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Original Article

Comparative Effects of Mobilization with Movement versus Stretching on Hip Functionality in Patients with Hamstring Tightness

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ABSTRACT

Background: Hamstring tightness is common in the general population and can compromise quality of life. Stretching and mobilization with movement are two of the most commonly used treatment approaches for addressing hamstring tightness. **Objective:** To compare the effects of mobilization with movement versus stretching on hip functionality in patients with hamstring tightness. **Methods:** The study was quasi-experimental in which 56 subjects were assigned randomly into two groups (28 in each group). Both groups were experimental groups, where MWM was given to Group A, and stretching exercise was given to Group B. The numeric pain rating scale, international hip outcome tool and range of motion were used as outcome measure tools for pain, function and range of motion respectively at baseline,4th, 8th and 12th weeks of intervention. The data was analyzed using SPSS 26.0 and the statistical tests were according to data distribution. The test of normality was applied for outcomes at baseline. The p-value was <0.05 for pain and IHOT, non-parametric Friedman ANOVA within group A and Mann-Whitney U test for between-group comparisons of A and B were used. For flexion, data was approximately normally distributed so repeated measured ANOVA was used within the group and an independent sample test was used for between group comparison of A and B. The level of significance was ≤0.05 (CI 95%). **Results:** A total of 56 patients were enrolled in this study. The Mann-Whitney U test revealed a sum of 249.5 at baseline, 256 after 4 weeks and 186 after 12 weeks of reading in both groups. It shows no significant difference at baseline, 8 and 12 weeks with p-values of 0.14 and 0.13 respectively. However, after 12 weeks significant p-value of 0.000 showed the effectiveness of both but significant differences in groups from baseline to follow-up. **Conclusion:** The study concluded that both treatments were effective in reducing pain and improving hip functions and range of motion along with hamstring tightness, but mobilization with movement has significant effects on tightness in hamstrings.

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INTRODUCTION

Flexibility, a quality that improves both safety and the best possible physical activity, is what determines how easily a person can move. Examples of muscle groups that are prone to shortening are the hamstrings.[1] Overuse injuries, trauma, stress, or illness can all cause muscle tightness. Static stretching, dynamic stretching, proprioceptive neuromuscular facilitator (PNF) technique and a variety of fascial release techniques are used to stretch tight muscles or connective tissue. However, confusion persists when it comes to determining the best exercise to extend.[1] Hamstring tightness is defined as the inability to extend the knee beyond 160 degrees with the hip at 90 degrees of flexion.[2] Hamstring rigidity causes hamstring injuries, which are the most common kind of injury among athletes.[3] These injuries necessitate a long time to mend, cost a lot of money to treat and harm your life and the athlete's performance ability.[4] Stiffness could happen when the tone of the muscle is enhanced either passively or actively. Passively via postural adaptation, which can cause the muscles to become shortened, whereas, actively via spasm or contraction of the muscles.[5] Athletes playing without warm-ups are more prone to hamstring tightness due to overuse.[6] A sedentary lifestyle can also play a role in the shortening of hamstring tightness.[7] Many complications occur due to hamstring stiffness like tears, which can change the curvature of the lumbar spine; it can cause lower back pain, decreased walking ability and planter pain.[8] Hamstrings extend the hip with or without resistance, as well as serving as knee flexors.If the hip is extended and the knee is flexed to 90 degrees or more, the hamstrings may not be able to contribute much to the hip extension force because of active insufficiency.[9] Extension forces in the hip increase by 30% if the knee is extended during hip extension.[10] Flexibility is the ability to move a single joint or series of joints smoothly and easily through an unrestricted, pain-free range of motion.[11] Muscle length with joint integrity and the extensibility of periarticular soft tissues determine flexibility.[12] A sedentary lifestyle often results in diminished flexibility. Flexibility enhances body knowledge, better posture and enhances performance of skilled movements.[13]

Mainly hamstring flexibility may decrease acute and chronic musculoskeletal injuries, low back pain problems, postural alteration, gait disorders and risk of injuries.[14] The majority of studies are aimed at the young or middle-aged population.[15] Older muscles are more vulnerable to contraction-induced injury, particularly when the muscle lengthens during the contraction, and they have a reduced ability to recover from acute or repetitive musculoskeletal trauma.[16] There is a scarcity of literature to conclude the best technique for increasing flexibility in the geriatric population.[17] The basic purpose was to study the mobilization with movement (MWM) and hamstring stretching exercises effects on pain and range of motion (ROM) functions of the hip in patients with hamstring tightness.

METHODS

The study was a quasi-experimental study conducted at Times Institute Multan, Pakistan, THQ Khanpur, Fayyaz Jatoi Physiotherapy Center Khanpur and Alshifa Medicare, Pakistan. The sample size was calculated using the Raosoft sample size calculator, where Z1-α/2 level of significance=95%, μ1 expected mean change in EFAP in Group A= 6.5, μ2 expected mean change in EFAP in Group B 5.7. A total of 56 subjects were divided into two groups A and B (28 in each

group).

$$n = \frac{2\sigma^2(z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

δ1 Expected standard deviation in group A=1.44, δ2 Expected standard deviation in group B=0.9, Z1-β power of the study= 80% and n calculated sample size in a group= 28. After adding 20% drop out 28+6=34 in each group. The subjects were included female gender, idiopathic hamstring pain, age between 25-40 years, pain duration of more than 3 months SLR below 70 degrees. The subjects with a range of more than 60 degrees, male gender, acute pain, and acute injury were excluded from the study. Both groups were assessed using a numeric pain rating scale (NPRS),[7] international hip outcome tool (IHOT),[8] goniometer[9] and all baseline measurements were taken. Written consent was taken from all participants.

All the ethical considerations for human subjects as participants were followed. Regarding the treatment one group was treated with MWM of the hip joint and the other group was given hamstring stretching. One group was treated by MWM of the hip joint for 15-20 minutes with a minimum of 10 repetitions. The other group was treated with a conventional hamstring stretching protocol of static stretching of 10 repetitions for a single set. The treatment was done 5 days a week for 15 days than home exercise plan was given to the patients of both groups. After intervention subjects were assessed at the 4th, 8th and 12th week of intervention. The test of normality was applied for outcomes at baseline. The p-value was <0.05 for pain and IHOT, non-parametric Friedman ANOVA within group A and Mann Whitney U test for between-group comparisons of A and B were used. For flexion, data was approximately normally distributed so repeated measured ANOVA was used within the group and an independent sample test was used for between group comparison of A and B. The level of significance was ≤0.05 (CI 95%).

RESULTS

A total of 56 female patients were enrolled in this study. The mean pain was 6.00 and the rank was 3.98 in group A, while 5.35 was the mean and the rank was 4.00 in group B. The pain was reduced to a mean of 0.82 and 1.57 in groups A and B respectively after the 12th week with p-value<0.05 (Table 1). The between-group comparison showed a significant p-value of 0.00 showing the effectiveness of both but significant differences in the group from baseline to follow-up (Table 2). The between-group analysis showed that subjects were not significantly different in groups at baseline and four weeks of intervention. However, after eight weeks and 12 weeks of sessions, the subject's flexion was improved in both groups with significant differences with p-values of 0.01 and 0.00 respectively with mean differences of 3.17 and 3.17 (Table 1). The Mann-Whitney U test showed that IHOT at baseline was 750, 970.5 after 4 weeks, 131 after 8 weeks and 965.5 after 12 weeks of intervention in group A. While Wilcoxon shows 750 baseline, 625.50 after 4 weeks, 537.0 after 8 and 630.50 after 12 weeks of intervention in Group B. The p-value showed that between-group comparisons, there was a significant difference in hip functions in both groups from baseline (p=0.42) to 12 weeks of treatment (p=0.00) showing that mobilization with movement was the dominant over-stretching exercise (Table 4).

DISCUSSION

This study showed that the MWM technique and stretching both helped in the reduction of pain and improved hip functionality and ROM in patients with hamstring tightness. Group A who was given MWM showed more improvement in pain and ROM improvement than Group B who was

Table 1: Comparison of Pain Intensity within Group A and B

	Groups	n	Mean Rank	Mean	Standard Deviation	Min	Max	Percentiles	p-value
								50th (Median)	
Baseline	MWM (A)	28	3.98	6.00	0.98	4.00	8.00	6.00	0.00
4th week		28	2.96	3.71	0.65	3.00	6.00	4.00	
8th week		28	2.00	2.28	0.59	1.00	3.00	2.00	
12th week		28	1.05	0.82	0.77	0.00	2.00	1.00	
Baseline	Stretching Exercise (B)	28	4.00	5.35	.78	4.00	7.00	5.00	0.00
4th week		28	2.96	4.21	.83	3.00	6.00	4.00	
8th week		28	1.98	2.71	.65	1.00	4.00	3.000	
12th week		28	1.05	1.57	.50	1.00	2.00	2.00	

Table 2: Comparison of Pain Intensity Between Group A and B

	Groups	N	Mean Rank	Some of Ranks	p-value
Baseline	MWM (A)	28	33.59	940.50	0.14
	Stretching Exercise (B)	28	23.41	655.50	
4th week	MWM (A)	28	23.64	662.00	0.13
	Stretching Exercise (B)	28	33.36	934.00	
8th week	MWM (A)	28	23.64	662.00	0.13
	Stretching Exercise (B)	28	33.36	934.00	
12th week	MWM (A)	28	21.14	592.00	0.00
	Stretching Exercise (B)	28	35.86	1004.00	

given stretching. There was a more significant improvement in IHOT and ROM scores than the NPRS score. A study was conducted in 2014. A randomized control trial study was done by Yolanda Castellote-Caballero et al.[18], to see whether an isolated neurodynamic

Table 3: Flexion ROM between Group A and B Comparison

	Groups	n	Mean	Std. Deviation	Std. Error Mean	Mean Difference	p-value
Baseline	MWM (A)	28	66.42	3.81	.72	-1.03	0.32
	Stretching Exercise (B)	28	67.46	3.91	.73	1.03	
4th week	MWM (A)	28	79.42	5.08	.96	2.24	0.06
	Stretching Exercise (B)	28	77.00	4.65	.87	2.24	
8th week	MWM (A)	28	94.85	4.59	.86	3.17	0.01
	Stretching Exercise (B)	28	91.67	4.89	.92	3.17	
12th week	MWM (A)	28	107.92	4.46	.84	3.17	0.00
	Stretching Exercise (B)	28	104.75	3.90	.73	3.17	

Table 4: Hip Functions Score Between Group A and B

	Groups	n	Mean Rank	Sum of Ranks	p-value
Baseline	MWM (A)	28	26.79	750.00	0.42
	Stretching Exercise (B)	28	30.21	846.00	
4 week	MWM (A)	28	34.66	970.50	0.00
	Stretching Exercise (B)	28	22.34	625.50	
8 week	MWM (A)	28	37.82	1059.00	0.00
	Stretching Exercise (B)	28	19.18	537.00	
12 week	MWM (A)	28	34.48	965.50	0.00
	Stretching Exercise (B)	28	22.52	630.50	

sciatic sliding efficient than the conventional hamstring flexibility than stretching or a placebo in asymptomatic subjects with short hamstring syndrome (SHS). One hundred twenty SHS patients were randomly assigned to one of three groups: neurodynamic sliding, hamstring stretching, or placebo control. Before and after interventions, the dominant leg of each subject was measured for straight leg raise (SLR) ROM. A mixed model

ANOVA was used to analyze the data, followed by simple main effects analyses. At the end of the study, the neurodynamic and stretching groups had more ROM than the control group, and the neurodynamic group had more ROM than the Stretching group. the subjects with SHS, the results indicate that a neurodynamic sliding technique will enhance hamstring flexibility more than static hamstring stretching.[19]

A pilot study on the active release technique of hamstring flexibility was conducted in 2006 by James[11], the purpose of this study is to see if the active release technique (ART) improves hamstring flexibility in healthy male participants. The sit-and-reach test was used to evaluate hamstring flexibility before and after treatment. The study concluded that a single ART treatment significantly increased hamstring flexibility in a group of physically active male participants.[20] Our study also showed improved hamstring flexibility in the geriatric population following MWM as well as hamstring stretching. Sandeep Singh et al., conducted an RCT study to examine and contrast the effects of PNF stretching versus the combined effects of PNF stretching and Neural Mobilization (NM) on hamstring flexibility in female workers. The results indicated that after 4 weeks of intervention, hamstring flexibility improved significantly in both groups.[12] Furthermore, the between-group comparison revealed that there were no significant differences in AKE (t=1.86, p=0.07) and SLR (t=1.51, p=0.14) improvement scores, indicating that both interventions were equally effective in improving hamstring flexibility in working women. In our study, MWM and hamstring stretching techniques were evaluated and found comparable results on pain intensity, ROM and hip functionality.

CONCLUSION

It was concluded that mobilization with movement was more effective as compared to stretching in treating pain and improving the functions of the hip and range of motion in patients with hamstring tightness.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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