

Research Article

Effectiveness of Capsular Stretching and Strengthening of Shoulder on Back Pain among Recreational Volleyball Players

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A B S T R A C T

Background: Athletes that frequently perform overhead movements acquire shoulder capsule tightness, and the players can make up for this lack of range of motion by rotating the back more, using their back muscles to strike a smash. Shoulder capsule tightness and back pain are thus indirectly related. Back pain results from their back muscles being overused. The current study assesses how a 3-week stretching and strengthening protocol helps recreational volleyball players with back pain.

Objective: The present study was done to find the effectiveness of capsular stretching and shoulder strengthening on back pain among recreational volleyball players.

Methodology: A sample size of 30 players was calculated. Data were obtained at the beginning and end of the 3-week exercise session using resistance bands and stretching techniques.

Results: Of the 30 individuals, 27 (97%) experienced a significant decrease in their numerical rating scale (NRS) score for back pain, with a pre-mean score of 7.06 ± 1.25 and a post-mean score of 5.70 ± 1.14 . The stretching protocol significantly increased the glenohumeral internal rotation range of motion for all 30 individuals, with pre-test and post-test mean values of 49.26 ± 5.32 and 71.20 ± 4.31 , respectively. Capsular stretching and strengthening of the shoulder were found to be effective on back pain among recreational volleyball players.

Conclusion: Based on the analysis of the results obtained, the present study concluded that stretching and strengthening of the shoulder were effective on back pain among recreational volleyball players.

Keywords: Glenohumeral Internal Rotation Deficit (GIRD), Volleyball, Low Back Pain, Capsular Stretching, TheraBand Exercise

Introduction

The most popular sport in the world, both professionally and recreationally, is volleyball, which has been a part of the Olympics since 1964. Players need to be more conscious of injuries in these sports as the frequency of injuries has increased over the past ten years. According to studies, the majority of shoulder and back injuries are caused by overuse.¹ Servers and spikers tend to get shoulder injuries the most since they do these overhead, highly sophisticated actions repeatedly and frequently. Repeating this high-frequency movement over an extended period of time may change the dominant shoulder's functional and biomechanical characteristics, such as reducing its range of motion. According to numerous studies, there is a correlation between a decrease in internal rotation (IR) and an increase in the range of motion (ROM) of external rotation (ER), also known as external rotation gain (EGR). Additionally, volleyball players have muscle asymmetries with dominant shoulders and opposing shoulders.² Asymmetrical alterations in the dominant shoulder compared to the contralateral shoulder may result from these high-frequency repetitive overhead motions. In overhead throwers like volleyball players, there is a condition called Glenohumeral Internal Rotation Deficit (GIRD), which results in a loss of shoulder internal rotation. The parameters taken into consideration for GIRD are humeral retroversion and stiffness in the rotator cuff and posterior capsule.³ A loss of more than 20% in the internal rotation range when compared to the contralateral shoulder is defined as GIRD.⁴

Back pain is the most common problem faced by both younger and older people affecting between 54% and 90% of the population. Young volleyball players complain of cervical, thoracic, and lumbar pain. Reports show that there is a prevalence of back pain in overhead repetitive sports; frequent research is done that states the physical cause of back pain can be repetitive rotation and extension of the back.^{5,6} Volleyball has a higher prevalence of low back pain. It becomes important to prevent back pain and enable the player to play efficiently. According to studies, a player's position can affect injury patterns. This suggests that certain technical volleyball actions, such as serving and spiking, can cause lower back pain. More research is needed to confirm this theory.⁷ Incorrect repeated trunk movements in one direction, followed by motions of the trunk and extremities, are the primary cause of back pain.

The question that arises now is how shoulder stretching and strengthening, and back pain are correlated. Studies have proven that volleyball players specifically spikers and servers frequently experience GIRD, due to which players are unable to spike or serve efficiently. The force generated is less due to GIRD and the efficiency and

accuracy are hampered, so to overcome this problem, players use compensatory mechanisms, i.e. they use their back muscles to produce more force. This is done by excessive rotation and extension of the lumbar spine, which will give them additional force to hit the ball. Due to this repetitive overuse of back muscles, there will be adaptive changes in the musculoskeletal tissues, like a decrease in muscle elasticity, and functional insufficiency of other muscles. Repetitive exertional movement of the spine for a prolonged duration might result in the overloading of back muscles, microtrauma, tissue adaptation, and pain.⁸

As a result, to gain optimal performance by volleyball players and to reduce back pain, the primary focus should be on treating the GIRD rather than focusing on back pain, for which stretching capsular tightness for GIRD and balancing the muscle strength around the shoulder and scapula, providing dynamic GH (glenohumeral) stability and reducing the load on back muscles should be encouraged, which in turn, will reduce the back pain. Studies have shown the effectiveness of resistance band exercise for training the rotator cuff muscles in asymptomatic recreational volleyball players with GIRD.⁹ Improvement in IR:ER strength ratio, IR ROM, and GH joint position sense has also been noted.¹⁰ Researchers have found the effect of static stretching on shoulder ROM, specifically GH IR ROM, and injury prevention. Both sleeper's stretch and cross-body stretch significantly improve recreational volleyball players' internal rotation range of motion.¹¹⁻¹⁵

Therefore, the study aimed to investigate the effectiveness of capsular stretching and shoulder strengthening on back pain. We hypothesised that applying effective stretching and strengthening protocol would improve internal rotation ROM, eventually reducing forces on the back and relieving back pain. To the best of our knowledge, this is the first article studying the literature on shoulder and back correlation.

Materials and Method

This study was designed to identify the effectiveness of scapular stretching and strengthening exercises on back pain among recreational volleyball players. The research ethics committee of Krishna Vishwa Vidyapeeth approved the study.

The study included 30 players with back pain and GIRD and the study duration was 6 months (from July 2022 to January 2023). Both male and female volleyball players with GH IR range of motion fewer than 70 degrees and with back pain in the age group of 18 to 25 years were chosen by random sampling method in this interventional study. Players were approached on the volleyball court of Krishna Institute, Karad. An assessment was done for GIRD and back pain and players were selected based on the inclusion criteria. The players were informed

about the study procedure and consent was taken before being enrolled in the study. The demographic data of the subjects which included name, age, and gender were collected and 3 weeks of stretching and strengthening protocol was followed by the participants. After 3 weeks, the subjects were again assessed for back pain and IR range of motion.

Inclusion Criteria

- Age group of 18 to 25 years
- Recreational volleyball players with back pain
- Recreational volleyball players with GIRD

Exclusion Criteria

- Players with no back pain but had GIRD
- Players without GIRD
- Previous back injury

Outcome Measures

For GH IR ROM: The range of motion of internal rotation of the shoulder was assessed in both hands with the help of a goniometer. The range of motion was assessed by asking the participants to lie in a supine position with their shoulders relaxed. The subjects with less than 70 degrees of internal rotation were considered to have GIRD.

For back pain: The assessment for back pain was based on the numerical rating scale (NRS). On the first day, the pain was assessed by the NRS. The subjects with significant scores on the NRS were included in the study.

Intervention

Tables 1 and 2 show the exercises used in the intervention.

Table 1. Capsular Stretching Exercises

Exercises	Sets
Sleeper stretch	30-sec hold x 3
Cross-body stretch	30-sec hold x 3

Table 2. Resistance Band Strengthening Exercises

Exercises	Sets
Flexion extension with resistance band	10 x 3
Internal and external rotation with resistance band	10 x 3
Abduction adduction with resistance band	10 x 3

Statistical Method

The data obtained was entered, compared, and analysed using the Instat application. The data within a group were analysed using a paired t-test.

Results

The data findings of the volleyball players before and after 3 weeks of interventional programmes have been provided ahead.

Demographic Data

Table 3. Demographic Variables of Participants

Variables	No. of Individuals	Percentage of Individuals
Age (years)		
19–24	17	56.7
25–30	13	43.3
Gender		
Female	11	36.7
Male	19	63.3

Table 3 shows the demographic profile of the participants.

Glenohumeral Internal Range of Motion

A comparison of the changes in the ROM revealed a statistically significant difference before and after the intervention (Table 4). The comparison revealed that post-ROM was significantly more than pre-ROM on the dominant side.

Table 4. Pre-Test and Post-Test Values of Mean and Standard Deviation for a Glenohumeral Range of Motion

GH IR ROM	Pre-test Values	Post-test Values	p Value	Interference
Mean and SD	49.26 ± 5.32	71.20 ± 4.31	< 0.0001	Considered extremely significant

A comparison of the changes in the NRS score for back pain revealed a statistically significant difference before and after the intervention (Table 5). The comparison revealed that the post-NRS score was significantly less than the pre-NRS score.

Figures 1 and 2 show the pre-test and post-test values of NRS Score and ROM in degree.

Table 5. Pre-test and Post-test Values of Mean and Standard Deviation for an NRS Score

Back Pain NRS Score	Pre-test Values	Post-test Values	p Value	Interference
Mean and SD	7.06 ± 1.25	5.70 ± 1.14	< 0.0001	Considered extremely significant

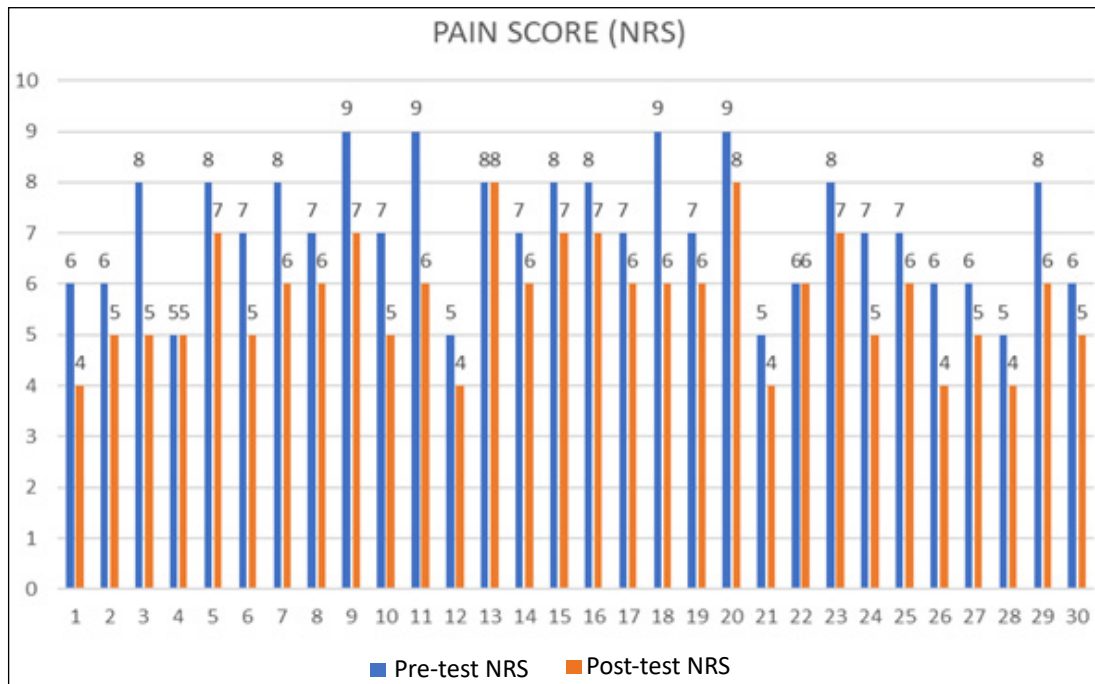


Figure 1. Pre-test and Post-test Values of NRS Score

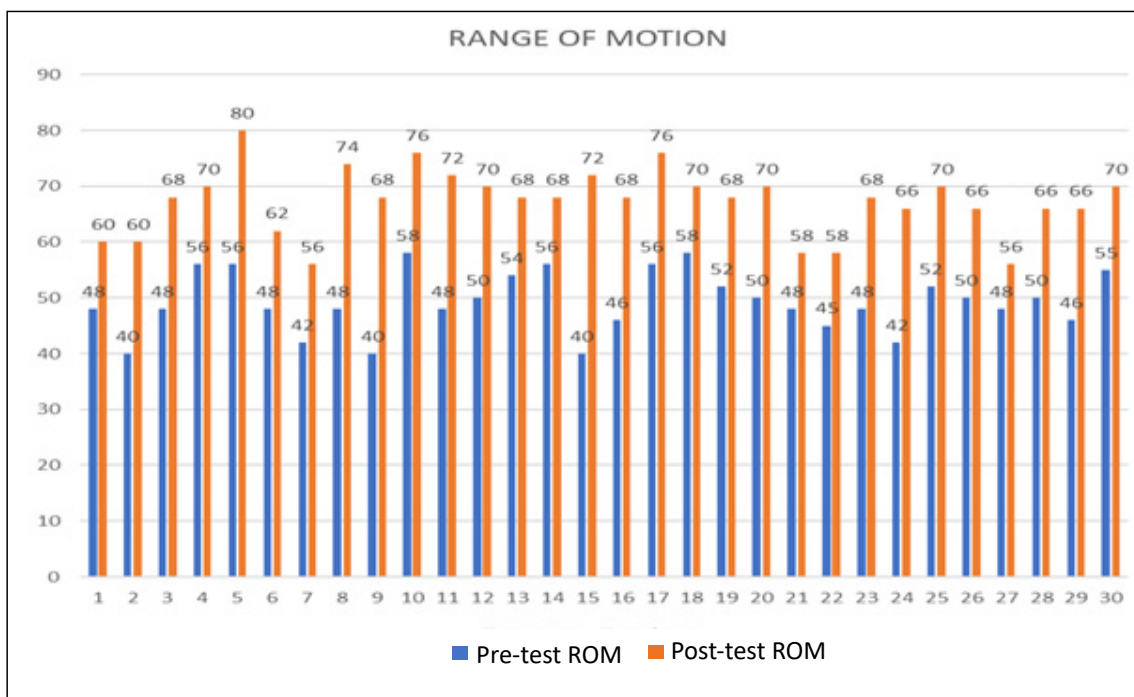


Figure 2. Pre-test and Post-test Values of ROM

Discussion

Most recreational volleyball players play for a longer time without proper training. Many players experience back pain after serving or spiking action. It has been proven that players with repetitive overhead activities like volleyball players have GIRD, as has been shown in studies like those of Challoumas et al.,² Miura et al.,³ and Rose et al.⁴ Due to GIRD, the internal rotation required is hampered and the

force generated is less, as a result of which they use their back muscles to compensate for the force actually needed to spike or serve. This shows that overhead athletes have back pain as proven in studies like those of Ławnicki et al.⁸ and Fett et al.⁵ In this research, it has been studied that for the chief complaint of back pain, the treatment area to be focused on should be the cause, which is the GIRD that is creating the problem in the back and hence causing back pain due to its overuse. This study focused on the cause

rather than the symptoms, that is focusing on GIRD instead of back. Here the study was done on players with back pain and asymptomatic GIRD. The treatment protocol used was stretching of the affected shoulder capsule strengthening the surrounding muscles with TheraBand. Studies like those of Guney et al.,¹² Harshbarger et al.,¹³ and Aldridge et al.¹⁴ showed the effectiveness of stretching on glenohumeral internal rotation deficit, and the effectiveness of the TheraBand strengthening exercises was seen in the studies done by Mascarin et al.⁹ and Moradi et al.¹⁰

This study aimed to investigate if stretching the capsule and strengthening muscles of the shoulder are effective in reducing back pain in recreational volleyball players. Releasing the capsular tightness and strengthening the shoulder musculature have led to a higher improvement in reducing the NRS score for back pain.

Stretching protocol refers to releasing capsular tightness and TheraBand exercises which increase the shoulder's strength, and help in producing the required force while hitting or serving action. This assists in overcoming the overuse of the back muscles.

We hypothesised that the link between the back and the shoulder is the latissimus dorsi muscle, a muscle of the back and shoulder. It is the internal rotator of the shoulder and also the chief muscle of the back. It is active during overhead activities like while moving the trunk anteriorly and superiorly when the upper limb is fixed overhead.² The anatomical trains constitute the other link between shoulder tightness and back pain. The back functional line is connected from the shaft of the humerus to the back through the latissimus dorsi muscle. Anatomical trains connect muscles to muscles through the fascia. This back functional line transmits the strain downhill and serves as the foundation of support for the upper limbs when performing overhead tasks or in postures that call for stabilising the upper girdle to the trunk. This line enables us to give extra power and precision to the movement of the limbs by lengthening their lever arm and linking them across the body to the opposite limb in the other girdle.¹⁶ Thus, this can be evidence of the link between shoulder stretching and back pain.

Conclusion

From an overall perspective, it is readily apparent that capsular stretching and shoulder strengthening are effective in relieving back pain in recreational volleyball players. These exercises can be incorporated into rehabilitation programmes for volleyball players with back pain and asymptomatic GIRD.

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Conflict of Interest: None

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