

## The Effect of Retro Walking Vs Slump Stretch on Hamstring Flexibility in Asymptomatic Female Population (Comparative Study)

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### Abstract

**Background:** Hamstring is one of the most often tightened muscles in our body in both symptomatic and asymptomatic individuals. Muscle tightness results in decreased flexibility of that muscle. Results of previous research have investigated the effects of slump stretch and retro walking on the hamstring flexibility and concluded that both interventions help to improve the flexibility of hamstring muscles. But there is no clinical trial that compares how retro walking and slump stretch affect hamstring flexibility.

**Objective of study:** To study the effect of retro walking and slump stretch on the flexibility of the hamstring muscle and to compare the effect of slump stretch and retro walking on the flexibility of the hamstring muscle.

**Materials & Methods:** The data was gathered from asymptomatic individuals from GIRS. The study was completed 6 weeks after the approval of the synopsis. The study design was pre-test post-test study design and the sampling technique was the convenient sampling technique. 60 subjects were taken with inclusion criteria met and divided equally into two groups (n=30 in each group). Group A performed retro walking while group B performed slump stretch. Pre- measurements of hamstring flexibility at the start of the treatment session and post- measurements of hamstring flexibility after 6 weeks of treatment were taken by sit & reach test and noted for comparison. Both groups executed the selective protocol 5 days / week for 6 weeks. Results were calculated at baseline and on the 5th day of the 6th week.

**Results:** The results of this study revealed that the slump stretch is more effective in improving hamstring muscle flexibility. The Slump stretch group showed a greater increase in Sit & Reach distance of 11.37 % than the Retro walking group who showed an increase of 5.86 %.

**Conclusion:** Slump stretch is more effective in improving the hamstring flexibility.

**Keywords:** Slump Stretch, Retrowalking, Hamstring muscle

### Introduction

The hamstring (muscles of the posterior compartment of the thigh) is one of the most common muscles in our body that tends to get tight and even undergo shortening. This affects the normal biomechanics and can cause musculoskeletal problems. The hamstring muscle is a multi-joint muscle that is most frequently injured in the human body. Prolonged sitting is a contributing factor to decreased hamstring flexibility. The ability of muscles to lengthen is called flexibility, which allows one or more joints in a series to move through the range of motion.

The sedentary lifestyle is a most common reason for postural abnormalities evident in modern society. The prolonged sitting hours can affect soft tissues flexibility, especially two joint muscles. Prolonged sitting can cause tightness of the hamstrings in young students who have to sit for long hours of teaching [1]. Tightness of posterior thigh muscles results in decreased ability to extend the knee completely with hip flexion accompanied by pain along the posterior side of thigh or knee. Hamstring tightness may be found in both symptomatic and asymptomatic subjects. Hamstring tightness is a most obvious cause of back pain and it may lead to the patellofemoral syndrome.

The tight hamstring is also a risk factor for the development of patellar tendinopathy and patellofemoral pain.

Tight hamstrings can limit anterior pelvic tilt during forward trunk bending, and this limitation can result in increased tension in muscular and ligamentous structures in the lower back. Tight hamstrings are also responsible for severe restriction in straight leg raising. Tightness cause changes in the length-tension relationship of muscle and also affects the shock- absorbing capacity of a limb. Thus, it can cause a vicious cycle of restriction in range of motion during functional activities and aggravates abnormal posture. Mobility of soft tissues and joints is very important in maintaining static and dynamic postures and in preventing injury and re- injury of soft tissues.

The favorite recreational physical activities cherished by humans are walking and running. They play an important role in improving physical and mental health. Retrowalking or backward moving is a new concept in the field of physical therapy and rehabilitation to improve the flexibility of hamstring muscles. Retro walking is a backward method of locomotion. Backward walking is a mirror picture of forward walking i-e the joint patterns are similar to FW but with

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a simple temporal reversal. However, the biomechanics of BW as compared to FW differs greatly. Forward walking initiates with heel contact and ends with toe-off while in backward walking toes contact the ground first and the heel is lifted off the ground at the end of the stance. Backward walking is associated with increased cadence and decreased stride length as compared to forward walking.

Retrowalking is beneficial as compared to forward walking alone because it produces more muscle activation in proportion to effort than forward walking. It improves oxygen uptake, cardiopulmonary fitness, and muscle activity while simultaneously decreasing joint stress. Retro walking is also used in specific sports to practice and train athletic skills and to reduce the potential for injury, such as, in basketball, American football and soccer players incorporate backward running during competition to improve performance and to decrease the risk of injury. Stretching exercises are used to improve the flexibility of muscles. An increase in muscle flexibility as a result of stretching exercises may reduce the risk of musculoskeletal injuries, decrease and relieve muscle soreness, and increase muscle performance. Three types of stretching exercises are used to enhance muscle flexibility: static stretching, ballistic stretching, and PNF techniques [2].

A slump test is an assessment tool used to detect altered neuro-dynamics or neural tissue sensitivity. During the slump test, the neural structures within the vertebral canal and foramen are slowly and progressively put on maximum stretch. Slump stretch is also a neuro-dynamic treatment. According to recent research, it can be used as an intervention in patients with hamstring tightness. It is also found to be effective in low back pain as hamstring tightness may cause low back pain thus slump stretch can be effective in patients having low back pain. This stretch can be used to unwind the sciatic nerve from fascia and muscle tissue. Thus, effective in sciatic pain and piriformis syndrome. Neurodynamics increases the activity of muscles more significantly than that observed at rest [3,4]. When applying neurodynamics, tension occurs in the nervous system, and pressure within the nerve increases due to the decrease of the cross-sectional area, and the axonal transport system lengthens the sciatic nerve after shortening because of the influence of the surrounding related structures and hamstring flexibility.

**Study Gap**

Several pieces of research have been conducted on slump stretch and retro walking that show positive effects of both interventions but there is a lack of clinical research to compare the effects of slump stretch and retro walking on hamstring flexibility. But until now there is no comparative study in the literature to compare the effects of retro walking and slump stretch on hamstring flexibility.

**RATIONALE**

This study is conducted to find which technique (slump stretch and retro walking) is most significant for the flexibility of hamstrings, so it can be used to improve the flexibility among the female population.

**Material & Methods**

**Study Design**

Pre-test Post-test study design (Quasi experimental study)

**Study Settings:** Gujranwala Institute of Rehabilitation Sciences.

**Study Duration:** 6 weeks (5 days / week).

**Participant Selection**

Sampling Technique  
Convenient sampling technique

**Inclusion criteria**

- Females only
- Age between 18-30 years
- Active Knee Extension < 160 degree

**Exclusion criteria**

- Individuals with a hamstring injury in the past year
- Any past traumatic or surgical history of lower extremity
- Subject with a history of arthroplasty
- Individuals with musculoskeletal problems
- Individuals with underlying systemic pathology
- Pregnancy
- A patient who had a severe spinal deformity, spondylosis, spondylolisthesis, lumbar canal stenosis, and disc herniation

**Sample Size**

The calculated sample size using ROM as an outcome measure is 30 in each group after adding 20% dropout the sample size will be 30+6=36 in each group [4].

Input Data			
Confidence Interval (2-sided)	95%		
Power	80%		
Ratio of sample size (Group 2/Group 1)	1		
	Group 1	Group 2	Difference*
Mean	141.2	135.96	5.24
Standard deviation	7.874	6.4451	
Variance	61.9999	41.5393	
Sample size of Group 1	30		
Sample size of Group 2	30		
Total sample size	60		
*Difference between the means			
Results from OpenEpi, Version 3, open source calculator--SSMean			
Print from the browser with ctrl-P or select text to copy and paste to other programs.			

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

Z1-α/2 Level of significance=95%

μ1 Expected mean change in ROM in Group A= 141.20 μ2 Expected mean change in ROM in Group B= 7.8740

δ1 Expected standard deviation in group A=135.96 δ2 Expected standard deviation in group B=6.4451 Z1-β power of the study= 80%

n Expected sample size in a group= 30

After adding 20% drop out 30+6=36 in each group.

**Data Collection Procedure**

Prior to the procedure, the following two tests were performed:

**AKE Test**

ROM of both sides was checked by using a goniometer. The subject is in a supine lying position and his hip (of testing side) is 90-degree flexed while the other side (non- testing hip) is in a neutral position. Then the subject actively extended the respective knee as far as possible. The lateral epicondyle of the femur and lateral malleolus of the ankle were used as landmarks for the measurement [5].

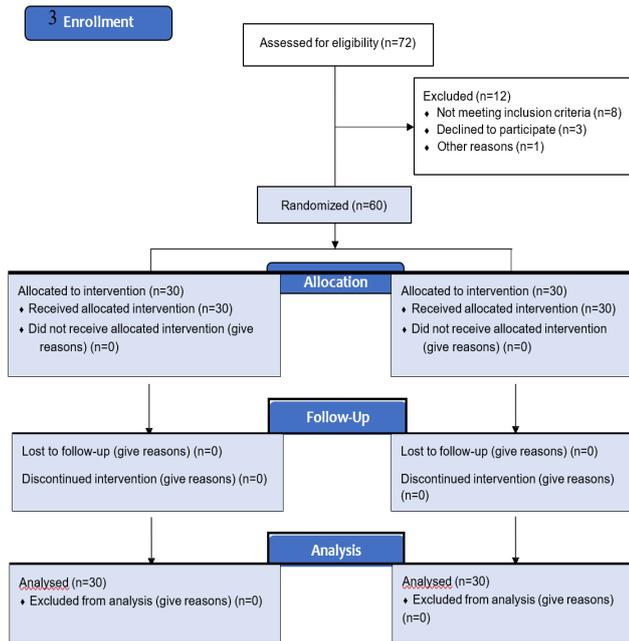
Reliability of AKE test is 0.87 to 0.94.

**Sit & Reach Test**

The participant was sitting with her feet approximately hip-wide against the testing box. She kept her knees extended and placed the right hand over the left, and slowly reached forward as far as she

could by sliding her hands along the measuring board. Following baseline measurements, the subjects (n=60) were randomized into one of the 2 groups: Group A (N=30): retrowalking and Group B (N=30): Slump stretch.

**Consort Diagram**



**Intervention**

Both groups followed protocol 5 days / week for 6 weeks and subjects in both the groups were instructed that no other exercise is to be followed at home.

**Group A**

The participants in group A completed 15 min of retro walking training with a 5-min forward walking warm-up session, at their comfortable walking speed [6].

**Group B**

Group B performed slump stretch actively by sitting erect with the right foot supported on the floor and pointing straight ahead (no hip internal or external rotation). The right leg is supported on the elevated surface (high enough to cause a significant stretch in the posterior compartment of the thigh) in front of the participant with the knee fully extended and toes pointed towards the ceiling (with no hip internal or external rotation). The participant then flexed forward from the hip, maintaining the spine in a neutral position, while reaching the arms and fingers towards the toes until a significant stretch was felt in the posterior compartment of the thigh. Once this position was achieved, the stretch was sustained for 30 seconds. Then the same procedure is applied to the contralateral limb.

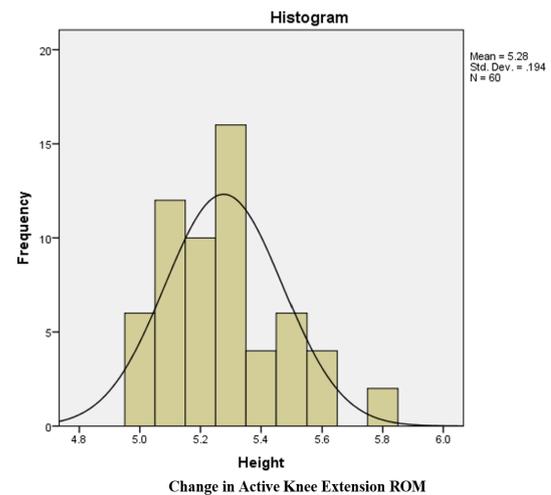
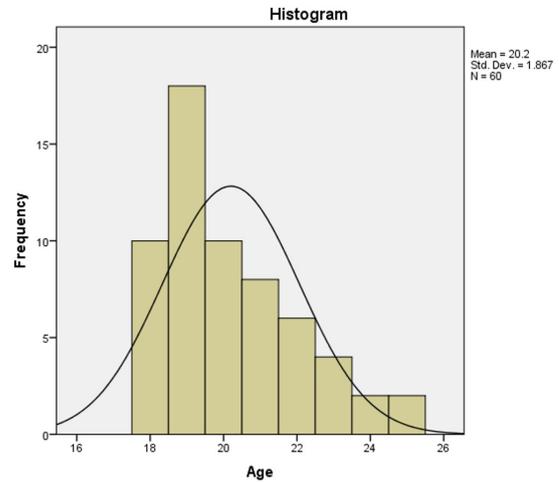
**RESULTS**

**Table 1:** Between group comparison of Mean Age.

Group	Mean	Standard Deviation	Minimum Age	Maximum Age
A	20.20	1.867	18	25
B	20.20	1.867	18	22

**Table 2:** Between group comparison of Mean Height.

Group	Mean	Standard Deviation	Minimum Height	Maximum Height
A	5.2	.1943	5.0	5.4
B	5.2	.1943	5.0	5.8



**Table 3:** Within group comparison of flexibility outcome before and after treatment.

Study Group		Paired Differences		P Value
		Mean	Standard Deviation	
Group A (n=30)	Flexibility of hamstrings pre-treatment & post-treatment	-8.400	6.479	.000
Group B (n=30)		-18.667	6.557	.000

The within group analysis of the active knee extension ROM showed that there was a significant difference between the pre-readings and post-readings with an overall improvement of hamstring flexibility in both groups. Paired sample T-test showed that there was a significant

increase in hamstring flexibility after 6 weeks in both groups ( $p < 0.05$ ).

**Change in Sit and Reach distance**

**Table 4:** Within group comparison of flexibility outcome before and after treatment.

Study Group		Paired Differences		P Value
		Mean	Standard Deviation	
Group A (n=30)	Flexibility of hamstrings pre-treatment & post-treatment	-1.4000	0.8030	.000
Group B (n=30)		-4.5333	1.6291	.000

The within group analysis of the sit and reach distance showed that there was a significant difference between the pre-readings and post-readings with an overall improvement of hamstring flexibility in both groups. Paired sample T-test showed that there was a significant increase in hamstring flexibility after 6 weeks in both groups ( $p < 0.05$ ) [7-9].

**Change in Sit and Reach distance**

**Table 5:** Between group comparison of flexibility outcome before and after treatment.

		Treatment Group		P Value
		Retro walking (n=30)	Slump stretching (n=30)	
Sit and Reach Test	Pre-treatment (mean±SD)	13.91 ± 4.05	13.16 ± 3.59	.452
	Post-treatment (mean±SD)	15.31 ± 4.02	17.70 ± 2.62	.009

The between group analysis of sit and reach test showed that there was a significant difference in sit and reach distance before treatment and after treatment. Independent sample T-test was applied to compare the effect of both techniques in improvement of hamstring flexibility. Mean of difference of pretest -posttest flexibility measurement shows that Group B showed statically significant difference. Thus, slump stretch is more effective for improving hamstring flexibility ( $p < 0.05$ ).

**Conclusion**

Slump stretch is more effective in improving hamstring flexibility in asymptomatic female population as compared to retro walking. There is a significant difference between slump Stretch and Retro walking.

**Limitations**

1. Some participants were unwilling to participate
2. Participants showed difficulty in understanding
3. Follow-up of the subjects was not done to see if the results are retained.
4. Only females were included in the study

**Recommendation**

- The study can be done on wider sample
- Subjects of different age groups can be included
- In future sstudy can be conducted in subjects with low back pain
- Further study can be boducted on both genders.

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