ISSN: 2347-6567

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

IJAMSCR |Vol. 14 | Issue 4| Oct - Dec 2026

www.ijamscr.com

DOI : https://doi.org/10.61096/ijamscr.v14.iss4.2026.1731-1737

# Effects of Scapular Stabilization Exercises Combined with Global Postural Re-Education on Pain and Functional Outcomes in Overhead Athletes with Scapular Dyskinesis and Chronic Nonspecific Pain: A Pre-Experimental Study

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Published on: 21-10-2026
Published by: Futuristic Publications
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**Abstract**

**Background:** Scapular dyskinesis is frequently observed in overhead athletes and may be associated with altered scapular mechanics, impaired muscle coordination, and musculoskeletal symptoms. Scapular stabilization exercises are directed toward improving scapular muscle control, whereas global postural re-education addresses postural alignment, muscle length, and muscular balance. The effects of combining these approaches in overhead athletes with scapular dyskinesis and chronic nonspecific neck pain require further investigation.

**Objective:**To evaluate changes in pain intensity, neck-related disability, and upper-limb functional disability following a program of scapular stabilization exercises combined with global postural re-education in overhead athletes with scapular dyskinesis and chronic nonspecific neck pain.

**Methods:**The study was approved by the institute ethics committee, IEC-RIPT/DT/21/4512. A pre-experimental, single-group pre-test–post-test study was conducted among 30 overhead athletes aged 18–23 years with scapular dyskinesis and chronic nonspecific neck pain. Scapular dyskinesis was assessed clinically using the Scapular Dyskinesis Test and Lateral Scapular Slide Test. Pain and functional outcomes were assessed using the Visual Analogue Scale (VAS), Neck Disability Index (NDI), and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. The scapular stabilization program consisted of approximately 40-minute sessions performed three times weekly for four weeks. Global postural re-education was delivered in approximately 60-minute sessions once weekly for six weeks. Pre-test and post-test scores were compared using paired-samples t-tests, with statistical significance set at $p < 0.05$.

**Results:** VAS scores decreased from 4.77 ± 0.77 at pre-test to 2.70 ± 0.47 at post-test ($t(29) = 19.40$, $p < 0.001$). NDI scores decreased from 19.27 ± 2.60 to 16.97 ± 2.36 ($t(29) = 13.22$, $p < 0.001$). DASH scores decreased from 50.27 ± 4.65 to 45.98 ± 4.51 ($t(29) = 7.20$, $p < 0.001$).

**Conclusion:** The combined rehabilitation program was associated with statistically significant reductions in pain intensity, neck-related disability, and upper-limb functional disability. Because the study used a single-group pre-test–post-test design without a control group, the observed changes cannot be attributed exclusively to the intervention. Controlled randomized studies with larger and more diverse samples are required to determine the comparative effectiveness of these interventions.

**Keywords:** Scapular dyskinesis; scapular stabilization; global postural re-education; overhead athletes; chronic nonspecific neck pain; pain; functional disability.

## Introduction

Scapular dyskinesis refers to an alteration in the normal position or movement of the scapula. It is commonly observed in overhead athletes and may be associated with altered scapular mechanics, impaired muscle coordination, and musculoskeletal symptoms. Previous research has reported a substantial occurrence of scapular dyskinesis among overhead athletes. [1,2]

Overhead sports involve repetitive upper-limb movements that place considerable mechanical demands on the shoulder and scapulothoracic regions. Sports involving repetitive overhead activity may expose the shoulder and cervical regions to increased mechanical loading. Repetitive movement, high training loads, and sport-specific adaptations may contribute to alterations in scapular movement and muscle activation. [2]

The scapula contributes to force transmission between the trunk and upper limb, and its movement is mechanically related to cervical and shoulder function. Altered scapular movement has been associated with neck and shoulder symptoms, altered scapulothoracic muscle activity, and functional limitations. [3,5,9,20]

Scapular stabilization exercises are intended to improve the strength, activation, coordination, and motor control of muscles involved in scapular movement. Such exercises may contribute to improved scapular control and upper-limb function in individuals with scapular and neck dysfunction. [4,6,10,14]

Global postural re-education is based on sustained postural positioning and stretching of shortened muscle chains with the aim of improving muscle length, postural alignment, and muscular balance. Previous research has investigated its effects in individuals with chronic nonspecific neck pain and scapular dysfunction. [7,13]

Although scapular stabilization exercises and global postural re-education have been investigated individually, limited evidence is available regarding their combined application in overhead athletes with scapular dyskinesis and chronic nonspecific neck pain. Addressing scapular muscle control together with broader postural factors may provide a comprehensive rehabilitation approach for this population.

Therefore, the present study evaluated changes in pain intensity, neck-related disability, and upper-limb functional disability following a rehabilitation program incorporating scapular stabilization exercises and global postural re-education in overhead athletes with scapular dyskinesis and chronic nonspecific neck pain.

## Methodology

### Study Design

A pre-experimental, single-group pre-test–post-test study design was used.

### Study Duration

The study was conducted over a period of six months.

### Study Setting

The study was conducted at Revathi Group of Institutions, Avinashi, Tirupur, India.

### Participants and Sample Size

Thirty college-level overhead athletes aged 18–23 years who fulfilled the eligibility criteria were included in the study.

### Sampling Method

Convenience sampling

### Inclusion Criteria

Participants were eligible if they met the following criteria:

1. Age 18–23 years.

2. College-level overhead athletes.
3. Male or female participants.
4. Presence of scapular dyskinesis.
5. Scapular dyskinesis identified clinically using the Scapular Dyskinesis Test (SDT) and Lateral Scapular Slide Test (LSST).
6. Presence of chronic neck pain.
7. VAS pain score ≥4.

### Exclusion Criteria

Participants were excluded if they had:

1. Neurological disorders, including cervical stenosis, myelopathy, stroke, epilepsy, Parkinsonism, or peripheral neuropathy.
2. Scapular winging associated with long thoracic nerve lesions.
3. A history of surgery involving the neck, scapula, or shoulder.
4. Malignancy.
5. Systemic diseases affecting the joints, including rheumatoid arthritis or osteoporosis.

### Procedure

Forty-five individuals were initially screened for eligibility. Fifteen were excluded according to the selection criteria, and 30 participants were included in the study.

Baseline assessment was performed before commencement of the intervention. Scapular dyskinesis was assessed clinically using the SDT and LSST. Pain intensity was assessed using the VAS, while neck-related disability and upper-limb functional disability were assessed using the NDI and DASH questionnaires, respectively.

Following baseline assessment, participants underwent the rehabilitation program incorporating scapular stabilization exercises and global postural re-education.

### Scapular Stabilization Exercise Program

The scapular stabilization exercise program was performed for approximately 40 minutes per session, consisting of 5 minutes of warm-up, 30 minutes of exercise training, and 5 minutes of cool-down. The program was conducted three sessions per week for four weeks.

The exercise program consisted of stretching exercises for four muscles and strengthening exercises for four muscles. Stretching exercises were initially performed with a 5-second hold for 10 repetitions and three sets, with 30 seconds of rest between sets.

Strengthening exercises were initially performed for 10 repetitions and three sets, with a 5-second hold and 1 minute of rest between sets. Repetitions were progressed from 10 to 12 and subsequently to 15 according to the exercise progression described in the original protocol.

Active movements against gravity were initially performed and subsequently progressed to body weight or resisted movements as tolerated.

Each session concluded with a 5-minute cool-down period.

### Global Postural Re-education

Global postural re-education sessions lasted approximately 60 minutes and consisted of 5 minutes of warm-up, 50 minutes of training, and 5 minutes of cool-down. Sessions were performed once weekly for six weeks.

The program consisted of three postural positions:

1. Stretching of the anterior muscle chain in lying for approximately 15–20 minutes.
2. Stretching of the posterior muscle chain in lying for approximately 15–20 minutes.
3. Stretching of the posterior muscle chain in standing for approximately 5–10 minutes.

Each session concluded with a 5-minute cool-down period.

## Outcome Measures

### Visual Analogue Scale

The Visual Analogue Scale (VAS) was used to assess perceived pain intensity before and after the intervention.

### Neck Disability Index

The Neck Disability Index (NDI) was used to assess neck-related functional disability before and after the intervention.

### Disabilities of the Arm, Shoulder and Hand

The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was used to assess upper-limb functional disability before and after intervention.

### Statistical Analysis

Data was analyzed using descriptive and inferential statistical methods. Mean and standard deviation were calculated for the outcome variables. Paired-samples t-tests were used to compare pre-test and post-test scores for VAS, NDI, and DASH. Statistical significance was set at $p < 0.05$.

For the final journal submission, the paired mean differences, 95% confidence intervals, and an appropriate paired-samples effect size should also be reported if the individual participant data or the standard deviation of paired differences is available.

## Results

A total of 45 individuals were screened, of whom 15 were excluded according to the eligibility criteria. Thirty participants completed the study and were included in the final analysis.

The participants were overhead athletes aged 18–23 years. The sample comprised 25 males (83.3%) and 5 females (16.7%).

### Pain Intensity

The mean VAS score decreased from 4.77 ± 0.77 at pre-test to 2.70 ± 0.47 at post-test. The paired-samples t-test demonstrated a statistically significant difference between pre-test and post-test scores, $t(29) = 19.40$, $p < 0.001$.

### Neck Disability

The mean NDI score decreased from 19.27 ± 2.60 at pre-test to 16.97 ± 2.36 at post-test. The reduction was statistically significant, $t(29) = 13.22$, $p < 0.001$.

### Upper-Limb Functional Disability

The mean DASH score decreased from 50.27 ± 4.65 at pre-test to 45.98 ± 4.51 at post-test. The reduction was statistically significant, $t(29) = 7.20$, $p < 0.001$.

**Table 1. Comparison of Pre-test and Post-test Outcome Measures**

| Outcome | Pre-test Mean ± SD | Post-test Mean ± SD | t | df | p-value |
|---|---|---|---|---|---|
| VAS | 4.77 ± 0.77 | 2.70 ± 0.47 | 19.40 | 29 | <0.001 |
| NDI | 19.27 ± 2.60 | 16.97 ± 2.36 | 13.22 | 29 | <0.001 |
| DASH | 50.27 ± 4.65 | 45.98 ± 4.51 | 7.20 | 29 | <0.001 |

**Note:** $p < 0.05$ was considered statistically significant.

## Discussion

The present study evaluated changes in pain intensity, neck-related disability, and upper-limb functional disability following a rehabilitation program incorporating scapular stabilization exercises and global postural re-education in overhead athletes with scapular dyskinesis and chronic nonspecific neck pain. Statistically significant reductions were observed in VAS, NDI, and DASH scores following the intervention period.

Pain intensity decreased from 4.77 ± 0.77 at baseline to 2.70 ± 0.47 following intervention. The reduction in pain may be related to improved scapular muscle control and movement coordination

associated with stabilization exercises. Improved control of scapular movement may influence the mechanical demands placed on the cervical and shoulder regions during upper-limb activity. Previous studies have reported relationships between scapular dysfunction, neck symptoms, and altered scapulothoracic muscle activity. [4,8,20,21]

The NDI score decreased from 19.27 ± 2.60 to 16.97 ± 2.36. This reduction indicates an improvement in the measured level of neck-related disability. The relationship between scapular and cervical function may partly explain the observed change, as the scapulothoracic and cervical regions are functionally and biomechanically interconnected.

The DASH score decreased from 50.27 ± 4.65 to 45.98 ± 4.51, indicating improvement in the measured upper-limb functional disability. Reduced pain together with improved scapular control may have contributed to improved performance of activities involving the upper limb.

Global postural re-education may also have contributed to the observed changes by addressing postural alignment, muscle length, and muscular balance. Previous clinical research has investigated global postural re-education in patients with chronic nonspecific neck pain and in individuals with scapular dyskinesis associated with neck pain. [7,13]

The combined rehabilitation approach therefore addressed two potentially relevant components of the participants' presentation: local scapular motor control and broader postural factors. Previous studies have also investigated scapular stabilization and scapular-focused exercise approaches in individuals with scapular and shoulder dysfunction. [4,6,14,21]

However, the findings should be interpreted cautiously. The present study used a single-group pre-test–post-test design without a control group. Consequently, the observed changes cannot be attributed exclusively to the intervention. Regression to the mean, natural variation in symptoms, participant expectations, changes in training load, and other uncontrolled factors may have contributed to the observed improvements.

The sample size was relatively small, and the participants were restricted to a young college-age population. Furthermore, the sample contained substantially more males than females, with 25 males and 5 females, which limits the extent to which the findings can be generalized across sexes and other athletic populations.

Future randomized controlled trials should compare the combined program with appropriate control or comparator interventions. Studies with larger and more diverse samples, standardized intervention protocols, longer follow-up periods, and additional functional or biomechanical outcomes may provide stronger evidence regarding the contribution of scapular stabilization and global postural re-education.

## Conclusion

The present study demonstrated statistically significant reductions in pain intensity, neck-related disability, and upper-limb functional disability following a rehabilitation program incorporating scapular stabilization exercises and global postural re-education in overhead athletes with scapular dyskinesis and chronic nonspecific neck pain.

These findings indicate an association between the rehabilitation program and improvements in the measured outcomes. However, because the study used a single-group pre-test–post-test design without a control group, causality cannot be established. Randomized controlled studies with larger and more diverse samples are required to determine the comparative and long-term effects of the intervention.

## Limitations

The study had several limitations. The sample size was relatively small, and participants were recruited from a single institutional setting. The single-group pre-test–post-test design did not include a control or comparator group, limiting the ability to attribute observed changes specifically to the intervention. The follow-up period was limited to the intervention period, and therefore long-term effects could not be determined. The age range was restricted to 18–23 years, and the sample contained substantially more male than female participants. The study also did not evaluate whether scapular stabilization exercises or global postural re-education independently contributed to the observed changes.

## Recommendations

Future research should include randomized controlled designs with larger sample sizes, appropriate comparator groups, standardized intervention protocols, and longer follow-up periods. Studies should also investigate the independent effects of scapular stabilization exercises and global postural re-education and

determine whether combining the interventions provides additional benefit. Further research involving athletes from different overhead sports and more balanced sex distributions would improve the generalizability of the findings.

## Ethical Considerations

**Ethical approval:** The institutional ethics approval information was not provided in the submitted manuscript and should be added before journal submission if approval was obtained.

## Informed Consent

Written informed consent was obtained from all participants before commencement of the study. Participation was voluntary, and confidentiality of participant information was maintained throughout the study.

## Conflict of Interest

The authors declare that they have no conflict of interest related to this study.

## Funding

No external funding was received for this study.

## Author Contributions

**Godson N:** Conceptualization, methodology, participant recruitment, data collection, statistical analysis, manuscript preparation, and manuscript revision.

**Dr. Santhanalakshmi A:** Study conception and design, supervision, methodology validation, interpretation of results, critical revision of the manuscript, and final approval of the manuscript.

**Dr. P. Bright Alwin Victor:** Administrative support, overall academic guidance, and final approval of the manuscript.

## Acknowledgments

The authors sincerely thank the management, principal, faculty members, and staff of Revathi Institute of Physiotherapy and Research, Avinashi, for their support and guidance throughout the study. The authors also thank all participants for their cooperation and participation in the study.

## References

1. Burn MB, McCulloch PC, Lintner DM, Liberman SR, Harris JD. Prevalence of scapular dyskinesis in overhead and nonoverhead athletes. Orthop J Sports Med. 2016;4(2):2325967115627608.
2. Moon SE, Kim YK. Neck and shoulder pain with scapular dyskinesis in computer office workers. Medicina (Kaunas). 2023;59(12):2159.
3. Tang L, Chen K, Ma Y, Huang L, Liang J, Ma Y. Scapular stabilization exercise based on the type of scapular dyskinesis versus traditional rehabilitation training in the treatment of periarthritis of the shoulder: study protocol for a randomized controlled trial. Trials. 2021;22(1):713.
4. Jeong JH, Kim YK. Association of scapular dyskinesis with neck and shoulder function and training period in Brazilian Jiu-Jitsu athletes. Medicina (Kaunas). 2023;59(8):1481.
5. Constand MK, MacDermid JC. Effects of neck pain on reaching overhead and reading: a case-control study of long and short neck flexion. BMC Sports Sci Med Rehabil. 2013;5:21.
6. Kibler WB, McMullen J. Scapular dyskinesis and its relation to shoulder pain. J Am Acad Orthop Surg. 2003;11(2):142-151.
7. Salamh PA, Hanney WJ, Boles T, Holmes D, McMillan A, Wagner A, et al. Is it time to normalize scapular dyskinesis? The incidence of scapular dyskinesis in those with and without symptoms: a systematic review of the literature. Int J Sports Phys Ther. 2023;18(3):558-576.
8. Amorim CSM, Gracitelli MEC, Marques AP, Alves VLS. Effectiveness of global postural reeducation compared to segmental exercises on function, pain, and quality of life of patients with scapular dyskinesis associated with neck pain: a preliminary clinical trial. J Manipulative Physiol Ther. 2014;37(6):441-447.

9. Tang L, Chen K, Huang L, Liang J, Wang M, He L, et al. Efficacy of targeted scapular stabilization exercise versus conventional exercise for patients with shoulder pain: a randomized clinical trial. Am J Phys Med Rehabil. 2024;103(9):771-776.
10. Huang TS, Lin JJ, Ou HL, Chen YT. Movement pattern of scapular dyskinesis in symptomatic overhead athletes. Sci Rep. 2017;7:6621.
11. Castelein B, Cools A, Parlevliet T, Cagnie B. Are chronic neck pain, scapular dyskinesis and altered scapulothoracic muscle activity interrelated? A case-control study with surface and fine-wire EMG. J Electromyogr Kinesiol. 2016;31:136-143.
12. Cools AMJ, Struyf F, De Mey K, Maenhout A, Castelein B, Cagnie B. Rehabilitation of scapular dyskinesis: from the office worker to the elite overhead athlete. Br J Sports Med. 2014;48(8):692-697.
13. Villavicencio AT, Hernández TD, Burneikiene S, Thramann J. Neck pain in multisport athletes. J Neurosurg Spine. 2007;7(4):408-413.
14. Paksoy A, Akgün D, Pawelke J, Eckl L, Mavi A, Uzun S, et al. Scapular dyskinesis is common among asymptomatic European basketball players at the professional level. Knee Surg Sports Traumatol Arthrosc. 2025;33(12):4353-4363.
15. Guerrero-Henriquez J, Oyarce-Mella M, Reyes Rocabado J, Olivares-Ponce D, Olivares-Lee O, Pérez-Pasten S, et al. Inter-rater reliability of scapular dyskinesis classification in overhead athletes by entry-level physical therapy students. J Man Manip Ther. 2022;30(1):56-60.
16. Jildeh TR, Ference DA, Abbas MJ, Jiang EX, Okoroha KR. Scapulothoracic dyskinesis: a concept review. Curr Rev Musculoskelet Med. 2021;14(3):246-254.
17. Zago M, Kawczyński A, Klich S, Pietraszewski B, Galli M, Lovecchio N. Fatigue-induced scapular dyskinesis in healthy overhead athletes. Front Bioeng Biotechnol. 2020;8:302.
18. Telli H, Sağlam G. Scapular dyskinesis and loss of cervical lordosis in myofascial pain syndrome and its effects on pain and posture disorders. Turk J Phys Med Rehabil. 2023;69(2):188-199.
19. Sağlam G, Telli H. The prevalence of scapular dyskinesia in patients with back, neck, and shoulder pain and the effect of this combination on pain and muscle shortness. Agri. 2022;34(2):100-108.
20. Intelangelo L, Bordachar D, Barbosa AWC. Effects of scapular taping in young adults with shoulder pain and scapular dyskinesis. J Bodyw Mov Ther. 2016;20(3):525-532.
21. Iqbal ZA, Alghadir AH, Anwer S. Efficacy of deep cervical flexor muscle training on neck pain, functional disability, and muscle endurance in school teachers: a clinical trial. Biomed Res Int. 2021;2021:7190808.
22. Dos Santos C, Jones MA, Matias R. Short- and long-term effects of a scapular-focused exercise protocol for patients with shoulder dysfunctions: a prospective cohort. Sensors. 2021;21(8):2888.