Immediate effect of muscle energy technique in comparison with passive stretching on hamstring flexibility of healthy individuals: A randomized clinical trial

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ABSTRACT

Objective: To determine the effective treatment for the Hamstring tightness by Passive Stretching and Muscle Energy Technique.
Study Design: A randomized clinical trial.
Place and Duration: Riphah College of Rehabilitation Sciences Lahore in 5 months 15th March to 15th August, 2015.
Methodology: Subjects of both genders with age between 25- 50 years with Tight hamstrings were included in the study and allocated in two groups after randomization. One group was given stretching and the other group was treated with muscle energy technique. Moist heat was given for 20minutes as standard treatment to both groups. The effects of Muscle Energy Technique and Static Stretching was calculated by taking pre and post-treatment readings of active knee extension (AKE), Straight Leg raise (SLR) and visual analogue scale (VAS).
Results: Within the group analysis revealed statistically significant difference (p value < 0.05) for each of the outcome measure in each of the treatment group. VAS showed a mean reduction of 4.40 ± 5.26 and 6.80 ± 6.10 in stretching and MET group respectively. AKE showed a mean difference of 4.80 ± 5.29 in stretching and 7.80 ± 8.90 MET groups. SLR showed a mean difference of 1.12 ± 1.09 in stretching and 1.52 ± 0.91 MET groups. However, across the group comparison showed no significant difference in VAS, AKE and SLR with a mean difference of 2.40, 3.00 and 0.40 respectively with p value greater than 0.05
Conclusion: Within the group each technique showed significant improvement but on comparing the two groups there was no significant difference in improving the hamstring muscle flexibility, so static stretching and muscle energy technique both are equally effective.
Keywords: Flexibility, Hamstrings muscle, Muscle energy technique and Static stretching, Tightness, Range of motion

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INTRODUCTION

Flexibility is considered the basic component of human fitness and decreased flexibility of soft tissues lead to severe musculoskeletal injuries. In lower extremity one of the most common musculotendinous injuries are hamstrings injury[1,2]. According to a study Hamstring muscle injury is the most common of all injuries in American football[3], and in another study estimate its prevalence is 16% in Australian Rules football[4]. In Division 1 soccer teams after knee and ankle injuries the third most common injury is hamstring strains[5]. In a study Woods et al[6] reported 12% hamstring strains in professional soccer players injuries and according to an estimate £74.7 million is the financial burden.

Hamstring muscle tightness is when the hip is flexed and one is unable to extend knee completely and also complains some sort of discomfort and pain in the posterior compartment of thigh[7]. To improve the flexibility different stretching interventions have been widely used such as soft tissue mobilization technique, stretch and spray technique, stretching and its different types (static, ballistic, and proprioceptive neuromuscular facilitation) technique, and muscle energy technique[8-10]. In these treatment strategies Muscle Energy

Technique and Static Stretching are commonly used. Although the treatment effect of different stretching techniques on hamstring flexibility has been evinced in these studies, but still it cannot be determined which stretching technique is better in improving the hamstring flexibility as results of different studies varies with each other[11]. Most of the work in these studies was done on sports injuries but there is need to be more research work on asymptomatic individuals with hamstring. There has been a lot of research work on symptomatic patients but no research work available on comparison of MET and static stretching on flexibility of hamstrings on healthy individuals. There have been different studies on effectiveness of dynamic stretching[12]. Much research is done on patients with musculoskeletal disorders rather than asymptomatic healthy individuals with hamstring tightness[13]. The reason of this study was to demonstrate the immediate effects of Muscle Energy Technique in comparison with static stretching on healthy subjects with hamstring tightness. Exploratory studies of this nature are needed to define the better treatment intervention for improving hamstring flexibility in order to improve quality of life of people, to save time and money. The main reason of this study was to determine the effective treatment for the Hamstring tightness from Passive Stretching and Muscle Energy Technique by measuring popliteal angle in Active Knee Extension (AKE), SLR and pain score on VAS. We conducted this study with an objective to determine the effective treatment for the Hamstring tightness by Passive Stretching and Muscle Energy Technique.

METHODOLOGY

This randomized clinical trial was conducted at Riphah College of Rehabilitation Sciences Lahore from 15th March to 15th August, 2015, after the approval of synopsis and data was collected at Sports and Spine Professionals, DHA, Lahore. By using convenient sampling technique 50 patients were taken during 16 weeks. Subjects with age between 25- 50 year, both gender, with established diagnosis i.e. Tight hamstring (knee extension less than 160º with the hip at 90º flexion), decreased ROM at the knee joint, decreased straight leg raise and pain in posterior compartment of thigh were included in the study. Subjects presented with low back or intervertebral disc Prolapse pain either acute or chronic were excluded. Patients presented with severe hamstring injury either acute or chronic, visual acute swelling in the region of hamstring muscle, patients with fracture, dislocation or subluxation, patient with any hip or knee joint pathology, patient with any neurological disease and patient with any tumor of hip or knee were excluded from the study.

Patients were randomly divided into 2 equal groups using Gold Fish Bowl randomization method. Subjects in group A received passive stretching and Group B received muscle energy technique. Moist heat at hamstring muscle was given to subjects in both groups as a baseline treatment. Both groups received only one session. The muscle energy technique group performed isometric contractions for 7-10 seconds with relaxation period of 10 seconds with 3 repetitions. The static stretching group was treated with 30 seconds of static stretching. The outcome measures used were active knee extension (AKE), Straight Leg raise (SLR) and visual analogue scale (VAS).The effect of Muscle Energy Technique and Static Stretching was calculated by taking pre and post-treatment readings of AKE, SLR and VAS.

The measurement of popliteal angle during Active knee Extension (AKE), Straight Leg Raise (SLR) and Visual Analogue Scale (VAS) before and after treatment session determined the improvement regarding the treatment outcomes. The commonly used method to measure the Hamstring extensibility is Active Knee Extension (AKE).Researchers widely used Active Knee extension(AKE) as a measuring tool for hamstring length and according to literature it was found to be highly reliable measuring tool[11].

Data Analysis: Data analysis was conducted through SPSS version 22 to determine any significant difference in hamstring flexibility across the two treatment groups.

RESULTS

Among a total of 50 patients the demographic variables like age, height, weight and BMI of the subjects was comparable across the two treatment groups (Table-I) Mean Age of Group A (Stretching) was 32.12±11.05 whereas mean age of Group B (Muscle Energy Technique) was 33.72±12.97.Mean Height of Group A was 5.53±0.28 whereas mean height of Group B was 5.42±0.22.Mean Weight of Group A was 130.48±24.7 and mean weight of Group B was 131.1±23.59. Mean BMI of Group A was 20.66±3.50 and mean BMI of Group B was 21.42 ± 4.19. Across the group comparison showed no significant difference in VAS, AKE and SLR with a mean difference of 2.40, 3.00 and 0.40 respectively with p value greater than 0.05 (Table-I).

Table-I: The compassion of AKE (Active Knee Extension), SLR (Straight Leg Raise) and VAS (Visual Analogue Scale) across the groups (N=50)

Variables	Group A (Stretching)	Group B (Muscle Energy Technique)	Mean Difference	P value
Pre Treat AKET	58.00 ± 9.27	56.20 ± 13.94	2.60	0.441
Post Treat AKET	63.20 ± 9.34	63.00 ± 10.30	0.20	0.943
Pre Treat SLR	66.20 ± 10.63	64.40 ± 11.84	1.80	0.574
Post Treat SLR	71.00 ± 8.59	72.00 ± 7.51	1.00	0.600
Pre Treat VAS	5.28 ± 1.62	5.36 ± 1.35	0.08	0.850
Post Treat VAS	4.16 ± 1.70	3.84 ± 1.37	0.32	0.468

Within the group analysis revealed statistically significant difference (p value < 0.05) for each of the outcome measure in each of the treatment group (Table-II). VAS showed a mean reduction of 4.40 ± 5.26 and 6.80 ± 6.10 in stretching and muscle energy technique group respectively. AKE showed a mean difference of 4.80 ± 5.29 in stretching and 7.80 ± 8.90 muscle energy technique group. SLR showed a mean difference of 1.12 ± 1.09 in stretching and 1.52 ± 0.91 muscle energy technique group.

Table-II: The compassion of AKE (Active Knee Extension), SLR (Straight Leg Raise) and VAS (Visual Analogue Scale) with in Groups (N=50)

Study Group	Variables	Mean Diff ±SD	P-Value
Group A (Stretching) n=25	AKE	4.40 ± 5.26	0.04
	SLR	4.80 ± 5.29	0.01
	VAS	1.12 ± 1.09	0.03
Group B (Muscle Energy Technique) n=25	AKE	6.80 ± 6.10	0.01
	SLR	7.80 ± 8.90	0.04
	VAS	1.52 ± 0.91	0.03

DISCUSSION

Although several stretching maneuvers are in practice for the prevention of muscle shortening, risk of soft tissue injury as well as soft tissue techniques leading to increased flexibility but still there is ambiguity regarding the most effective and time saving method for management. This study was designed to determine the immediate effects of Post isometric relaxation (MET) in comparison with static stretching for improving hamstring flexibility. The findings of our study direct that both muscle energy Technique and static stretching improves the hamstring flexibility. In muscle energy technique the contractile component of the muscles relaxes to improves flexibility, while static stretching acts by increasing the elasticity of the non-contractile viscoelastic component. Thus, our study demonstrated that flexibility of the muscles improves equally by both stretching maneuvers. Good reliability has been found for sit and reach test in the results of one of the previous study on healthy individuals[12] However, Literature also supports the use of Active Knee Extension test for assessment of hamstring flexibility because of its high reliability as well as its easy method of application[11].

The present study data analysis and results demonstrated that hamstring flexibility equally improved by both stretching techniques, as both techniques showed significant differences separately between assessments and reassessments. In this same perspective, other studies comparing PNF to static stretching showed that hamstring flexibility improves more efficiently by PNF stretching[13,14]. In another study Muscle Energy Technique was found to be more effective in improving hamstring flexibility according to the findings[15]. However just like many previous studies, results of another study illustrated that static stretching led to instant flexibility gains[16]. Other previous studies that have reported similar results concur with the findings of our study. Madeleine et al. reported that muscle energy technique of two different types had similar benefits in improving flexibility and primary difference in both techniques was that their post-contraction stretch phase was not equal in duration[17] Similarly, Ahmed and his co-authors found that the modified hold-relax stretching (MET) and static stretching improved the flexibility of hamstring equally[11]. Similarly, when effectiveness of proprioceptive neuromuscular facilitation and static stretching were compared and assessed on hamstring flexibility of young women in another study no significant difference was indicated to determine the better maneuver in reducing hamstring tightness[12]. It is concluded that hamstring flexibility improves by both stretching maneuvers i.e. Muscle Energy Technique and Static Stretching techniques. However, when comparison is made between these two stretching techniques, no statistical difference was noticed. Improvement in hamstring flexibility was on equal level by both treatment strategies.

Limitations of study: Male female ratio of subjects with hamstring tightness was not equal in this study. Sample size was small because of the limited time and it was taken from population of same socioeconomic status. In this study only asymptomatic patients were taken

CONCLUSION

Within the group each technique showed significant improvement but on comparing the two groups there was no significant difference in improving the hamstring muscle flexibility, so static stretching and muscle energy technique both are equally effective.

Recommendations: More research work is required on this with equal ratio of male and female, with large sample size and population of different socio economic status. There is need of more work especially on symptomatic patients with decreased hamstring flexibility.

CONTRIBUTION OF AUTHORS

Rabia K: Literature search, Data collection, Literature review
Nasir RH: Conceived idea, Designed research methodology
Hassan D: Data interpretation, Statistical analysis, Manuscript writing, Manuscript final reading

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REFERENCES

1. Shadmehr A, Hadian MR, Naiemi SS, Jalaie S. Hamstring flexibility in young women following passive stretch and muscle energy technique. J Back Musculoskelet. 2009;22(3):143-148.
2. Junker DH, Stöggl TL. The foam roll as a tool to improve hamstring flexibility. J Strength Cond Res. 2015;29(12):3480-3485.
3. Ekstrand J, Healy JC, Waldén M, Lee JC, English B, Hägglund M. Hamstring muscle injuries in professional football: the correlation of MRI findings with return to play. Br J Sports Med. 2012;46(2):112-117.
4. Seward H, Orchard J. AFL injury report 2003. Sport Health. 2004;22(2):7.
5. Askling CM, Tengvar M, Thorstensson A. Acute hamstring injuries in Swedish elite football: a prospective randomised controlled clinical trial comparing two rehabilitation

protocols. Br J Sports Med. 2013;47(15):953-959.
6. Woods C, Hawkins R, Hulse M, Hodson A. The Football Association Medical Research Programme: an audit of injuries in professional football—analysis of preseason injuries. Br. J. Sports Med. 2002;36(6):436-441.
7. Mhatre BS, Singh YL, Tembhekar JY, Mehta A. Which is the better method to improve "perceived hamstrings tightness"–Exercises targeting neural tissue mobility or exercises targeting hamstrings muscle extensibility? Int J Osteopath Med. 2013;16(3):153-162.
8. Page P. Current concepts in muscle stretching for exercise and rehabilitation. Int J Sports Phys Ther. 2012;7(1):109.
9. Hopper D, Deacon S, Das S, Jain A, Riddell D, Hall T, et al. Dynamic soft tissue mobilisation increases hamstring flexibility in healthy male subjects. Br J Sports Med. 2005;39(9):594-598.
10. Decoster LC, Cleland J, Altieri C, Russell P. The effects of hamstring stretching on range of motion: a systematic literature review. J Orthop Sports Phys Ther. 2005; 35(6):377-387.
11. O'Sullivan K, Murray E, Sainsbury D. The effect of warm-up, static stretching and dynamic stretching on hamstring flexibility in previously injured subjects. BMC Musculoskelet. 2009 Dec;10(1):37.
12. Kolber MJ, Zepeda J. Addressing hamstring flexibility in athletes with lower back pain: A discussion of commonly prescribed stretching exercises. Strength Cond J. 2004 1;26(1):18-23.
13. Ahmed H, Iqbal A, Anwer S, Alghadir A. Effect of modified hold-relax stretching and static stretching on hamstring muscle flexibility. J Phys Ther Sci. 2015;27(2):535.
14. Navega MT, Paleari B, Morcelli MH. Assessment and comparison of the effects of two techniques on hamstring flexibility. Fisioterapia em Movimento. 2014;27(4):583-589.
15. O'Hora J, Cartwright A, Wade CD, Hough AD, Shum GL. Efficacy of static stretching and proprioceptive neuromuscular facilitation stretch on hamstrings length after a single session. J. Strength Cond. Res. 2011;25(6):1586-15891.
16. Puentedura EJ, Huijbregts PA, Celeste S, Edwards D, In A, Landers MR, et al. Immediate effects of quantified hamstring stretching: hold-relax proprioceptive neuromuscular facilitation versus static stretching. Phys Ther Sport. 2011;12(3):122-126.
17. Waseem M, Nuhmani S, Ram C. Comparative effectiveness of static stretching and muscle energy technique on hamstring flexibility in normal Indian collegiate males. Indian J Med Res. 2010;4(3):91.
18. de Oliveira Busarello F, de Souza FT, de Paula GF, Vieira L, Nakayama GK, Bertolini GRF. Ganho de extensibilidade dos músculos isquiotibiais comparando o alongamento estático associado ou não à crioterapia. Fisioterapia em Movimento. 2011;24(2):29
19. Smith M, Fryer G. A comparison of two muscle energy techniques for increasing flexibility of the hamstring muscle group. J Bodyw Mov Ther. 2008;12(4):312-317.