

EFFECTIVENESS OF HOLD-RELAX STRETCHING WITH OR WITHOUT THERMOTHERAPY IN IMPROVING PAIN AND RANGE OF MOTION AMONG PATIENTS WITH HAMSTRING TIGHTNESS

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Abstract: Hamstring tightness is an inability to extend the knee more than 160 degrees while keeping the hip in a 90-degree flexion position.

Objective: To assess the effectiveness of hold-relax stretching with or without thermotherapy in decreasing pain and increasing the range of motion in hamstring tightness patients.

Methodology: A randomized controlled trial was undertaken on individuals with hamstring tightness in District Head Quarter (DHQ) Gujranwala and Tehsil Head Quarter (THQ) Wazirabad during September to December 2022. Total 42 participants were selected on the basis of inclusion and exclusion criteria and allocated into two groups (Hold-Relax stretching with hot pack Group A= 21, Hold-Relax stretching without hot pack =Group B=21) with simple random sampling technique. Pain and ranges of motion were assessed before and after intervention through Visual analog scale (VAS) and Goniometer. Collected data were entered and analysis with SPSS. Frequency distribution table was established for the presentation of data and independent and dependent t-test was applied for between and within group comparison. All data were examined using a 95% confidence level, and a p-value of <0.05 was regarded as significant.

Results: Total 42 participants selected and average age of participants were 28.71±3.73 and 30.00±5.46 years whereas BMI was observed 25.33±3.65 and 23.14±3.14 in hold-relax stretching with (Group A=21) and without thermotherapy (Group B=21) respectively. Hold-relax stretching with thermotherapy and without thermotherapy were statistical significant with p-value <0.05 to decreasing pain and improving the range of motion.

Conclusion: Hold-relax stretching with thermotherapy were more effective technique than hold-relax stretching without thermotherapy to decreasing pain and increasing the range of motion in hamstring tightness patients.

Keywords: Hamstring tightness, thermotherapy, hold-relax stretching, randomized control trail

INTRODUCTION

The ability to move one or more joints through their complete range of motion without experiencing any pain is referred to as flexibility. It is reliant on the extensibility of the muscle, which enables the muscle to relax, lengthen, and yield to a stretch force when it crosses a joint. Flexibility is more typically used to describe the musculotendinous unit's propensity to extend as a limb or when the joint advances through ROM. For the most ideal musculoskeletal functioning and to execute physical activities to their fullest potential, it is a crucial element of fitness.¹ General public and athletes alike frequently struggle with flexibility problems, particularly when it comes to the hamstring muscle group.^{2,3}

Muscle tension is brought on by a decline in the muscle's tendency to contract, which decreases the range of motion at the joint it affects.⁴ The inability to retain the hip in a 90-degree flexion posture while extending the knee over 160 degrees is known as hamstring tightness.⁵ Hamstring tightness can cause several different musculoskeletal issues in addition to limiting the range of motion.⁶ Koreans spend an average of 7.5 hours sitting each day. The average sitting time is 8.7 hours daily for people aged 19 to 29, 7.6 hours for people aged 30 to 39, and 7.3 hours for people aged 40 to 49.

Most young people spend their days sitting at desks or in chairs, which frequently shortens their hamstring muscles and produces a variety of problems with functional tasks. Hamstrings are among the key muscles that regulate pelvic motions, which in turn control spinal movements. Hamstring muscles support the knee capsule posteriorly when the knee is extended during the stance phase and principally govern the forward swing of the leg during the terminal swing. Consequently, in terms of one's healthy lifestyle and rehabilitation settings, the shortening of the hamstring muscles is the core concern.⁷

The tightness of the muscle affects the length-tension relationship of the muscle as well as the limb's capacity to absorb shock. Reduced flexibility creates a vicious cycle where the range is reduced and postural issues worsen as a result. Additionally, tight muscles restrict blood flow, which lowers performance.⁸ One of the most frequently reported ailments resulting from hamstring tightness is a hamstring strain.⁹ Gajdosik et al. (2011) found that the degree of hamstring flexibility during forward bending had an impact on both the pelvic angle and the range of motion in the thoracic region. Additionally, hamstring strain affects the lumbar pelvic rhythm.¹⁰

Patellar tendinopathy, patellofemoral pain syndrome, and plantar fasciitis are among conditions that can occur as a result of tight hamstrings.¹¹ There will usually be a dull aching or tingling in the person's body. Studies demonstrating a favorable relationship between tight hamstring and intensity of LBP also reveal a link between hamstring tension and mechanical low back pain. Short hamstring muscles prevent the pelvis from tilting anteriorly during spinal flexion. This causes lumbar muscle and ligamentous tension to worsen, which increases the compressive pressures on the lumbar spine.¹² Other postural alterations brought on by hamstring tightness may indirectly affect the stability of the sacroiliac joint.¹³ Therefore, hamstring muscle flexibility is essential for overall health and for reaching peak physical fitness.¹⁴

Because static stretching has been shown to promote flexibility in contrast to other types of stretching, it has long been the de facto standard for evaluating training programs. Stretching is the most popular technique for enhancing muscle flexibility.¹⁵ Modified hold-relax stretching is presently utilized by a variety of manual therapy domains in addition to static stretching. The goal of these workouts is to improve the proprioceptors' neuromuscular responsiveness. They have been proven to be beneficial in treating several ailments, including

lengthening shortened muscles, bolstering frail muscles.¹⁶ To treat hamstring muscle shortness, a hold-relax approach is used that entails stretching the muscle until it reaches its maximum length, at which point one engages in an isometric contraction for approximately ten seconds before passively moving the leg into the new end-range.¹⁷

Hot packs, which conduct a surface heating agent, are among the most popular thermotherapy techniques. Bentonite, a hydrophilic silicate gel, is typically used to create hot packs. There are different sizes and forms available for such hot packs to conform to different parts of the body.¹⁸ Most frequently, hot packs are utilized as the initial treatment modality for stretching muscles.¹⁹ Thermal treatment of the tight hamstring muscles before stretching may provide a better improvement in hamstring flexibility.²⁰

This study compares the benefits of hold-relax with or without thermotherapy on alleviating pain and increasing the ROM in individuals with a short hamstring. Only a few research have investigated the effect of thermotherapy on these patients, despite many studies on the effects of stretching on hamstring tightness. This will aid individuals in developing novel intervention techniques helpful in treating hamstring tightness.

METHODOLOGY

A randomized controlled trial was conducted among 42 participants. Individuals who meet the inclusion and exclusion criteria were selected. Details about consent forms was explained to the participants prior to filling the forms. Participants who agreed to take part were included in this study. Demographic data such as name, age, gender was obtained at baseline assessment. The 90-90 straight leg raise test and visual analogue scale served as this study's primary outcome measures.

The patient was lying supine throughout the 90-90 straight leg lift exam. The patient holds onto the backs of both thighs to stabilise the hip joints while lying supine with the hips and knees bent at a 90-degree angle. The patient then actively extends each knee in turn.

The goniometer was placed on knee joint with fulcrum placed over lateral tubercle, stationary arm along femur aligned with greater trochanter parallel to the edge of table, the moving arm along the tibia aligned with lateral epicondyle. Hamstring tightness is indicated if the knee cannot be extended within 20 degrees of knee extension.²¹ There was excellent intratester reliability (ICC=0.92-0.95) of SLR²². A goniometer was used to measure ROM. There was excellent intratester reliability of goniometer is

present with Intraclass Correlation Coefficients (ICC) for goniometry $\geq 0.94^{23}$.

Using the Visual Analogue Scale, the pain results of patients during the previous weeks were evaluated (VAS). Scores ranging from 0 to 4mm indicated no pain, 5 to 44mm indicated mild pain, and 45 to 74mm indicated moderate pain. 75 to 100mm - excruciating agony²⁴. The VAS was reliable and highly correlated (ICC coefficient=0.96 to 0.98) with other forms of assessment of pain²⁵. All data were collected under the rules and regulations of ethical committee of University of Lahore.

Research was approved by Institutional review board (IRB), University of Lahore, Punjab, Pakistan.

RESULTS

Following results were obtained after total 42 participants were selected randomly to assess the effectiveness of hold-relax stretching with or without thermotherapy in decreasing pain and improving the range of motion in patients with hamstring tightness. All participants were allocated into two groups (Hold-Relax stretching with hot pack Group A= 21, Hold-Relax stretching without hot pack =Group B=21).

Table 1: Descriptive analysis of participants

Variables	Intervention	
	Hold-Relax stretching with Hot pack	Hold-Relax Stretching without Hot pack
	Mean \pm S.D	
Age of participants (Years)	28.71 \pm 3.73	30.00 \pm 5.46
BMI (Kg/m ²)	25.33 \pm 3.65	23.14 \pm 3.14

Average age of participants were 28.71 \pm 3.73 and 30.00 \pm 5.46 years whereas BMI was observed 25.33 \pm 3.65 and 23.14 \pm 3.14 in hold-relax stretching

with (Group A) and without thermotherapy (Group B) respectively that is demonstrated in table 5.1.

Table5.2: Frequency distribution of demographic variables

Variables		Intervention	
		Hold-Relax stretching with Hot pack	Hold-Relax Stretching without Hot pack
		n (%)	
Gender	Male	20(95.20)	19(90.50)
	Female	1(4.80)	2(9.50)
Marital status	Single	7(33.30)	13(61.90)
	Married	14(66.70)	8(38.10)
Occupation	Student	7(33.30)	6(28.60)
	Public Job	3(14.30)	3(14.30)
	Private Job	10(47.60)	10(47.60)
	House wife	1(4.80)	1(4.80)
	Others	0(0)	1(4.80)
Total		21(100)	21(100)

Gender and occupation was approximately equal proportion in both groups (Group A and Groups B) whereas single participants 13(61.90%) in Group B however married were more 14(66.70%) in Group A (hold -relax stretching with hot -pack) shown in table 5.2.

Table 3: Between Hold-Relax stretching with and without Hot pack groups comparison

Variables	Intervention		Independent Samples Test				
	Hold-Relax stretching with Hot pack, n=21	Hold-Relax Stretching without Hot pack, n=21	t-test for Equality of Means			95% Confidence Interval of the Difference	
	Mean ± S.D		t	P-value	Mean Difference	Lower	Upper
Range of Motion at Baseline	51.43±6.35	49.05±6.05	1.244	0.221	2.38095	-1.48672	6.24862
Range of motion at 4th week	75.95±5.15	70.95±4.64	3.304	<0.002*	5.00000	1.94139	8.05861
Pain severity with VAS at Baseline	54.76±6.80	51.43±9.64	1.295	0.203	3.33333	-1.86728	8.53395
Pain severity with VAS at 4th week	7.14±7.17	17.62±7.00	-4.789	<0.001*	-10.47619	14.89703	6.05535

(* indicates statistical significant difference)

Table 4: Within group comparison

Variables	Intervention	
	Hold-Relax stretching with Hot pack, n=21	Hold-Relax Stretching without Hot pack, n=21
Range of Motion at Baseline (mean±S.D)	51.43±6.35	49.05±6.05
Range of motion at 4th week (mean±S.D)	75.95±5.15	70.95±4.64
paired difference (mean±S.D)	-24.52±8.20	-21.90±3.70
95% CI of the Difference (LL-UL)	-28.25 to -20.79	-23.59 to -20.22
t-Score	13.7000	27.1290
P-value	<0.001*	<0.001*
Pain severity with VAS at Baseline(mean±S.D)	54.76±6.80	51.43±9.64
Pain severity with VAS at 4th week (mean±S.D)	7.14±7.17	17.62±7.00
paired difference (mean±S.D)	47.62±9.44	33.81±9.73
95% CI of the Difference (LL-UL)	43.32 to 51.91	29.38 to 38.24
t-Score	23.125	15.92
P-value	<0.001*	<0.001*

ROM and pain were not statistical significant at baseline whereas at 4th week assessment, Pain and range of motion were statistical significant with p-value <0.002 and P-value <0.001 in Group A (hold-relax stretching with hot-pack) and Group B (hold-relax stretching without hot-pack) that are presented in **table 5.3**.

Improvement in range of motion in within Group A (hold-relax stretching with hot pack) was 51.43 ± 6.35 to 75.95 ± 5.15 whereas in group B (hold-relax stretching without hot pack) 49.05 ± 6.05 and 70.95 ± 4.64 that showed the statistical significant in both groups but change was more in hold-relax stretching with hot pack. Decreasing the in pain within Group A (hold-relax stretching with hot pack) was 54.76 ± 6.80 to 7.14 ± 7.17 whereas in group B (hold-relax stretching without hot pack) 51.43 ± 9.64 and 17.62 ± 7.00 that showed the statistical significant in both groups but change with decreasing trend was more in hold-relax stretching with hot pack. This within group comparison was shown in **table 5.4**.

DISCUSSION

Current randomized control trail was carried out to assess the effectiveness of hold-relax stretching with or without thermotherapy in decreasing pain and increasing the range of motion in hamstring tightness sufferers. Total 42 participants were selected randomly and selected participants were allocated into two groups (Hold-Relax stretching with hot pack Group A= 21, Hold-Relax stretching without hot pack =Group B=21). Present trial showed that statistical significant in pain and range of motion in both group (hold-relax stretching with and without hot pack) but results revealed that hold-relax stretching with hot pack was more effective than hold-relax stretching without hot pack.

To determine the impact of modified hold-relax stretching with moist heat on the range of motion and strength of the hamstring muscle in college-age boys, an interventional research was conducted. Outcomes of that study indicated that hold relax stretching with moist heat had statistical significant on range of motion and strength of hamstring muscle that were align with current study.²⁶

Finding of other previous studies^{27, 28, 29} were also in accordance and indicated that modified hold-relax method was improving the range of motion and decreasing the pain.

Changing with improving the ROM with modified hold relax stretching with additional moist heat could be more effective on thixotropic properties, neural components of the muscle and viscoelasticity.³⁰

In past, an interventional study was carried on 30 participants with three groups (therapy including stretching, heat, and a combination of both) 10 participants were in each group. Only heat had improving effect on the ROM of hip joint whereas stretching showed increasing effect external and flexion rotation but in group with combined effect of heating and stretching was more effective to increase in flexion motion and significantly increasing improvement in abduction.³¹

Effects of Hot-pack and Ultrasound Therapy with Hot and Deep Thermotherapy on Hamstring Muscle Flexibility Participants in this research with hamstring tightness totaled 28. Three workout groups were chosen at random for them: the stretching group (n=10), the hot-pack group (n=9), and the ultrasound group (n=9). According to the findings, stretching alone and hot packs before stretching are less efficient than ultrasound treatment for increasing hamstring muscle flexibility. The findings of this study demonstrate that thermotherapy combined with therapeutic ultrasonography will reduce hamstring muscle shortening before stretching exercises.⁷

Limitations: Only individuals with mild to moderate hamstring tightness may use the study's findings. Therefore, it is impossible to apply these results to really tight hamstrings. Results are only promised for a follow-up period of four weeks.

Recommendations: As a result of our findings, more study comparing various methods for the treatment of hamstring tightness is encouraged. Additional related examinations are to be suggested in cases of extreme hamstring tightness.

CONCLUSION

Hold-relax stretching with thermotherapy were more effective technique than hold-relax stretching without thermotherapy to decreasing pain and increasing the range of motion in hamstring tightness patients.

Conflict of Interest

There was no conflict of interest.

Financial Statement

No fundings were given by any authorities; it was a project thesis of doctor of physical therapy.

Data availability

Data will be provided on the demand by corresponding author.

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