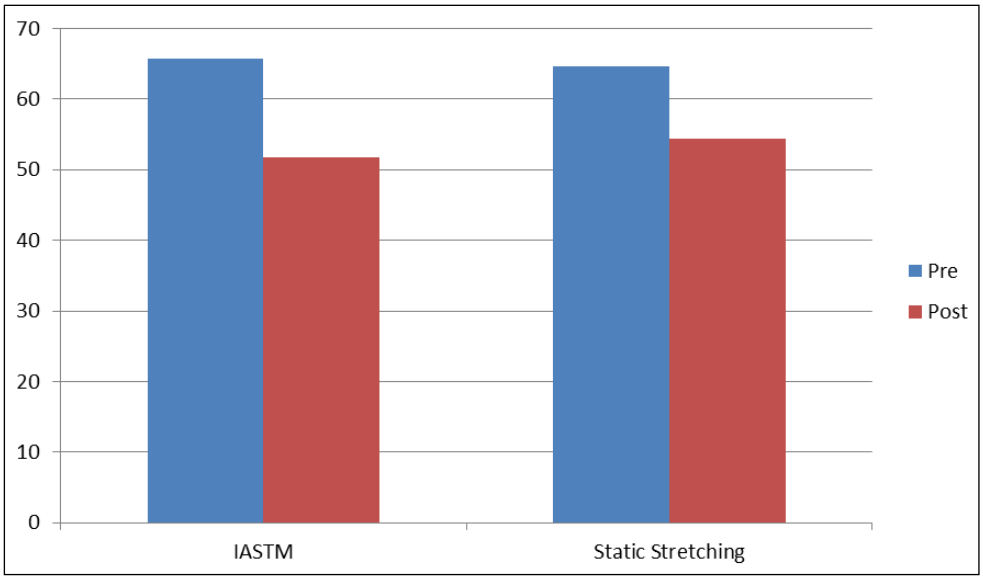

Fig 1: Comparison of IASTM ad Static Stretching pre-test ad post-test mean values

Discussion

The aim of the study was to compare the effect of IASTM and Static stretching on hamstring flexibility of healthy young individuals. Both experimental interventions demonstrated a statistically significant increase in hamstring flexibility. But when compared between their effects, there was no significant difference found.

In the present study, age group of subjects were between 18-25 years. Previous studies shows that 20-25 years of age were prone to get the hamstring tightness, owing to the increased physical stress, and decreased concentration on muscle flexibility during workout. Aging plays an important role in the reduction of muscular flexibility, which sets the platform for myofibril genesis inducing muscular tightness. It is proved that hamstring tightness attains as schooling starts among the children. It increases till 25 years of age. Once the physical stress reduces the tightness within hamstring decreases and after attainment of old age, the tightness increases further [22].

There are several studies which justifies the reasons for improving hamstring flexibility by static stretching. According to Magnusson *et al*. acute increase in the muscle length after static stretching have been attributed largely to

concomitant increases in the capacity to tolerate loading prior to stretch termination (i.e., stretch tolerance) and/or to changes in mechanical properties (i.e., reduced muscle stiffness) [41]. Although, both mechanisms are reported generally, substantial alterations in the study parameters (duration, intensity, muscle group, subject demographics) limit our ability to fully determine the importance of these mechanisms to increases in ROM after static stretching. In contrary, Weppler and Magnuss explained that effect of stretching on the improvement of muscle length are not completely understood [30].

The improvements in ROM observed following static stretching might be explained by the following reasons that stress created by specific degree of stretching in static stretching there is a large chances of increasing the number of sarcomeres in series (muscle length) owing to longer exposure to the stresses [41]. In addition, muscular extensibility enhanced by stretching were due to the increase in visco-elasticity and decrease in stiffness of muscle and connective tissues. The existence of muscular mechanical adaptation after static stretching was explained by many studies. Increased sensory capability of tolerating the discomfort associated with stretching of tight muscles is the mechanical change in muscular extensibility. Finally stretching was effective in improving flexibility regardless of the mechanisms behind flexibility improvements [42].

The improvement in hamstring flexibility in the IASTM group is because of the breaking of adhesions within the facia of muscle that limites the extensibility [43]. IASTM technique helps to bring tightened muscles back to normal functioning length which is explained by the fact that strokes used by the tools focuses on a tightened muscle fibber. According to Prentice WE, relaxation is one of the possible reason for improved hamstring flexibility after the application of Graston Technique. In this the strokes are parallel to Swedish massage strokes which are long and slow. These strokes results in muscle relaxation which is reflected as tissue elongation. As a result of natural process of healing or as a protection for loads due to stress or tension the adhesions occurs. Also, another possibility is that mechanical micro traumatic damage produced by soft tissue mobilization treatment method using IAST creates an inflammatory response. As a result there was an acceleration in the healing process and restoration of normal flexible tissue [44].

Between groups comparison does not show any statistical significant difference. This could be due to the difference in group demographics since static stretching group had less number of males (N=18) and more number of females (N=27), whereas the IASTM group had more males (N=30) than females (N=15). The literature indicates that males tend to be less flexible at baseline than females. Studies showed that females respond significantly higher rates of change to the immediate bout of stretching than males. If this is the case, higher mean change after static stretching may be due to higher number of females in the static stretching group hence the study showed that both static stretching and IASTM are beneficial in improving hamstring flexibility.

Conclusion

In this present study both the groups treated either with static stretching or IASTM had a significant effect on hamstring flexibility in young individuals with hamstring tightness but when comparing between their effects there was no significant difference found. Hence we conclude the study by stating that there no significant difference between the effect of static stretching and IASTM on hamstring flexibility in young individuals with hamstring tightness

Limitation

- IASTM may be less appropriate for some individuals hence IASTM are more broad than those for static stretching.
- Our study was done in healthy participants, so it is hard to generalize the results to individuals with pathological conditions.
- Unequal distribution of male and female participants in both the groups.

Future scope

- Long term effects of the interventions can be studied.
- Further studies can be carried out among female or male population alone.

References

1. Kage V, Bootwala F, Kudchadkar G. Effect of Bowen Technique versus Muscle Energy Technique on Asymptomatic Subjects with Hamstring Tightness: A Randomized Clinical Trial. International Journal of Medical Research & Health Sciences. 2017 Jan 1;6(4):102-8.
2. Page P. Current concepts in muscle stretching for exercise and rehabilitation. International journal of sports physical therapy. 2012 Feb;7(1):109.
3. Lim KI, Nam HC, Jung KS. Effects on hamstring muscle extensibility, muscle activity, and balance of different stretching techniques. Journal of Physical Therapy Science. 2014;26(2):209-13
4. Phrompaet S, Paungmali A, Pirunsan U, Sitilertpisan P. Effects of pilates training on lumbo-pelvic stability and flexibility. Asian Journal of sports medicine. 2011 Mar;2(1):16.
5. Adkitte R, Rane SG, Yeole U, Nandi B, Gawali P. Effect of muscle energy technique on flexibility of hamstring muscle in Indian national football players. Saudi Journal of Sports Medicine. 2016 Jan 1;16(1):28.
6. Weerasekara I, Kumari I, Weerarathna N, Withanage C, Wanniarachchi C. The prevalence of hamstring tightness among the male athletes of university of peradeniya in 2010. J Palliative Care Med. 2013;1(108):2.
7. Vidhi S, Anuprita T, Asmita K, Twinkle D, Unnati P, Sujata Y. Comparison of PNF technique with NDS technique for hamstrings tightness in asymptomatic subjects. Indian Journal of Physiotherapy and Occupational Therapy. 2014 Jul 1;8(3):158.
8. Talapalli R, Sheth MS. Comparison of muscle energy technique and post isometric relaxation on hamstring flexibility in healthy young individuals with hamstring Tightness. Int J of Health and Rehabil. 2014;3(2):65-8
9. Koli BK, Anap DB. Prevalence and severity of hamstring tightness among college student: A Cross Sectional Study. International Journal of Clinical and Biomedical Research; c2018.
10. Hennessey L, Watson AW. Flexibility and posture assessment in relation to hamstring injury. British journal of sports medicine. 1993 Dec 1;27(4):243-6.
11. Jonhagen S, Nemeth G, Eriksson E. Hamstring injuries in sprinters: the role of concentric and eccentric hamstring muscle strength and flexibility. The American Journal of Sports Medicine. 1994 Mar;22(2):262-6
12. Hultman G, Saraste H, Ohlsen H. Anthropometry, spinal

canal width, and flexibility of the spine and hamstring muscles in 45-55-year-old men with and without low back pain. Journal of spinal disorders. 1992 Sep;5(3):245-53.
13. Hreljac AL, Marshall RN, Hume PA. Evaluation of lower extremity overuse injury potential in runners. Medicine & Science in Sports & Exercise. 2000 Sep 1;32(9):1635-41.
14. Grieve R, Goodwin F, Alfaki M, Bourton AJ, Jeffries C, Scott H. The immediate effect of bilateral self myofascial release on the plantar surface of the feet on hamstring and lumbar spine flexibility: A pilot randomised controlled trial. Journal of bodywork and movement therapies. 2015 Jul 1;19(3):544-52.
15. Mason JS, Crowell M, Dolbeer J, Morris J, Terry A, Koppenhaver S, *et al*. The effectiveness of dry needling and stretching vs. stretching alone on hamstring flexibility in patients with knee pain: a randomized controlled trial. International journal of sports physical therapy. 2016 Oct;11(5):672.
16. Hartig DE, Henderson JM. Increasing hamstring flexibility decreases lower extremity overuse injuries in military basic trainees. The American journal of sports medicine. 1999 Mar;27(2):173-6.
17. Houston MN, Hodson VE, Adams KK, Hoch JM. The effectiveness of whole-body-vibration training in improving hamstring flexibility in physically active adults. Journal of sport rehabilitation. 2015 Feb 1;24(1):77-82.
18. Whitley CR, Dufek JS. Effects of backward walking on hamstring flexibility and low back range of motion. International Journal of Exercise Science. 2011;4(3):4.
19. MassoudArab A, RezaNourbakhsh M, Mohammadifar A. The relationship between hamstring length and gluteal muscle strength in individuals with sacroiliac joint dysfunction. Journal of Manual & Manipulative Therapy. 2011 Feb 1;19(1):5-10.
20. Nishikawa Y, Aizawa J, Kanemura N, Takahashi T, Hosomi N, Maruyama H, *et al*. Immediate effect of passive and active stretching on hamstrings flexibility: a single-blinded randomized control trial. Journal of physical therapy science. 2015;27(10):3167-70.
21. Medeiros DM, Cini A, Sbruzzi G, Lima CS. Influence of static stretching on hamstring flexibility in healthy young adults: Systematic review and meta-analysis. Physiotherapy theory and practice. 2016 Aug 17;32(6):438-45.
22. Mohr AR, Long BC, Goad CL. Effect of foam rolling and static stretching on passive hip-flexion range of motion. Journal of sport rehabilitation. 2014 Nov 1;23(4):296-9
23. Konrad A, Stafilidis S, Tilp M. Effects of acute static, ballistic, and PNF stretching exercise on the muscle and tendon tissue properties. Scandinavian journal of medicine & science in sports. 2017 Oct;27(10):1070-80.
24. Covert CA, Alexander MP, Petronis JJ, Davis DS. Comparison of ballistic and static stretching on hamstring muscle length using an equal stretching dose. The Journal of Strength & Conditioning Research. 2010 Nov 1;24(11):3008-14.
25. Kim DH, Ms TH, Jung DY, Weon JH. Effects of the graston technique and self-myofascial release on the range of motion of a knee joint. Journal of Korean Society of Physical Medicine. 2014 Nov 31;9(4):455-63.
26. Gehlsen GM, Ganion LR, Helfst RO. Fibroblast responses to variation in soft tissue mobilization pressure. Medicine and science in sports and exercise. 1999 Apr;31(4):531-5.
27. Loutsch RA, Baker RT, May JM, Nasypany AM. Reactive neuromuscular training results in immediate and long term improvements in measures of hamstring flexibility: A case report. International journal of sports physical therapy. 2015 Jun;10(3):371.
28. Nishishita S, Tanaka H, Umehara J, Ichihashi N. Static stretching duration needed to decrease passive stiffness of hamstring muscle-tendon unit. The Journal of Physical Fitness and Sports Medicine. 2019 May 25;8(3):113-6.
29. Prentice WE. Off-the-field injury evaluation. In: Prentice WE, ed. Arnheim's Principles of Athletic Training. 12th edition. New York, NY: The McGraw-Hill Companies; c2006. p. 381.
30. Magnusson SP, Simonsen EB, Aagaard P, Sørensen H, Kjaer M. A mechanism for altered flexibility in human skeletal muscle. The Journal of physiology. 1996 Nov 15;497(1):291-8.
31. Weppler CH, Magnusson SP. Increasing muscle extensibility: a matter of increasing length or modifying sensation?. Physical therapy. 2010 Mar 1;90(3):438-49.
32. Medeiros DM, Cini A, Sbruzzi G, Lima CS. Influence of static stretching on hamstring flexibility in healthy young adults: Systematic review and meta-analysis. Physiotherapy theory and practice. 2016 Aug 17;32(6):438-45.