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RESEARCH ARTICLE

Comparison of Static Stretching and Muscle Energy Techniques on Hamstring Tightness in Asymptomatic Females

Ayesha Majeed[1], Syeda Rafia Mansoor[2], Ahmad Bilal Arif[3], Muhammad Mudassar Yasin[4], Minahil Wasim[5], Farah Naeem[6]

ABSTRACT

Background: Hamstring flexibility is an essential variable because decreased extensibility can cause injuries, non-specific low back pain and altered lumbopelvic rhythm. Flexibility training is an important component in preventing or rehabilitation of injuries and also a method of improving one's performance in everyday activities and sports.

Objectives: To compare the effects of static stretching & muscle energy techniques on hamstring shortness in females.

Methods: A randomized controlled trial conducted at Department of Health Sciences, Khawaja Fareed University of Engineering & Information Technology Rahim Yar Khan on 50 asymptomatic females. In this study, 50 females were randomly allocated in two groups strictly following the inclusion/ exclusion criteria. Group A received hamstring static stretching, while group B muscle energy techniques (Autogenic inhibition). Informed written consent was taken from each participant. 90-90 test, SLR, Sit and reach test were used as outcome measurement tools of hamstring tightness. 6 sessions in 2 weeks were given to each participant. Baseline as well as follow-up data after 2 consecutive weeks was recorded.

Results: Mean age of participants of Groups A & B were 26±1.2, 26±0.9 years respectively. Group B participants showed marked improvement at 90-90 test, SLR, Sit and reach outcome measurement tools compared to group A as p-value was found less than 0.05 which is considered significant.

Conclusion: Muscle energy techniques particularly autogenic inhibition have better treatment outcome as compared to hamstring static stretching alone in asymptomatic females with hamstring shortness.

Keywords: Autogenic Inhibition, Hamstring Muscle, Manual Therapy, Muscle Energy Techniques, Stretching.

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Introduction:

Flexibility has been defined as the ability of a muscle to lengthen and allows one joint (or more than one joint in a series) to move through a range of motion.(1) A decrease in muscular flexibility reduces not only functional level of an individual but also harms the musculoskeletal system due to overuse.(2) Muscle tightness is caused by a decrease in the ability of a muscle to deform which results in decreased range of motion at the acting joint. Hamstrings are two joint acting muscles and most frequently damaged in body.(3) Static stretching helps in reducing muscle stiffness while enhancing range of motion within a duration of 5 to 30 seconds stretch commonly suitable for athletes or general population. Muscle Energy Technique (MET) is a manual technique developed by osteopaths and is now used in many different manual therapy professions.(4)

One such approach which targets the soft tissues primarily (although it makes a major contribution towards joint mobilization) has been termed as muscle energy technique which is also known as active muscular relaxation technique. It is claimed to be effective for a variety of purposes including lengthening a shortened muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood and increasing the range of motion. (5) An increased stretch tolerance is a possible mechanism behind the increased ROM after the contract-relax exercise program.(6)

Hamstrings have proximal attachment to ischial tuberosity with exception of short head of biceps femoris. Due to this attachment, hamstrings influence pelvic posture. Pelvic is the base of spine and its tilting does affect the sagittal curvatures of spine. Hamstring flexibility is an essential variable

Affiliations: 1. University of Management & Technology (UMT), Lahore; 2. Fatima Memorial Hospital Lahore; 3. Department of Health Sciences Khawaja Fareed University of Engineering & Information Technology Rahimyar Khan; 4. Children Hospital & Institute of Child's Health, Lahore; 5. Shifa Tamer-e-Millat University Islamabad; 6. Physiotherapy Department, Combined Military Hospital (CMH), Okara
Correspondence: Dr. Ahmad Bilal Arif PT
Email: ahmad.bilal@kfueit.edu.pk
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because decreased extensibility can cause injuries, non-specific LBP and altered Lumbopelvic rhythm. (7)

Flexibility training is an important component in preventing and rehabilitation of injuries. It is a method of improving one's performance in everyday activities and sports.(8) Several researchers have compared different stretching techniques to determine which technique is more effective for increasing range of motion of joints. Stretching has many physical benefits including, improved athletic performance, flexibility, decreased energy expenditure, injury prevention, decreased DOMS, and promotion of healing.(9)

Stretching is also used as pre-exercise training protocol. It has been suggested that it enhances flexibility of muscles, increases physical performance and prevents injury.(10) Stretching increases flexibility of muscles around hip, knee, and trunk. A 15-30s stretch is more effectual than shorter duration stretch. It is as effective as longer duration stretch. Passive stretching has more profound results than dynamic stretching. A 30s to 60s of stretch results in significant increase in ROM. The authors concluded that a 30s of stretch is ideal.(11) Among all the muscle strains associated with sports, the most common are the hamstring strains. 13% of the injuries has been reported in Australian Rules football.(12) The atypical feature of hamstring is that it is bi-arthrodial, made primarily of type II fibers. It has less amount of titan proteins. That is why it has higher risks of strains. These are slow in rehabilitation process and higher in injury rates. (12) Conservative management strategies are helpful in treating low back pain. These include manipulation, exercise therapy, modalities, kinesio taping and myofascial release and flexibility regimen especially of hamstrings.(13)

Methods:

A parallel design randomized controlled trial was conducted on 50 females presented with hamstring tightness strictly following the inclusion and exclusion criteria. The study was conducted at Department of Health Sciences, Khawaja Fareed University of Engineering & Information Technology (KFUEIT) Rahim Yar Khan from September 2019 to April 2020. The inclusion criteria of study was healthy females aged between 20 - 40 years having scores of 90-90 test<50 & SLR<70. Females with any known mental disability, pregnant females, having any active complaint of low back pain or of lower extremity were excluded from this study. Non-probability purposive sampling technique was used & group allocation was randomly done into two respective groups. Total 55 participants were screened out. Out of which 3 did not meet the inclusion criteria & 2 were unable to continue the treatment due to their domestic reasons.

Ethical approval for study was obtained from Research Ethics committee of KFUEIT (Kfueit/ hesc/R-51). Informed written consent was taken from each participant. Demographic details including age, height, weight, BMI were noted as per study requirements. Group A (n=25) received static hamstring stretching & Group B (n=25) participants treated with muscle energy techniques (Autogenic inhibition) Figure 1. Each group was treated for 2 weeks on alternate days making 6 treatment sessions in total. The group wise treatment breakdown of session was as follow: Group A was treated with hamstring static stretching of 30 seconds × 3 times = 1 session and Group B was treated with muscle energy techniques (Autogenic inhibition) with time duration of 20 seconds × 3 times = 1 session. Treatment prognosis was measured in terms of outcomes using SLR, sit and reach test and 90/90 test (known as the Active Knee Extension (AKE) Hamstring Flexibility Test). Data analysis was done using IBM SPSS version 21. Shapiro-Wilk test of normality showed data to be non-normally distributed having p value less than 0.05 so Man Whitney U test was applied for inter group comparisons.

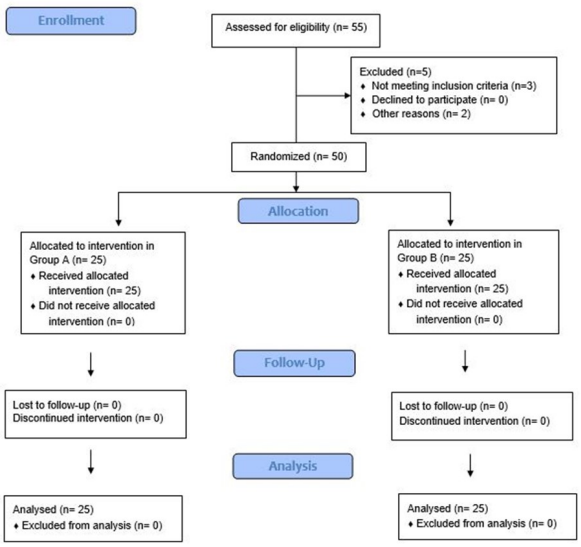

Figure 1: CONSORT Diagram

Results:

Total 50 females with hamstring tightness were recruited in this study. The demographic data details are shown in Table-1. Statistical analysis showed Group B participants having significant improvement compared to group A on sit and reach, SLR, and 90-90 test as p-value was found

less than 0.05 which is considered significant as shown in Table-2.

Table1: Demographic Details

Variable	Group A (n=25) Mean ± S.D	Group B (n=25) Mean ± S.D
Age	26.14 ± 1.2	26.42 ± .93
Height	1.65 ± 0.11	1.69 ± 0.21
Weight	59.60 ± 10.23	60.84 ± 11.67
BMI	21.77 ± 2.95	22.12 ± 2.12

Discussion:

A parallel design randomized controlled trial on fifty subjects was conducted to find the effects of two different static stretching and muscle energy techniques on ROM, balance and muscle activation. Both the techniques showed significant increase in knee extension angle.(14) A systematic review on impact of stretching on sports injury concluded that stretching enhances muscle flexibility which is an important component for athlete's performance.(15) Some studies also showed that there is no effect of stretching on tightness and flexibility of the muscles. Giwon Kim et al carried out a randomized clinical trial determining efficacy of stretching-based rehabilitation on pain, flexibility, and muscle strength. They concluded that stretching effectively eliminates pain and enhances flexibility in patients with hamstring injury.(16) A systematic review done by Diulian M. Medeiros et al under the title of "influence of static stretching on hamstring flexibility in healthy young adults" concluded static stretching to be effective in increasing hamstring flexibility in healthy young adults.(17) Similarly another study observed sustained stretching resulted in increased range of motion in hamstring shortness individuals.(1)

Davis et al conducted a single blinded randomized trial to see the effects of static stretching of muscles, surrounding the knee-on-knee joint position sense". Three different techniques of stretching were conducted to see the effects on ROM and flexibility of hamstrings. Self-stretching, static stretching and PNF were included. Out of all the three, static stretching showed profound effects on flexibility of hamstrings.(18) Ahmed et al showed that there is an equal effect of static stretching and hold relax on hamstrings. Similarly, PNF stretching has also an effect on hamstrings. All the three techniques have same effect but among all static stretching has more pronounced effect.(19) Shadmehr et al concluded in their research work that that there is no considerable difference between passive stretch and muscle energy techniques.(20) Mohamed Serag et al after running a randomized controlled trial, revealed autogenic inhibition to be more effective than reciprocal inhibition technique on reducing hemiplegic children spasticity.(21) Mariana Oliveira Borges et al concluded in their research work that both static hamstring stretching and proprioceptive neuromuscular facilitation have equal efficacy in reducing hamstring shortness.(22)

Conclusion:

In conclusion, muscle energy techniques particularly autogenic inhibition muscle energy technique has better treatment outcome as compared to hamstrings static stretching alone in asymptomatic females of hamstring tightness.

Disclaimer: None

Table 2: Man Whitney U Test for Between Group Comparison at Baseline & Follow-up sessions

Outcome Measurement Variables	Group of Treatment	Median (IQR)	Mean rank	p-value
Active Knee Extension Test at Baseline	Group A	12.00(1)	22.68	0.15
	Group B	11.21(2)	19.42	
Active Knee Extension Test at 6^{th} session	Group A	18.00(5)	31.32	< 0.05
	Group B	20.00(3)	38.58	
Straight Leg Raise Test at baseline	Group A	12.00(3)	22.50	0.72
	Group B	12.00(2)	21.66	
Straight Leg Raise Test at 6^{th} session	Group A	18.00(3)	30.00	0.02
	Group B	21.00(5)	33.44	
Sit & Reach Test at baseline	Group A	14.00(1)	20.14	0.20
	Group B	13.00(2)	20.12	
Sit & Reach Test at 6^{th} session	Group A	20.00(2)	28.00	< 0.05
	Group B	22.00(4)	30.00	

Conflict of Interest: None

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Yasin MM: Analysis, Interpretation of data for the work.
Wasim M: Drafting the work or revising it critically for important intellectual content.
Naeem F: Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.