International Journal of Science Academic Research
Vol. 03, Issue 09, pp.4389-4392, September, 2022
Available online at http://www.scienceijsar.com

ISSN: 2582-6425

Research Article

EVALUATION OF IMMEDIATE EFFECT OF DIFFERENT NEURODYNAMIC MOBILIZATION TECHNIQUES ON HAMSTRING FLEXIBILITY IN BASKETBALL PLAYERS

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Received 25th July 2022; **Accepted** 20th August 2022; **Published online** 30th September 2022

Abstract

Hamstring muscle injuries are common in many mainstream sports, Basketball being one of them. The factors responsible commonly for these injuries are insufficient warm up, poor flexibility, fatigue, neural tension etc. Hamstring tightness leads to musculoskeletal disorders. In Basketball players Hamstring flexibility is very important. It contributes to run, squat and jump. Methods like stretching are commonly used to regain Range of motion. Neurodynamic sliding is also considered to improve hamstring flexibility. Thus, it is important to undertand beneficial effects of neurodynamic sliding along with passive stretching to increase hamstring flexibility. This study aims to undertand immediate effect of neurodynamic mobilization techniques on hamstring flexibility in basket ball players. A randomized control trial on 45 participants having atleast five years of experience and having popliteal angle less than 125 degree were included. Three groups were made and the interventions were 1. Passive stretching 2. Passive stretching plus slump neurodynamic sliding 3. Passive stretching plus straight leg raise neurodynamic sliding. Goniometer and Sit and reach test were used pre and post intervention as outcome measures. The study indicates passive stretching with SLUMP neurodynamic sliders will have better immediate effect amongst all three techniques. To sum up, clinically Passive stretching with SLUMP neurodynamics is more effective and thus will help prevent injuries.

Keywords: Hamstring, Basketball, Tightness, Injury, Neurodynamic, Stretching.

INTRODUCTION

Hamstrings muscle injuries are common in many mainstream sports and physical activity (Gil-Crujera *et al.,* 2014). The factors affecting hamstring injuries are usually insufficient warm-up (Safran *et al.,* 1988), poor flexibility (Witvrouw *et al.,* 2003), muscle imbalances (Croisier, 2004), neural tension (Turl and George, 1998), fatigue (Kujala *et al.,* 1997), and previous injuries (Verrall *et al.,* 2001). Inadequate flexiblility being the most common cause of hamstring injuries (Kujala *et al.,* 1997). Hamstring tightness also results into low back pain and many other musculoskeletal disorder (Forman *et al.,* 2014). Hence hamstring flexilibility is an important factor to avoid muscle injuries (Decoster *et al.,* 2005). Basketball combines finesse and power and requires players to be in peak physical condition to excel. Lower limb muscles are critical for playing basketball (Castellote-Caballero *et al.,* 2012). Players are required to squat and defend the ball which needs good co contraction of quadriceps and Hamstring muscle. Hamstring muscles are in shortened position for long time, therefore hamstring tightness is common. Strong thigh muscles provide the boost needed to power a player off the ground and allow him to shoot the ball with proper technique (Castellote-Caballero *et al.,* 2012). Hamstring muscles tightness being the most commonest should be treated immediately to avoid any muscle injuries. Stretching is one of the most therapeutic way to improve and maintain hamstring flexibility (Nagarwal *et al.,* 2010). It helps to lengthen the tight muscle (Herrington *et al.,* 2006). Different types of stretching such as static, ballistic, contract relax and neurodynamic stretching (Stephens *et al.,* 2016; George *et al.,* 2006; Smith, 1994). Static stretching is considered more effective and commonly used (Magnusson, 1998).

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Static stretching helps in holding the muscle in an elongated manner which helps in increase in viscoelasticity and stretch tolerance of the muscle (Castellote-Caballero *et al.,* 2013). Involvement of Neural tissues in hamstring flexibility has been studied in the literature (Mendez-Sanchez *et al.,* 2010; Butler, 2004). During daily activities, the sciatic nerve which innervates the hamstrings is exposed to constant pressure during prolonged sitting, standing and other activities resulting in hamstring tightness (Lew and Briggs, 1997). Nerve Adhesions in the muscle may affect the neurodynamic casing abnormal mechanosensitivity of the scatic nerve, which would affect the hamstring flexibility (McHugh *et al.,* 2012). There are different types of neurodynamic techniques used to improve neural tightness. Neurodynamic is a manual method of stretching in which force is applying to nerve structures through posture and multi-joint movement aiming to produce a sliding movement of neural structures relative to their adjacent tissue (Coppieters and Butler, 2008). Neurodynamic is thought to decrease neural mechanosensitivity and can be a beneficial technique in the management of hamstring flexibility (Kavlak and Uygur, 2011). In this study we are going to use two different neurodynamic sliding technique to improve hamstring flexibility. Slump neurodynamic sliders and straight leg raise position sliders helps to increase mechanosensitivity of the muscle (De-la-Llave-Rincon *et al.,* 2012).

Problem statement

To evaluate immediate effects of neurodynamic mobilization techniques on hamstring flexibility in basket ball players.

Objectives

1. To evaluate effect of passive stretching on Hamstring flexibility exclusively.

2. To evaluate effect of Passive stretching with slump Neurodynamic sliding on Hamstring flexibility
3. To evaluate effect of passive stretching with neurodynamic sliding in straight leg on Hamstring flexibility.
4. To compare the three techniques.

METHODOLOGY

Type of study: Randomized control trial

Sample size – 45

Inclusion criteria

1. Age 18 to 25 year old
2. Popliteal angle less than 125 degrees

Exclusion criteria

1. Any recent hamstring injury
2. Any recent lower limb fracture
3. Any recent ligament injury

Outcome measure

1. Popliteal angle ROM
2. Sit and reach test

Procedure

We collected a sample of 45 basketball players. Players included in the study were 16-25 years of age, having atleast 5 years of experience and having popliteal angle less than 125 degrees. Players having any recent hamstring, lower limb fracture or ligament injury were excluded. Before starting the assessment, player's consent was taken and the whole procedure was explained to them. The players were randomly divided into 3 groups of 15 each using a simple random distribution. The 3 intervention groups were: 1) passive stretching 2) passive stretching plus slump neurodynamic sliding and 3) passive stretching plus straight leg raise neurodynamic sliding. This was a single blinded study. The players were included in the study on the basis of two outcome measures – goniometer and sit and reach test.

In each group pre and post assessment was taken after the stretching and neurodynamic sliders.

Measurement of hamstring flexibitity: All physical measurements were obtained by a pair of trained examiners who were blinded to each subject's group allocation. The passive hip knee 90-90 deg flexion was performed in supine position. The goniometer was placed to measure the popliteal angle and then the knee was passively extended to measure the poplitael angle. Second test performed was sit and reach test- The player is asked to remove their shoes and sit on flat surface, legs extended in front of the body, toes pointing up and feet slightly apart, with the sole of the feet against the base of the step. Place one hand on top of the other and then reach slowly forward. At the point of your greatest reach,hold for couple of secs and then the therapist will measure the distance.

Intervention

Passive stretching: Subjects in the Stretching group received passive stretching of the hamstring muscles in their dominant leg. While lying supine, a researcher who was blinded to popliteal test measures would passively position the subject into the SLR position (hip in flexion, knee in extension, and ankle in neutral) without pain/discomfort to the point where resistance to movement was first noted .This position was then maintained for 30 seconds and repeated further 5 times. During the 30 second stretches, the therapist monitored the subjects to ensure they did not make any compensation that could modify the stretching position. Each subject had a total of 180 seconds of stretching on their lower extremity.

Passive stretching with neurodynamic sliding : Subjects in the Neurodynamic group received sciatic neurodynamic sliders. The objective of the technique is to produce a sliding movement of neural (sciatic) structures relative to their adjacent tissues

Slump neurodynamic sliding: Player is sitting on the edge of the table with cervical, thoracic, lumbar flexion maintained by the therapist. The therapist passively performs knee flexion, ankle planterflexion followed by knee extension, ankle dorsiflexion continuously for 60 secs then rest for 30 secs (total 3 sets).

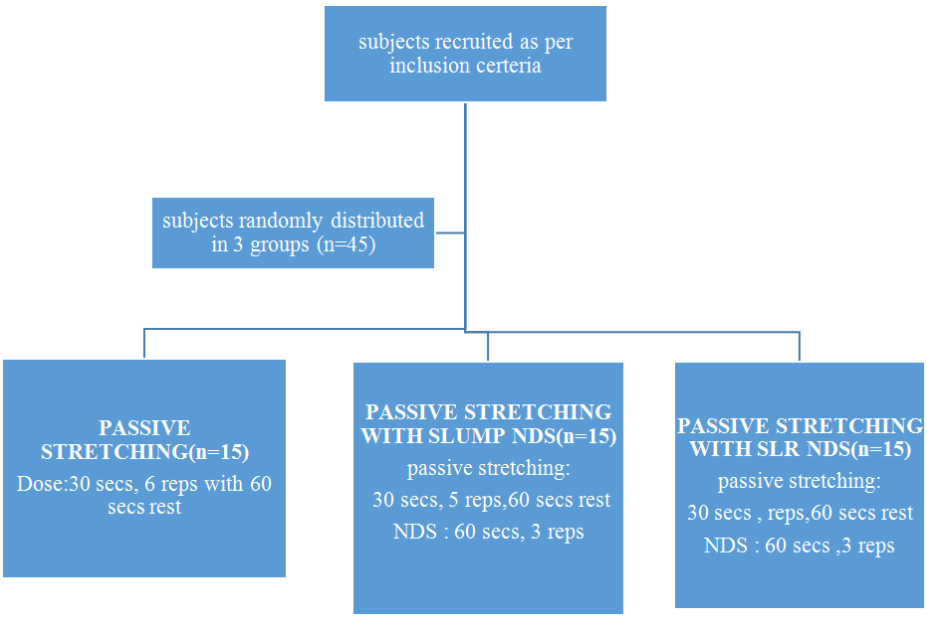

Figure 1. Flow diagram of patient's recruitment and intervention

Straight leg raise neurodynamic sliding: Player is in supine position with the leg passively in hip flexion, ankle planterflexion and followed by hip extension, ankle dorsiflexion.

STATISTICAL ANALYSIS AND RESULTS

The data collected was entered into MS Excel. Keeping in mind the aims and objective of the study the data was descriptively analysed and the mean and standard deviation was obtained.

The Data analysed for normal distribution and difference will be evaluated using: SPSS version 16

Intra group: paired T test

Inter group: one way ANOVA

Results: Passive Stretching (PS)

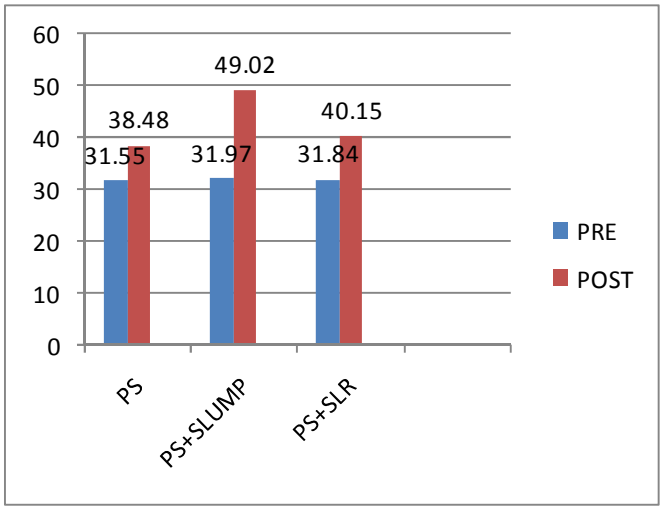

Figure 1. Mean for pre and post (Popliteal angle Rom)

Table 1. mean for pre and post (Popliteal angle Rom)

Popliteal angle Rom	Pre	Post
PS	31.55±2.1	38.48±2.2*
PS+SLUMP	31.97±2.44	49.02±3.78**
PS+SLR	31.84±2.21	40.15±5.01**

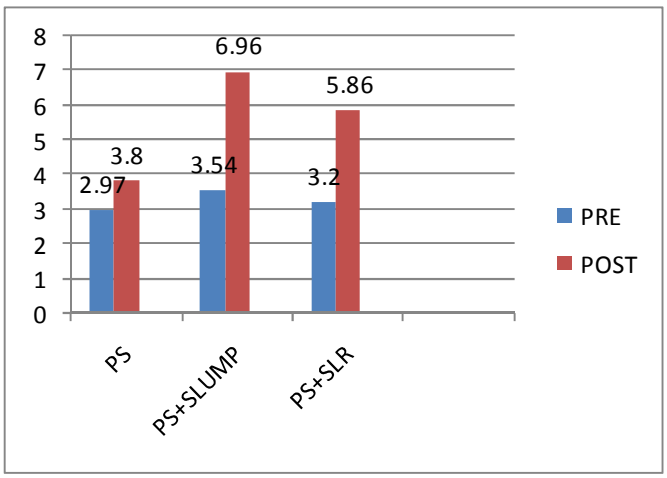

Figure 2. Mean for pre and post (sit and reach test)

Table 2. Mean for pre and post (sit and reach test)

Sit and Reachtest	Pre	Post
PS	2.97±0.5	3.8±0.41
PS+SLUMP	3.57±0.5	6.96±1.74**
PS+SLR	3.20±0.72	5.86±1.74

p value(<0.005) : * significant ** extremely significant

Table 3. Mean and standard deviation

	PS	PS+Slump	PS+SLR
Popliteal angle rom	6.93±2.66	17.31±3.86	8.31±3.11
Sit and reach test	0.82±0.57	3.42±1.35	2.66±1.54

Anova

This is the table that shows the output of the ANOVA analysis and whether there is a statistically significant difference between our group means. We can see that the significance value is 0.001 (i.e., p = .001), which is below 0.05. and, therefore, there is a statistically significant difference in the mean length of time to complete the spreadsheet problem between the different courses taken. Multiple Comparisons table which contains the results of the Tukey post hoc test.

Table 4. One way anova for popliteal angle rom

Popliteal Angle rom	Sum of sqaures	Df	Mean sqaure	F	Sig.
Between group	2858.9	2	1429.5		
Within group	1396.1	132	10.5	135.5	0.001
Total	4255.0	134			

Table 5. One way anova for sit and reach rest

Sit and reach test	Sum of sqaures	Df	Mean sqaure	F	Sig.
Between group	160.55	2	80.27		
Within group	200.66	132	1.52	52.82	0.001
Total	361	134			

DISCUSSION

Hamstring tightness is viewed as musculoskeletal problem in most of the clinical setup. Results from this study proves that passive stretching along with neurodynamic sliding provides a greater immediate increase in passive popliteal range of motion than isolated passive stretching and passive stretching along with straight leg raise position neurodynamic sliding in subjects with hamstring tightness. Although both neurodynamic groups along with passive stretching show effective increase in passive popliteal range of motion than isolated passive stretching of hamstring but passive stretching along with SLUMP neurodynamic sliders show more difference in pre and post values (17.31±3.86) and for sit and reach test (3.42±1.35). The results confirms our initial hypothesis that passive stretching along with SLUMP neurodynamic sliding technique would provide greater immediate effects then other two methods. Increasing hamstring flexibility has been suggested to play an important role in the treatment and prevention of lower extremity overuse. Usually many research for hamstring flexibility has focused on different types of stretching techniques like static stretching, ballistic stretching, plyometric stretching and many other. There are very few research that show the effects of neurodynamic intervention on hamstring flexibility However neurodynamic sliders cannot be ignored as it helps in achieving efficient extensibility of the tissue which results in improving extensibility of the muscle.. And fewer research studies the combined effects of stretching along with

neurodynamic technique. However neurodynamic sliders cannot be ignored as it helps in achieving efficient extensibility of the tissue which results in improving extensibility of the muscle. Sliders in slump position offers effective handling of neural tightness and hence gives better results when combined with passive stretching. However neurodynamic sliders cannot be ignored as it helps in achieving efficient extensibility of the tissue which results in improving extensibility of the muscle. This is proved by Castellote-Caballero et al. compared the short-term effects of NS to no intervention control on hamstring flexibility using a passive SLR test in healthy male soccer players. The authors showed that NS provided a significant improvement in ROM of passive SLR. Sliders in slump position offers effective handling of neural tightness and hence gives better results when combined with passive stretching as compared to sliders in SLR. This is proved by S. Sharma et al. who studied short term effectiveness of neural sliders and tenionsers as an adjunct to passive stretching of hamstring muscle on knee extention in healthy individual and proved that it was effective.

Conclusion

Findings from this study indicate that passive stretching with SLUMP neurodynamic sliders will have better immediate effects on hamstring flexibility than passive stretching along with SLR NDS and isolated passive Stretching.

Future scope: Long term effects for the same study.

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