

## **Skill Oriented Preventive Strategies and Eccentric Muscle Training on Shoulder Pain and Function in Volleyball Players with Shoulder Injury - An Experimental Study**

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### **Abstract**

**Background:** Volleyball is a game which played by all age group in all over the world. In competitive atmosphere the collegiate players tend to get injuries, and the main considerable factor is these injuries are cumulative. Trained athletes also get cumulative injuries but prevalence of these kind of injuries are more in collegiate players because of improper skills and lack of adequate training, this study used to concentrate on correcting the skill as well as giving appropriate training.

**Method:** This is an Experimental study; participants are 22 collegiate volleyball players from KG campus. They have divided into two groups by simple random sampling. Group A consist of 11 players. Group B consist of 11 players. Group A have received Eccentric muscle training along with skill oriented preventive strategies and Group B received Eccentric muscle training alone. After the acute management and rest, Eccentric muscle training and improving the skill by proper analysis and correction get started, duration of the study was 8 weeks.

**Results:** The two outcome measures Spiking velocity and SPADI (shoulder pain and disability index) was used. Both Pain and activities shows positive improvement, t values of SPADI and Spiking Velocity is 11.731 and 2.765 at  $p < 0.05$ .

**Conclusion:** Eccentric muscle training along with skill oriented preventive strategies are help full in preventing the injuries as well improving the performance of an athlete.

### **Keywords**

Eccentric muscle training, Skill oriented preventive strategies, Spiking velocity, Shoulder pain and disability index.

### **Introduction**

Volleyball is a kind of sport which gives lots of cumulative injuries on soft tissues. According to Van Mechelen's model, one must first understand the injury pattern characteristics of the sport before it is possible to design effective prevention programme (Van Eetvelde *et al.*, 2021).

On an average an elite volleyball athlete is hitting 40,000 spikes in one single season (Bahr and Krosshaug, 2005). So, the cumulative injuries are common in shoulder. Shoulder injuries

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accounting 8-20% of all volleyball injuries (Reeser *et al.*, 2006; Van Eetvelde *et al.*, 2021) Scientific approach on strengthening of muscle is needed. Eccentric training for shoulder shows much good improvement among players (Burkhart, Morgan and Kibler, 2013). But strengthening alone is not sufficient, so, mitigating the injuries should be based on proper analysis of biomechanical loading of the each joint (Kugler *et al.*, 1996).so the skill oriented preventive strategies is going to be helpful for the players.

In skill oriented preventive strategies, therapist need to analyze the players spiking pattern, in terms of arm swing, trunk control, body balance and position of the lower extremities. By analyzing all, the therapist needs to give ideas to avoid the injuries by changing their pattern of skills, so it will directly avoid the injury causing factors, and makes the strengthening program highly efficient one.

Volleyball is a game which played by all age group in all over the world. In competitive atmosphere the collegiate players tend to get more injuries. This study used to concentrate on correcting the skill as well as giving appropriate training. Analysis based on this kind of research is limited. So, there is need to investigate the effectiveness of the skill oriented preventive strategies and eccentric muscle training to reduce injury prevalence, pain and improving the performance.

The aim of this study to investigate the skill oriented preventive strategies and eccentric muscle training on shoulder pain and function in volleyball players with shoulder injury

## Methodology

This is an experimental study, this study was conducted in K.G campus sports ground and therapeutic gymnasium, Saravanampatti, Coimbatore. The samples are from the KG institution student's population. The ethical clearance was obtained from the institution. The ethical certificate number is EC-KGH-P0053. Totally 22 players were included in this study. Randomized sampling method was used to divide the players into two groups. That is group A and group B. Each group consist of 11 players, the included players selected based on some inclusion and exclusion criteria. The inclusion criteria are, the subject must be a volleyball player who is having a 50 % and above in SPADI, volleyball players who play at least 3 competitive games a year, players who practice thrice a week minimum, male player, Age should between 18-25 years. BMI should be 18.5-24.9 was included in this study. The exclusion criteria are players who going for a gym or any other training program, players with any musculoskeletal and neurological abnormalities. Players not willing to participate are excluded. Group A underwent skill oriented preventive strategies along with eccentric muscle training; Group B underwent eccentric muscle training alone. The skill oriented preventive strategies are based on Giatsis and Tilp, (2022) and Hu, Liu, and Zhao (2022). The eccentric muscle training program is based on Blume *et al.* (2015). Total study duration was 8 weeks. Shoulder pain and disability and Spiking performance was assessed based on SPADI and Spiking velocity respectively. SPADI score was obtained based on the questionnaire. Spiking velocity was calculated with the help of real time video analysis, to identify the accurate duration and that is based on metre per second. The consent was obtained

from the players (Ramalingam, Jagatheesan and Suganthirababu, 2023). Pretest evaluation was done before the study. After the total training duration posttest evaluation was done.

### Result and discussion

Table 1. Demographic data of Group A and Group B

Subject Characteristics	Group A	Group B
Age (Years)	21.36±2.02	22±1.81
BMI	22.27±2.101	21.95±1.04

BMI – Body Mass Index, Values are presented as mean± standard deviation

Table 2. Post test comparison of Group A and Group B with Spiking velocity and SPADI

Variables	Post Test Mean		T Values	P Values
	Group A	Group B		
Spiking Velocity	17.27	15.73	2.7651	0.0001
SPADI	6.27	12	11.731	0.0001

SPADI- shoulder pain and disability index

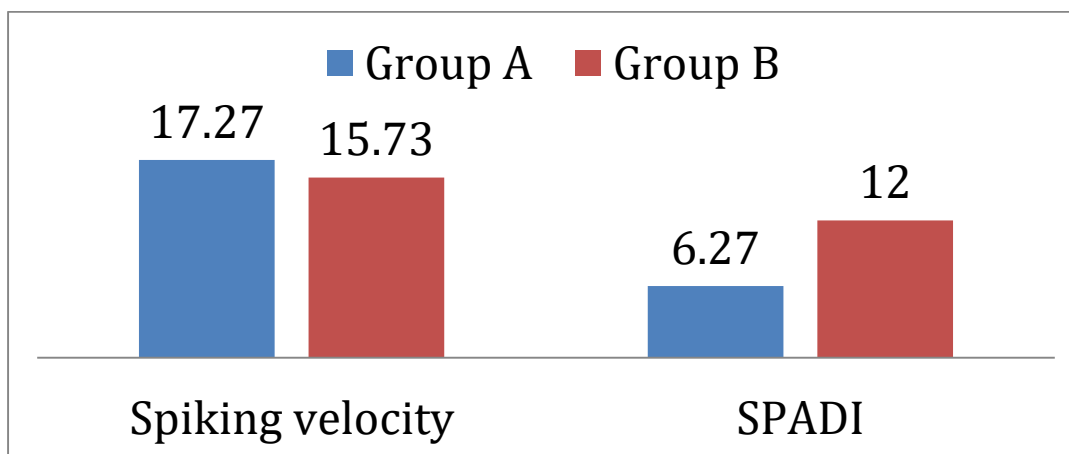


Figure 1. Post test comparison of Group A and Group B with Spiking velocity and SPADI

The table 1 shows the demographic data of Group A and Group B. The table 2 and Figure 1 shows that group A have a significant difference compared to Group B. the t test values of Spiking velocity and SPADI was 2.7651 and 11.731 respectively at the  $p > 0.0001$ .

Eccentric training is beneficial for shoulder muscles. It will work on both musculoskeletal system and nervous system in a lengthened position. It will create a histological change in the injured tendons (Jonsson *et al.*, 2016).

Back and double arm swing is a considerable factor while hitting a ball. The momentum gained by the arm will results in decreased load, trunk extension is one of the kinematics will results in decreasing the load over the shoulder girdle and surrounding structure. Lateral runs along with progression of speed while running phase of spike is very important consideration to

mitigate the injuries, which will indirectly influence the load of the joint. Different arm swing techniques while hitting the balls is advised for the players. Circular techniques, bow and arrow techniques and straight techniques will be helpful for the athletes to improving the performance and reduce the chances of getting injuries (Giatsis and Tilp, 2022).

All strengthening protocols work on their own way, it will strength the muscle according to that exercise physiology, but skill training will helpful in improving the performance as well as maintain the strength by preventive the injuries (Sathish and Vinod., 2020). So, skill training will enhance the performance in volleyball players (Rajesh and Veeramani, 2022; Eryilmaz & Kaynak, 2020). Performing shoulder prevention programmes reduce the injury risk in overhead sports (Hoppe *et al.*, 2022).

Both the groups showed clinical significance. But Group A which received skill oriented preventive strategies along with eccentric training shows a better improvement in spiking velocity as well as SPADI. Limitations of the studies are sample size was small, only male players were included. Future studies are recommended to have large population with both genders and advanced scientific equipment's can be used for measuring the outcomes.

### **Conclusion**

The study concludes that Group A having a clinical significance than the Group B. This study proves that the skill management in a game along with proper exercises will helpful in mitigating the chances of getting injuries and correcting the improper skills is one of the key factors to reduce the pain as well as helpful in avoiding the re occurrence.

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### **References**

- Bahr, R., & Krosshaug, T. (2005). Understanding injury mechanisms: a key component of preventing injuries in sport. *British Journal of Sports Medicine*, 39, 324–9. <http://dx.doi.org/10.1136/bjism.2005.018341>.
- Blume, C., Wang-Price, S., Trudelle-Jackson, E., & Ortiz, A. (2015). Comparison of eccentric and concentric exercise interventions in adults with subacromial impingement syndrome. *International journal of sports physical therapy*, 10(4), 441.
- Burkhart, S. S., Morgan, C. D., & Kibler, W. B. (2013). The disabled throwing shoulder: spectrum of pathology. Part III: the SICK scapula, scapular dyskinesis, the kinetic chain, and rehabilitation. *Arthroscopy*, 19, 641–61.
- Eryilmaz, S. K., & Kaynak, K. (2020). The Effects of Skill-Based Volleyball Training Program on Running Economy in Male Volleyball Players. *African Educational Research Journal*, 8(3), 603-609. <https://DOI: 10.30918/AERJ.83.20.145>.

- Giatsis, G., & Tilp, M. (2022). Spike Arm Swing Techniques of Olympics Male and Female Elite Volleyball Players (1984-2021). *Journal of Sports Science & Medicine*, 21(3), 465. <https://doi.org/10.52082/jssm.2022.465>.
- Hoppe, M. W., Brochhagen, J., Tischer, T., Beitzel, K., Seil, R., & Grim, C. (2022). Risk factors and prevention strategies for shoulder injuries in overhead sports: an updated systematic review. *Journal of Experimental Orthopaedics*, 9(1), 78. <https://doi.org/10.1186/s40634-022-00493-9>.
- Hu, L., Liu, L., & Zhao, K. (2022). Biomechanics of Volleyball Players' Run-Up and Take-Off Link under Deep Learning. *Computational Intelligence and Neuroscience*, 2022. <https://doi.org/10.1155/2022/8409626>.
- Jonsson, P., Wahlström, P., Öhberg, L., & Alfredson, H. (2006). Eccentric training in chronic painful impingement syndrome of the shoulder: results of a pilot study. *Knee Surgery, Sports Traumatology, Arthroscopy*, 14, 76-81. <https://doi.org/10.1007/s00167-004-0611-8>.
- Kugler, A., Krüger-Franke, M., Reiningger, S., Trouillier, H. H., & Rosemeyer, B. (1996). Muscular imbalance and shoulder pain in volleyball attackers. *British journal of sports medicine*, 30(3), 256-259.
- Kumar, S. S., & Kumar, G. V. (2020). Effect of Skill Related Training on Skill Performance among Volleyball Players. *Journal of Humanities and Social Sciences Studies*, 2(5), 1-05.
- Rajesh, S., & Veeramani, S. (2022). Effects of specific volleyball training on selected skill performance variables among women volleyball players. *EPR International Journal of Multidisciplinary Research (IJMR)*, 8(1), 1-4.
- Ramalingam, V., Jagatheesan, A., & Suganthirababu, P. (Eds). (2023). Proceedings of International Physiotherapy Conference - Stride'23 in International Journal of Physiotherapy and Occupational therapy, 1-143. <https://ijpot.com/conference.html>
- Reeser, J. C., Verhagen, E. A. L. M., Briner, W. W., Askeland, T. I., & Bahr, R. (2006). Strategies for the prevention of volleyball related injuries. *British journal of sports medicine*, 40(7), 594-600. <https://doi.org/10.1136/bjism.2005.018234>.
- Van Eetvelde, H., Mendonça, L. D., Ley, C., Seil, R., & Tischer, T. (2021). Machine learning methods in sport injury prediction and prevention: a systematic review. *Journal of experimental orthopaedics*, 8, 1-15.