ISSN: 2347-6567

International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

IJAMSCR |Vol.14 | Issue 2| Apr - Jun - 2026

www.ijamscr.com

DOI : https://doi.org/10.61096/ijamscr.v14.iss2.2026.661-666

Role of Scapular Dyskinesis in Shoulder Instability Among Volleyball Players: A Literature Review

Edwin Benado Cardoz[1], Dr. Pinky Dutta[2]

[1]PG Student of Garden City University, Bangalore

[2]Professor, Garden City University, Bangalore

Corresponding Author: Edwin Benado Cardoz

Email ID: edwinbenado@gmail.com

Published on: 24.04.2026
Published by: Futuristic Publications
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Abstract: Shoulder instability is a common concern among volleyball players due to the repetitive overhead movements involved in the sport. Scapular dyskinesis, characterized by abnormal scapular motion or positioning, has been proposed as a contributing factor to shoulder instability. Hence, the purpose of this systematic review is to determine the role of scapular dyskinesis in the development of shoulder instability among volleyball players. The database search for this systematic review included Google Scholar, PubMed, PEDro, Research Gate, and Cochrane Library. A total of 112 articles were identified using the selected keywords. The studies were screened and filtered according to the inclusion and exclusion criteria, and 9 articles were selected for the final review. The review included clinical and observational studies conducted on volleyball players of various levels (professional, collegiate, and recreational) that assessed scapular dyskinesia through visual or kinematic evaluation methods and reported outcomes related to shoulder instability. Studies that did not include volleyball players, lacked instability outcomes, or were published in languages other than English were excluded. The analysis of the selected studies indicated that scapular dyskinesia is significantly associated with an increased risk of shoulder instability in volleyball players. Altered scapular kinematics, such as reduced upward rotation and posterior tilt, were consistently observed in athletes with instability. The findings suggest that early identification and correction of scapular dyskinesia through targeted rehabilitation and strengthening programs may play a crucial role in preventing shoulder instability and enhancing performance among volleyball players.

Keywords: Scapular dyskinesia, shoulder instability, glenohumeral instability, volleyball players, overhead athletes.

INTRODUCTION

Volleyball is one of the most popular sports worldwide. It involves repeated overhead actions like serving, spiking, and blocking. These fast and repetitive shoulder movements make volleyball players prone to shoulder injuries. Among these injuries, shoulder instability is very common and can limit performance and athletic longevity (1,2). Shoulder instability varies from micro instability, which causes pain and minor dysfunction, to recurrent dislocations that might need surgery. Studies have shown that the rate of shoulder instability among overhead athletes, including volleyball players, is significantly higher than among non-overhead athletes (3).

The shoulder joint is naturally unstable because of its wide range of motion and limited bone support. Therefore, stability greatly depends on the dynamic control provided by the scapular muscles, rotator cuff, and capsulolabral structures. Any change in the coordinated movement of the scapula, known as scapular dyskinesia, can disrupt the normal shoulder rhythm. This leads to poor shoulder mechanics and instability (4,5). Scapular dyskinesia refers to abnormal motion, positioning, or control of the scapula during arm movement. It often results from muscle imbalance, fatigue, or overuse.

In volleyball, repeated spiking and serving put uneven stress on the shoulder, making athletes more likely to experience scapular malposition and movement problems (6). These repeated stresses change the normal upward rotation, posterior tilt, and external rotation of the scapula, which are necessary for keeping the shoulder stable during overhead activities (7). Over time, these changes may raise the risk of shoulder instability, labral injuries, and reduced performance.

Several studies have looked at the link between scapular dyskinesia and shoulder problems in overhead athletes. However, the exact role of scapular dyskinesia in shoulder instability among volleyball players is still unclear and varies across different studies (8, 9). Understanding this connection is crucial for creating focused rehabilitation and prevention strategies that aim to restore proper scapular control and prevent further instability.

Therefore, this systematic review was conducted to analyze and summarize the current evidence on the relationship between scapular dyskinesia and shoulder instability in volleyball players. The findings from this review aim to emphasize the importance of identifying and correcting scapular movement issues early to prevent shoulder instability and enhance athletic performance in volleyball players.

METHODOLOGY

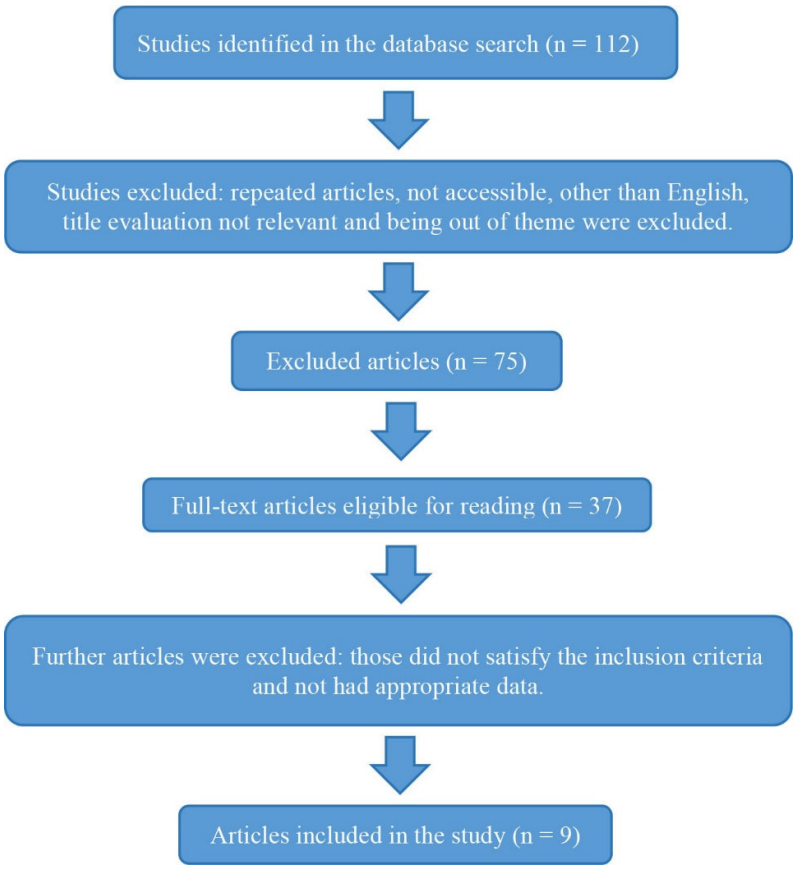
Study Design

This systematic review was conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines to ensure a transparent and structured approach to literature selection, data extraction, and synthesis.

Selection of Studies

A total of 112 articles were retrieved through database searches using relevant keywords (including "scapular dyskinesia", "shoulder instability", “glenohumeral instability” ", volleyball players", "overhead athletes"). The databases searched included PubMed, PEDro, Cochrane Library, Research Gate, and Google Scholar. After removing duplicates and screening titles and abstracts, 37 full-text articles were assessed for eligibility. Following application of inclusion and exclusion criteria, 9 studies were included in the final review.

Study Selection Strategy



Inclusion Criteria and Exclusion Criteria

This review included clinical trials, cohort studies, case-control studies, and cross-sectional investigations involving volleyball players with assessment of scapular dyskinesia (visual classification, lateral scapular slide test, 3D kinematics) and outcome of shoulder instability (dislocation, subluxation, micro-instability, positive apprehension/relocation).

Studies were included if they:

- Involved volleyball players (any level: professional, collegiate, recreational)
- Included a comparator group (volleyball players without scapular dyskinesia or without instability) or longitudinal follow-up
- Were published in English and available as full text
- Provided sufficient data on scapular dyskinesia assessment and shoulder instability outcomes

Studies were excluded if they:

- Involved mixed sports samples without extractable data for volleyball players
- Lacked a clear definition or measurement of scapular dyskinesia or shoulder instability
- Were case reports, narrative reviews, conference abstracts only
- Were published in languages other than English
- Focused solely on post-surgical shoulder instability rehabilitation without baseline dyskinesia assessment

Author	**Study-design**	**Participants**	**Objective of the study**	**Results obtained**	**Conclusion**
Reeser JC et al., 2010	Cross-sectional comparative	422 collegiate volleyball athletes; 276 examined	Identify risk factors for volleyball-related shoulder problems incl. scapular factors (SICK score).	Shoulder pain/dysfunction associated with SICK scapula ≥3 (P=0.010) and core instability; attackers/jump servers had more problems.	Scapular malposition/asymmetry is linked to shoulder problems in volleyball; supports screening and kinetic-chain focus.
Pascoal AG et al., 2023 (Sports)	Case–control, 3D kinematics	Volleyball players vs non-athlete controls	Compare scapular posture and scapulohumeral rhythm adaptations in volleyball players.	Dominant shoulder showed increased scapular internal rotation and anterior tilt vs controls (sports-specific adaptation).	Volleyball induces scapular adaptations that may influence stability profiling; clinicians must distinguish adaptation vs pathology.
Chang C-C et al., 2022 (J Strength Cond Res)	Randomized controlled trial	40 volleyball players with scapular dyskinesia & chronic pain	Test kinetic-chain (KC) vs conventional shoulder training on spike kinematics/consistency.	KC improved upper-trunk contralateral rotation and scapular movement consistency; both groups decreased pain; KC superior for movement consistency.	Integrated scapular-trunk training is more effective than local training; addresses dyskinesia mechanisms relevant to instability.
Karimi R et al., 2024 (J Rehabil Sci & Res)	Semi-experimental (random assignment)	30 female volleyball players with scapular	Examine 8-week scapular stabilization on pain, shoulder position,	Significant decrease in pain, increase in shoulder	Scapular stabilization effectively improves

		dyskinesia	performance.	position, and improvement in volleyball performance vs control after training.	alignment and sport performance in dyskinesia.
Meneghini GO et al., 2020 (MTP Rehab J)	Quasi-experimental	32 youth volleyball players with dyskinesia	Test PNF-based protocol's immediate effects on dyskinesia.	Significant improvements in scapular abduction test and right-arm weight-bearing after intervention.	PNF useful early to restore scapular orientation/neuro muscular balance.
IJNRD, 2024 – Prevalence of Scapular Dyskinesis in Volleyball Players	Cross-sectional (LSST/visual)	226 volleyball players	Estimate prevalence and angles where dyskinesia appears.	Dyskinesis noted at >90° abduction (17.69%) and at 45° (7.52%); side-to-side asymmetries reported.	Dyskinesis is common in volleyball; supports routine screening during overhead elevation.
Ravichandran H, 2016 (Case study—volleyball athlete)	Case report (8-week rehab)	1 male volleyball athlete with dyskinesia	Describe assessment and phased rehab of volleyball-related dyskinesia.	Progressive program improved pain, function, and scapular control.	Structured rehab targeting serratus/trapezius and kinetic chain can normalize scapular mechanics in volleyball.
Meneghini et al., 2020 – supplementary details (same cohort)	Quasi-experimental subgroup	32 adolescents, 84% attackers	Report training exposure/handedness, pain history, and photogrammetry/Scapular Dyskinesia Test reliability.	100% had 12-month shoulder pain history; protocol yielded measurable immediate kinematic change.	Reaffirms neuromuscular retraining effect in typical volleyball positional loads.
Tooth C et al., 2023 (JSES Int – preseason screening)	Prospective preseason cohort	Competitive youth volleyball players	Track short-term evolution of shoulder clinical measures/performance across pre-season.	Identified changes in shoulder measures over weeks; supports value of preseason screening for risk stratification (scapular measures included among clinical tests).	Routine screening can guide targeted scapular conditioning to mitigate instability-related risk.

RESULTS

A total of 112 articles were identified from the databases mentioned above. Of these 112 articles, 75 were excluded due to duplication, inaccessibility, non-English language, and irrelevance to the study topic. The remaining 37 full-text articles were screened, and 9 studies met the inclusion criteria and were included in the final review. Based on this review, the following results were obtained.

Several studies have highlighted the importance of scapular control and its influence on shoulder stability among volleyball players. The findings suggest that scapular dyskinesia is closely linked to shoulder instability, pain, and performance issues in volleyball athletes. Many studies reported that players with abnormal

scapular motion, such as reduced upward rotation, decreased posterior tilt, and excessive internal rotation, had a higher risk of shoulder dysfunction and instability compared to those with normal scapular movement.

Among the reviewed studies, Reeser et al. (2010) found that scapular malposition and asymmetry (SICK scapula) were strongly related to shoulder pain and instability in collegiate volleyball players. Likewise, Chang et al. (2022) showed that rehabilitation focused on the kinetic chain improved scapular movement consistency and trunk coordination, which in turn improved shoulder stability. Karimi et al. (2024) and Meneghini et al. (2020) also confirmed that scapular stabilization and proprioceptive training led to significant improvements in shoulder function and reduced instability symptoms.

Furthermore, Pascoal et al. (2023) and IJNRD (2024) reported a high prevalence of scapular dyskinesia among volleyball players, particularly during overhead positions exceeding 90° of abduction. This underscores its strong connection to repetitive overhead motions in the sport. The other studies consistently indicated that interventions targeting the serratus anterior, trapezius, and trunk coordination are crucial for restoring normal scapular mechanics and preventing shoulder instability.

Overall, the review findings indicate that scapular dyskinesia plays a significant role in developing shoulder instability among volleyball players. Early identification, prevention, and correction of dyskinesia through structured rehabilitation programs can improve shoulder stability, enhance athletic performance, and reduce the recurrence of shoulder injuries in volleyball athletes.

DISCUSSION

Volleyball players often perform repetitive overhead actions like spiking and serving. These actions place a lot of stress on the shoulder. To keep the shoulder working well, the scapular stabilizers must work together in a coordinated way. If this coordination breaks down, whether due to muscle imbalances or poor movement patterns, athletes can develop scapular dyskinesia. This condition can weaken shoulder stability and increase the risk of injuries.

The shoulder's stability relies heavily on how the scapula, clavicle, and humerus move in sync. Any change in how these bones work together can lead to unusual loading on the glenohumeral joint and surrounding tissues. The studies reviewed highlight the important role that scapular dyskinesia plays in causing and worsening shoulder instability in volleyball players. Reeser et al. (2010) found a strong link between scapular malposition, indicated by a high SICK scapula score, and shoulder problems in collegiate volleyball players. This supports the idea that scapular asymmetry and poor posture can increase the risk of shoulder instability and pain for players who often use overhead motions.

Similarly, Chang et al. (2022) showed that training which activates the trunk and lower limbs improved scapular movements and spiking consistency. This underscores that the shoulder does not work alone but as part of a larger kinetic chain. Including trunk and hip stabilization in rehabilitation is crucial for restoring scapular control and preventing future instability.

Karimi et al. (2024) reported that an 8-week scapular stabilization program significantly improved shoulder alignment, reduced pain, and boosted performance in female volleyball players with dyskinesia. These results align with those from Meneghini et al. (2020), who demonstrated that proprioceptive neuromuscular facilitation (PNF) techniques effectively improved scapular abduction and symmetry. This indicates that retraining neuromuscular connections can restore scapular movement and balance in young volleyball players.

Moreover, Pascoal et al. (2023) found that volleyball players had more internal rotation and anterior tilt in the scapula of their dominant shoulder compared to non-athletes. This suggests adaptations that are specific to the sport. While some scapular adjustments can be normal reaction to repeated overhead movements, too much change can lead to dyskinesia and instability. The IJNRD (2024) prevalence study confirmed that scapular dyskinesia is frequently seen in volleyball players, especially beyond 90 degrees of abduction, further linking it to repetitive overhead stresses.

Ravichandran H. et al. (2016) presented a case study demonstrating a comprehensive rehabilitation approach for a volleyball athlete with scapular dyskinesia. The intervention included postural retraining, neuromuscular control exercises, and manual therapy to restore scapular stability. Over six weeks, the athlete achieved marked improvements in pain, range of motion, and scapular alignment. This case highlights the effectiveness of individualized, multimodal rehabilitation strategies incorporating both strengthening and proprioceptive components for scapular correction.

Meneghini GO et al. (2020) conducted a subgroup analysis. This study looked at the effects of neuromuscular retraining on scapular control and pain in adolescent volleyball players. The intervention resulted in significant reductions in shoulder pain and improved scapular symmetry during arm elevation. The authors suggested that early neuromuscular training could prevent the progression of dyskinesia in young athletes. The results support adding age-specific motor control exercises into youth volleyball conditioning programs to keep shoulder function healthy.

Cools a M et al. (2014) reviewed rehabilitation approaches for scapular dyskinesia across different populations, emphasizing that athlete-specific interventions are crucial. For overhead athletes, the focus should

be on dynamic control and load tolerance, rather than static posture alone. The review outlined a progression model beginning with local stability and advancing to functional kinetic chain integration. This evidence-based framework provides clear guidance for physiotherapists managing scapular dysfunction in volleyball players and other overhead sports.

The evidence collected shows that scapular dyskinesia contributes to shoulder instability through irregular muscle coordination, altered movement patterns, and reduced proprioceptive control. To manage this effectively, rehabilitation should aim to restore scapular rhythm by targeting key muscles like the serratus anterior, lower trapezius, and rotator cuff, along with kinetic-chain-based exercises.

These findings highlight the importance of detecting and correcting scapular motion issues early. Screening for scapular dyskinesia during preseason assessments, as Tooth et al. (2023) demonstrated, can help identify at-risk athletes and guide preventive conditioning strategies. Overall, this systematic review highlights that rehabilitation focusing on scapular control, correcting posture, and integrating kinetic chains can significantly lower the risk of shoulder instability and enhance performance in volleyball players.

CONCLUSION

The assessment of the methods and findings from the studies showed that scapular dyskinesia significantly contributes to shoulder instability in volleyball players. Changes in scapular movement, such as less upward rotation, decreased posterior tilt, and increased internal rotation, were consistently linked to shoulder issues and instability. Rehabilitation programs that focus on scapular stabilization, kinetic-chain exercises, and correcting posture were very effective in improving shoulder function and reducing symptoms.

While all the studies reported positive results with interventions aimed at improving scapular control, there is still some variability in how assessments are done and in the training methods used. Future research should aim to find standard evaluation tools and evidence-based rehabilitation methods for scapular dyskinesia in volleyball players to ensure better prevention and treatment outcomes.

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