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ORIGINAL ARTICLE

COMPARATIVE EFFECT OF PNF STRETCHING TECHNIQUES ON HAMSTRING FLEXIBILITY

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RAMACHANDRAN. S¹, JIBI PAUL², SENTHILKUMAR. N², SELVARAJ SUDHAKAR², TAMILSELVI³

Authors:

²Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, Tamilnadu, India.

³student, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, Tamilnadu, India.

Corresponding Author:

¹Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, Tamilnadu, India

Mail id: ramsiva8448@gmail.com

Abstract

Background of the study: Hamstring is a group of muscle essential for flexion of knee and extension of hip. Hence hamstring flexibility is essential for the activities of Daily Living. Hamstring tightness may decrease the output of a person's activity. **Objective:** The purpose of the study is to find the effectiveness of two PNF stretching techniques (Hold Relax and Contract Relax-Antagonist Contract) on improving hamstring flexibility. **Materials and Methods:** Samples are randomly selected from the college students and divided into two equal groups. Each group consists of 15 samples. Group A treated with hold-relax stretching, Group B treated with contract relax antagonist relax stretching. Samples are positioned in supine lying with hip and knee flexed at 90 degree. Straps are used for the stabilization of hip and lower extremity. For each group stretching technique was performed 3 times in a week. The total period of experiment was 6 weeks. At the end of each week, the knee extension was measured with the help of universal goniometer. **Result:** Both the groups have reported an increase in hamstring flexibility. Group B with Contract Relax-Antagonist Contract found more effective in improving hamstring flexibility with a significant difference of $P < 0.001$. **Conclusion:** This study shows that both PNF hold relax and PNF contract relax antagonist contract stretching is effective in improving hamstring flexibility. However PNF contract relax antagonist contract stretching technique was better than PNF hold relax stretching technique in improving the hamstring muscle flexibility.

Keywords: Hamstring flexibility, PNF-Hold Relax, PNF-Contract Relax Antagonist Contract.

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INTRODUCTION

Flexibility plays an important role in preventing injury and improve physical performance. Stretching is essential for hamstring muscle flexibility. Hamstring is a two joint muscle, which acts primary extensor of hip joint and flexor of knee joint. The flexibility of hamstring plays a vital role in walking, standing, weight bearing and routine physical performance.¹ Hamstring injury is more common in sports activities (Running, jumping, kicking, etc². Its activity is high during initial stage of stance phase of gait. Presence of hamstring tightness causes decreased ROM of hip as well as knee joint¹¹. The tightness may be due to poor seating posture, obesity, lack of flexibility or lack of physical activities its results in LBA, Hamstring injury, etc.^{1,2} The samples are selected present with hamstring tightness 20 to 25 degree.

Numerous stretching techniques are administered to reduce hamstring tightness. They are 1) Ballistic stretching, 2) Static stretching and 3) PNF stretching^{3,4}. Maintaining normal muscle length requires regular stretching to prevent muscle stiffness and benefits from the decreased risk of musculoskeletal injuries.^{6,11} and enhance physical performance^{1, 5}. Various PNF stretching techniques based on Kabat's concept⁹. PNF stretching techniques are more advanced form for facilitation as well as elongation of muscle group. PNF stretching is originally developed as a form of rehabilitation. PNF stretching provides both stretching and contraction of targeted muscle group with locked knee. PNF stretching will facilitate muscular inhibition.

Hold Relax technique causes lengthening and static contraction against maximum resistant by autogenic inhibition. Contract relax antagonist contract technique is same as hold relax technique but the opposing muscle group will contract eccentrically along with autogenic and reciprocal inhibition. The comparison between two PNF stretching (Hold relax and Contract relax –Antagonistic contract) techniques used to improve the hamstring flexibility.

METHODOLOGY

This was a comparative study with Pre and Post test. The study carried out at faculty of physiotherapy ,A.C.S Medical College and Hospital, Chennai. The study consists of 30 subjects and the samples selected by simple random sampling method.

Inclusion criteria: Subjects with age group 18 to 24 Years of both gender with hamstring tightness Active Knee Extension of 20 to 25 degree were included in this study.

Exclusion criteria: Subjects with History of musculoskeletal injury ,Neurological pathology of low back ache, Pathology of pelvis, hip and knee, Any surgery of low back, Any surgery of hip and knee, Any injury of hamstring muscle in last 6 months from time of study were excluded.

Measuring tools: This study used Universal goniometer and Stop watch for measuring active knee extension range and holding time.

Procedure: The stretches includes both PNF- hold relax and PNF- contract relax antagonist contract techniques for Hamstring muscle. The hamstring muscle was stretched when the subject first announce a mild stretch feel; this position was held for 7 sec. Next, the subject then isometrically contracted the hamstring muscle for 3 sec by attempting to push his leg down towards the table against the resistance of the explorer. Following this, the subject was asked to relax for 5 sec. The explorer then passively stretched the muscle until a mild stretch sensation is feel. This stretch was held for 7sec. This sequence was repeated 5 times with each sequence separated from each by a 20 second interval. This was followed by post treatment measurement of ROM at the end of first, second and third week. The treatment was given 3 times per week for duration of 3 weeks^{7,8}.



Fig.1: Starting position of AKE Test



Fig.3: Group- A with PNF- Hold Relax Technique



Fig. 2: Measurement of Active Knee Extension ROM



Fig.4: Group: B with PNF- Contract Relax-Antagonist Contract Technique

RESULT

Active Knee Extention	Pre Test		Post Test		t - Test	Significance
	MEAN	S.D	MEAN	S.D		
Group- A	112.33	2.58	130.66	3.71	-23.00	.000***
Group- B	114.00	5.07	134.66	1.29	-16.16	.000***

Table 1.Comparison of Active Knee Extension within Group A and Group – B

Group A – PNF Hold Relax Technique, Group B – Contract Relax Technique. In AKE, there is a statistically highly significant difference between the pre and post test values within Group A and Group B with $P \leq 0.001$.

Active Knee Extention	GROUP - A		GROUP - B		t - TEST	df	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D			
PRE TEST	112.33	2.58	114.00	5.07	-1.13	28	.266*
POST TEST	130.66	3.71	134.66	1.29	-3.93	28	.000***

Table 2. Comparison of active knee extension test between Group A and Group B

Group A - PNF Hold Relax Technique, Group B - Contract Relax Technique. Active Knee Extension not significant at pre test between two Group, $P > 0.05$, but significant at post test between Group A and B with $P < 0.05$.

Above table shows that statistically highly significant difference in post test values of the AKE between Group A and Group B with $P \leq 0.001$. Both the Groups shows significant increase in the post test Means but (Group-B) which has the higher mean value is more effective than (Group-A)

DISCUSSION

In this study Group B which underwent for contract relax antagonist contract stretching technique had significant improvement in hamstring flexibility. The Group A undergone hold relax stretching technique also had significant improvement in hamstring flexibility. Group B had more improvement in hamstring flexibility compared with Group A.

In Table 1 both the group shows significant improvement in the post test means but (Group-B) which has the higher mean value difference when compared to (Group-A). However some studies have questioned the role of autogenic inhibition and reciprocal inhibition during PNF stretching through EMG and H- reflex studies, but those studies differed from each other related to their methodologies enrolled were also limited by factors such as muscle lengths, number of subjects, the year of the study etc. Whereas some studies impute these mechanism to be linked with PNF stretching techniques. For

example, Moore et al, 1991 approved the theoretical basis of PNF stretching and proposed that the relax portion of the hold-relax exercise should be applied quickly after the hold (muscle contraction) portion. Therefore the results of this study can be match up with the popular belief that PNF stretching techniques lead to relaxation/inhibition of the stretched muscle (target muscle) via the two physiological mechanisms proposed by Sherrington (1940) namely reciprocal inhibition and autogenic inhibition.

Another possible reason for the improved hamstring flexibility for the subjects in this study could be the viscoelastic nature of the muscle. As the total dose of the stretch for each stretching session was 70 seconds (7 sec of pre stretch + 7 second of post relaxation stretch x 5 repetitions). This aspect is in accordance with the findings of Bandy et al, 1994 who showed that a 30 sec static stretch was sufficient for increasing the hamstring muscle flexibility^{12,13}.

One more reason for this increased stretch could be the altered stretch perception again due to the stretch duration. Study done by Ulrike et al 2007, utilising a total dose of 40 sec stretch duration following a 6 sec isometric contraction duration of PNF-CR stretch for improving hamstring muscle flexibility, showed increased stretch capability for the subjects in that study. This finding may also be used to explain the reasons for increase in hamstring muscle flexibility taking in to account the total dose of 70 sec stretch

duration per session given thrice weekly for three weeks.

CONCLUSION

This study concluded that both PNF hold relax and PNF contract relax antagonist contract stretching are effective in improving hamstring muscle flexibility. However PNF contract relax antagonist contract stretching technique was better than PNF hold relax stretching technique in improving the hamstring muscle flexibility.

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