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The Immediate Effect of Sleeper Stretch and Proprioceptive Neuromuscular Facilitation Stretch on Shoulder Range of Motion in Badminton Player

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Abstract:
Background*:Badminton is a sport that requires a lot of overhead shoulder motion. Abduction, internal and external rotation of the shoulder joint during shots, lobbing, stroking and smashing were the cause of the injury. These alterations have been linked empirically to bony and soft tissue adaptations that result from the large rotational and distractive forces acting on the GH joint during the throwing motion.*
Materials and Methods*: In this prospectiveSubjects were randomly assigned to 1 of the 2 intervention groups; Group A: The sleeper stretch group (n=50) & Group B: PNF stretch group (n=50). Study subjects were evaluated before undertaking their assigned stretching sessions for their shoulder internal rotation ROM, using a mechanical inclinometer. Sleeper stretch was repeated 3 times and held for 30 seconds with 30 seconds of rest period. PNF stretch was conducted 3 times with 20 second of rest period in between each stretch.*
Results*:The difference of mean for group A was -3.48 whereas, for group B it was -7.46. Therefore, PNF Stretch showed a greater improvement with a mean difference of -7.46.*
Conclusion:*This study provides insight into the effectiveness of PNF stretch and sleeper stretch for increasing shoulder ROM. More specifically, the PNF stretch resulted in significant increase in shoulder internal rotation in the dominant arm of badminton players.*
Key Word*: Sleeper Stretch, PNF (Proprioceptive Neuromuscular Facilitation), Mechanical Inclinometer.*

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I. Introduction

Badminton is one of the most widely-played sports in the world. Badminton is a sport that requires a lot of overhead shoulder motion. Abduction, internal and external rotation of the shoulder joint during shots, lobbing, stroking and smashing were the cause of the injury. The overhead throwing athlete is an extremely challenging patient in sports medicine due to the high forces, repetitive nature, and extreme ranges of motion observed during the throwing motion.[1]

Research and clinical observations have shown that posterior shoulder tightness results in various kinematic alterations, such as decreased shoulder internal rotation, horizontal adduction, abduction, and flexion and increased external rotation. These alterations have been linked empirically to bony and soft tissue adaptations that result from the large rotational and distractive forces acting on the GH joint during the throwing motion.[2]

Bony adaptations among throwing athletes often appear as increased humeral retroversion, this increase has been reported to decrease shoulder internal rotation and increase external rotation, leaving the total arc of motion same (sum of total internal and external rotation). The deceleration phase of the throwing motion is a major contributor to the development of posterior shoulder soft tissue tightness, as the humerus internally rotates during the follow through phase of throwing motion; the posterior inferior capsule may be placed in a primary location to resist the deceleration phase, becoming direct restraints against these loads. Accumulation of such forces may result in tightness of the posterior capsule.[3,4,5]

Because throwing athletes often endure large forces and large number of repetitions, such athletes routinely participate in a variety of shoulder stretching exercises before and after a bout of throwing. They use these stretches to attempt to lengthen soft tissue restraints so that they can increase throwing velocity and can

limit the incidence of injury and muscle soreness. Techniques typically involve stretches in several directions, such as internal and external rotation, flexion, extension, and horizontal adduction.[2]

When implementing a stretching program for throwers, it is important to understand the biomechanics of throwing so that the correct musculature can be targeted. The throwing motion can be broken down into three distinct phases: cocking, acceleration, and follow-through. The cocking phase consists of the windup to maximum shoulder external rotation. The acceleration phase begins with maximum shoulder external rotation and continues to the moment of ball release. An increase in maximal shoulder external rotation at this point is correlated with an increase in throwing velocity. The follow-through phase starts with ball release and ends with the termination of the throw.[6]

The shoulder in overhead athletes exhibits excessive motion, ranging from 129_0 -137_0 of external rotation, 54_0 -61_0 of internal rotation, and 183_0 -198_0 of total ER/IR motion. The dominant shoulder exhibits greater ER and less IR. The act of throwing acutely reduces IR and total motion.[7]

Currently, athletes use several techniques of stretching. The most popular of these techniques are static stretching and PNF stretching.[6]

PNF stretching is popular in sports and focuses on using voluntary muscle contractions to increase ROM by minimizing the resistance of the spinal reflex pathway.[6] PNF stretching techniques are commonly used in both athletic and clinical settings to enhance both active and passive ROM to optimize motor performance and rehabilitation. The common types of PNF techniques include contract-relax, contract-relax with agonist contraction, hold-relax, and slow-reversal-hold relax. Effects can last up to 90 minutes or more after the stretching has been completed. The neuromuscular mechanisms that may be associated with these effects include reflex inhibition of the Golgi tendon organ and lengthening of the musculotendinous unit which ultimately is believed to increase overall performance in a desired sport or activity, including throwing.[8,9]

More recently, researchers have described a "sleeper stretch" that is accomplished by lying on the side to be stretched. The side -lying position enables stabilization of the scapula against the upper body and the treatment surface, thereby enabling more isolation of the posterior glenohumeral joint. The sleeper stretches can be performed independently without the use of the treatment table. Specifically, these stretches can be performed while standing and having the athlete lean against a rigid wall.[10]

There are very few studies available where in the efficacy of "sleeper stretch" and "PNF stretch" over routinely used techniques like cross body stretch and towel stretch have been established and moreover the amount of data on the immediate effect of sleeper stretch and PNF stretches on shoulder ROM In badminton players is very limited. By including other techniques, such as proprioceptive neuromuscular facilitation (PNF), it will be determined if one technique is more effective than the other in increasing ROM and flexibility. Hence, this study is undertaken to evaluate the immediate effect of sleeper stretch and PNF stretch on posterior shoulder tightness in badminton players.

II. Material and Methods

Both male and female badminton players between the age group of 18 to 30 years from SAI Sports Academy, The Big Box Academy and White Peacock Badminton Academy, Bangalore, participating at the State or National level for the past 2 years were included in this study.

100 subjects were evaluated and were assigned to 1 of the 2 intervention groups using Randomized Controlled Trial.

Group A: The sleeper stretch group (n=50) & Group B: PNF stretch group (n=50).

Subjects in both the stretching groups were shown their assigned exercises. The researcher first demonstrated and explained the appropriate stretching techniques, instructions to each participant was given & they were asked to demonstrate the same and explained the appropriate stretching techniques, instructions to each participant was given & they were asked to demonstrate the same.

Players involved in any other sport, who work in occupations involving heavy manual work, with a history of shoulder pain, fracture or dislocation within less than one year, had shoulder surgery and those who were undergoing physiotherapy treatment were excluded from the study.

Study subjects were evaluated before undertaking their assigned stretching sessions for their shoulder internal rotation ROM, using a mechanical inclinometer.

Prior to pre-stretch range of motion testing, subjects were asked to warm up by performing 3 active, bilateral shoulder flexion stretches with hands clasped, holding each for 10 seconds.

After the pre-test measurements were completed, the participant immediately was asked to perform the shoulder stretches assigned to them. A valid stretch was determined by ensuring proper positioning by the researcher and verbal feedback from the participant, indicating when a stretch is felt in the posterior shoulder.

Intervention

GROUP A: SLEEPER STRETCH

The sleeper stretch was performed by lying on the side to be stretched, with the stretching arm and elbow flexed to 90°, with the lateral border of the scapula positioned firmly against the treatment table then passively internally rotating the humerus with the opposite arm. The stretch was repeated 3 times and held for 30 seconds with 30 seconds of rest period.

GROUP B: PNF STRETCH

Subject should lie in supine with the dominant shoulder abducted to 90◦, and the elbow flexed to 90◦ with the shoulder externally rotated as far as possible. This PNF stretching protocol utilizes the contract-relax technique in which the subject's shoulder was stretched to end range for 5 seconds, contracted against the researcher for 5 seconds, and stretched to end range again for 20 seconds. The PNF stretches was conducted 3 times with 20 second of rest period in between each stretch.[6] Post-test measurements of shoulder internal rotation were done immediately following the stretching sessions. Mechanical inclinometer was used to measure glenohumeral internal rotation motion.

GLENOHUMERAL INTERNAL ROTATION MEASUREMENT

Subject in supine lying with shoulder in 90^0 of abduction and elbow 90^0 of flexion with scapula stabilized against the table. The inclinometer was strapped firmly to the subject's forearm at the distal radius and passive internal rotation was done till end range and the range of motion was measured.

Statistical analysis

The data collected was analyzed statistically by presenting in the form of table with frequency and percentage representing graphically.

Student t test (two tailed, dependent & independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) and within each group respectively on metric parameters.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis.

Statistical Software: The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data.

III. Result

Fifty subjects were taken in each group A and B with the mean age of 23.58 and 22.96 years respectively (Table 1).

AGE	GROUP A		GROUP B		TOTAL	
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE
>20	10	20%	11	22%	21	21%
20-30	40	80%	39	78%	79	79%
Total	50	100%	50	100%	100	100%
Mean ± SD	23.58±3.70		22.96±3.54		23.27±3.62	

Table 1: Age distribution between both the groups

Samples are age matched with P=0.394

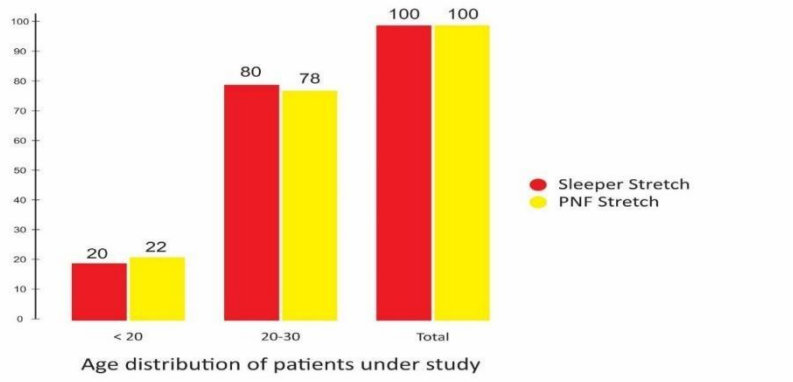
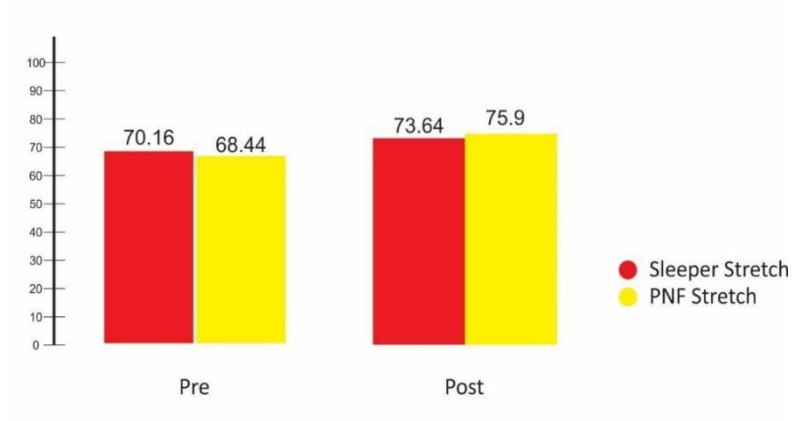


Table 2: IR ROM pre and post- tests within and between the two groups

INTERNAL ROTATION	SLEEPER STRETCH	PNF STRETCH	TOTAL	P VALUE
Pre	70.16±10.99	68.44±11.34	69.30±11.14	0.443
Post	73.64±11.09	75.90±12.19	74.77±11.65	0.335
Difference	-3.48	-7.46	-5.47	-
P Value	<0.001**	<0.001**	<0.001**	-

The above table shows the difference of mean and SD of internal rotation ROM pre-test and post-test within and between the two groups.



IR ROM pre and post- tests within and between the two groups

Interpretation

In group A (sleeper stretch), the mean and SD of IR pre-test is 70.16±10.99 and post-test is 73.64±11.09.
In group B (PNF stretch), the mean and SD of IR pre-test is 68.44±11.34 and post-test is 75.90±12.19.
The difference of mean for group A is -3.48 whereas, for group B it is -7.46.
PNF Stretch is showing a greater improvement with a mean difference of -7.46.
The P value within the groups are 0.443 and 0.335, that is less than 0.05, which means there is no significant difference within the groups.
The P value between both the groups is <0.001, which means between the groups the difference is statistically significant.

IV. Discussion

Athletes who participate in overhead activities requiring ballistic shoulder rotation, such as baseball, softball, badminton, tennis, and volleyball, routinely present with posterior shoulder tightness. Therefore, an easy, applicable, and specific stretching technique for lengthening soft tissues in the posterior aspect of the shoulder is essential to ensure proper shoulder ROM, kinematics, and kinetics and to rehabilitate athletes with disorders associated with this tightness.

Despite the subjects being trained players, playing at National levels using one or the other form of stretching, they showed a ROM deficit, more so in the internal rotation. This could be because of varied stretching techniques used by them and there are very few data available, detailing the effectiveness of specific stretches that clinicians and athletes can use. Moreover, most of the stretching techniques routinely followed are not specific to the posterior capsule but target the musculoskeletal structures generally.

Research and clinical observations have shown that posterior shoulder tightness results in various kinematic alterations, such as decreased shoulder internal rotation, horizontal adduction, abduction, and flexion and increased external rotation. Because of the vulnerability of the shoulder during repetitive overhead motions, such as throwing, even small changes in ROM may lead to soft tissue microtrauma and ensuing shoulder lesions.

Among 100 players, 49% of them showed internal rotation ROM deficit in their dominant shoulder. This clearly establishes the view point that there is a high prevalence of internal rotation deficit among overhead athletes, like badminton players.

-1910091116 www.iosrjournal.org

The aim of this study was to compare the immediate effect of sleeper stretch and PNF stretch in improving the internal rotation range of motion on posterior shoulder tightness among badminton players. The results showed significant improvement of shoulder internal rotation in both the groups, as the mean of internal rotation range of motion in group A prior to test was 70.16 and post- test was 73.64. Whereas, in group B prior to test the mean was 68.44 and post- test it was 75.90. But, PNF stretch was more effective compared to sleeper stretch, since the mean difference for PNF stretch was -7.460 whereas for sleeper stretch it was -3.480.

PNF stretching, or proprioceptive neuromuscular facilitation, is a method of flexibility training, allowing muscles to relax and lengthen. It is generally considered as one the most effective forms of stretching available. PNF stretching, are stretching techniques commonly used in clinical environments to enhance both active and passive range of motion with the ultimate goal being to optimize motor performance and rehabilitation.

Most PNF stretching techniques employ isometric agonist contraction/relaxation (CR) where the stretched muscles are contracted isometrically and then relaxed. Some PNF techniques also employ isometric antagonist contraction where the antagonists of the stretched muscles are contracted. In all cases, it is important to note that the stretched muscle should be rested (and relaxed) for at least 20 seconds before performing another PNF technique.

In this study, the contract relax technique was used to improve shoulder internal rotation ROM. In this technique, passive placement of the restricted muscle is done into a position of stretch followed by an isometric contraction of the restricted muscle. After the contraction period the patient is instructed to relax the restricted muscle that was just contracting and activate the opposing muscle to move the limb into a greater position of stretch.

Isometric contractions (the hold phase) and concentric contractions (the contract phase) used immediately before the passive stretch (the relax phase) facilitate autogenic inhibition.

Autogenic Inhibition is what occurs in a contracted or stretched muscle in the form of a decrease in the excitability because of inhibitory signals sent from the GTOs of the same muscle. This tension causes activation of afferent fibers within the GTOs. Afferent fibers send signals to the spinal cord where the stimulus causes the activation of inhibitory interneurons within the spinal cord. These interneurons places an inhibitory stimulus upon the alpha motor neuron, decreasing the nerves excitability and decreasing the muscles efferent motor drive. It is theorized that this reflex occurs as the body attempts to spread the workload evenly across the motor unit within the muscle, assisting the asynchronous recruitment of the body in preventing specific motor units from fatiguing. This chain reaction causes the Target Muscle to relax, which is one of the driving theories behind the increased elongation of the muscle fibers during the CR method of PNF stretching. These effects can last for up to one hour.

PNF stretching is capable of producing greater improvement in flexibility compared to other techniques. Its disadvantage is that it requires a therapist, although stretching by a therapist may have some motivational advantage for some individuals. The results of this study discussing ROM imply that PNF (CR method), increased ROM and flexibility in all of the subjects. However, this increase in flexibility and ROM is not permanent. In order to maintain it, performing PNF over a longer period of time is required. There is a very significant increase after the first bout of treatment, therefore PNF is a good way to gain immediate improvements in ROM of a joint.

Recently, clinicians and athletes have adopted a new stretch to isolate the soft tissue of the posterior aspect of the shoulder. This technique is known as the „„sleeper stretch"" because it is applied in the side-lying position. It is an easy, applicable, and specific stretching technique for lengthening soft tissues in the posterior aspect of the shoulder. The side-lying position enables stabilization of the scapula against the upper body and the treatment surface, thereby enabling more isolation of the posterior GH joint. Therefore, the stretch force is limited to posterior soft tissues of GH joint which results in separation between the posterior glenoid and the humerus, resulting in elongation of the posterior shoulder structures. Although the use of sleeper stretch is common place among throwing athletes, no data that details the acute effects of this stretching technique is available.

As stated earlier, the athletes can independently apply sleeper stretch and may produce positive results. Therefore, clinicians should teach their patients and athletes proper motion, stabilization, and force application for optimal benefits. Future investigators should focus on measuring posterior shoulder motion in a variety of populations, including basketball players of various performance levels and ages, other overhead athletes, nonathletic populations, and individuals with various shoulder disorders.

Limitation • No long term follow up was carried out to assess whether subjects retained the gained improvement.

• Limitation of references on immediate effects of sleeper stretch and PNF stretch on shoulder ROM in badminton players.

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Recommendation

- Long term follow up is warranted to see the effectiveness of the intervention and it might reveal higher statistical significance.
- Players involved in other sports can be considered for further studies.
- More studies can be conducted on the immediate effect of sleeper stretch and PNF stretch on shoulder ROM in badminton players.

V. Conclusion

This study provides insight into the effectiveness of PNF stretch and sleeper stretch for increasing shoulder ROM. More specifically, the PNF stretch resulted in significant increase in shoulder internal rotation in the dominant arm of badminton players. Because of the large forces and repetition of the throwing motion, posterior shoulder tightness is a common trait in badminton players. These stretching techniques may prevent or limit the posterior capsule tightness. However, this study does not confirm whether these stretches produce a long-term effect

References

[1]. A Muttalib, M Zaidi, C Kho. A Survey on Common Injuries in Recreational Badminton Players. Malaysian Orthopaedic Journal. 2009; 3(2):8-10.
[2]. Kevin G. Laudner, Robert C. Sipes, James T. Wilson. The Acute Effects of Sleeper Stretches on Shoulder Range of Motion. Journal of Athletic Training. 2008; 43(4):359–363.
[3]. Burkhart S.S, Morgan C.D, Kibler W.B. The disabled throwing shoulder: spectrum of pathology, part I: pathoanatomy and biomechanics, Arthroscopy. 2003; 19(4):404–420.
[4]. Pappas A.M, Zawacki R.M, and McCarthy C.F. Rehabilitation of the pitching shoulder. Am J Sports Med. 1985; 13(4):223–235.
[5]. Terri Jo Rucinski, Joseph B. Myers, SakikoOyama, Benjamin M. Goerger, J. Troy Blackburn, and R. Alexander Creighton Influence of Humeral Torsion on Interpretation of Posterior Shoulder Tightness Measures in Overhead Athletes. Clin J Sport Med. 2009; 19:366–371.
[6]. Michael Williams, LanisaHarveson, Jason Melton, Ashley Delobel, Emilio J. Puentedura. The Acute Effects of Upper Extremity Stretching on Throwing Velocity in Baseball Throwers. Journal of Sports Medicine. 2013; 1- 7.
[7]. Michael M. Reinold, Alan S. Curtis. Micro instability of the shoulder in the overhead athlete. The International Journal of Sports Physical Therapy. 2013; 8(5) 601-616.
[8]. Kayla B. Hindle, Tyler J. Whitcomb, Wyatt O. Briggs, Junggi Hong. Proprioceptive Neuromuscular Facilitation (PNF): Its Mechanisms and Effects on Range of Motion and Muscular Function. Journal of Human Kinetics. 2012; 31(2012):105-113.
[9]. J. Bradley Jordan, Ajit D. Korgaokar, Richard S. Farley, Jennifer L. Caputo. Acute Effects of Static and Proprioceptive Neuromuscular Facilitation Stretching on Agility Performance in Elite Youth Soccer Players. International Journal of Exercise Science. 2012; 5(2): 97-105.
[10]. Jakson K Joseph, Sunish A.V. The immediate effect of sleeper stretches on shoulder range of motion in volleyball players. Innovative Journal of Medical and Health Science. 2013; 3(4):171 - 176.
[11]. Priscilla M. Dwelly, Brady L. Tripp, Michelle L. Odai, Patricia A. McGinn. Reliability of the Clinical Application of a Mechanical Inclinometer in Measuring Glenohumeral Motion. Journal of Athletic Training. 2009; 44(6):611-616.

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