

ORIGINAL RESEARCH

SPORTS MEDICINE

Association of upper and lower extremity pain intensity and well-being among young overhead athletes

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ABSTRACT

Background & Objective: Overhead athletes are vulnerable to musculoskeletal pain due to severe stress, repetitive movements and the training demands. Persistent musculoskeletal pain may also influence their general well-being and adversely affect their day to day living. This cross-sectional study was carried out to determine the association of upper and lower limb extremity pain intensity and well-being among young overhead athletes.

Methodology: This cross-sectional study was conducted among 141 overhead athletes (aged 18-25 years) at the University of Lahore using non-probability convenient sampling. Data was collected from sports complex of the University of Lahore.

Pain intensity was measured with the Visual Analogue Scale (VAS), and well-being with the Personal Wellbeing Index-Adult (PWI-A). Data on sleep patterns, practice intensity, and health satisfaction were also collected. Associations were analyzed using chi-square tests ($P < 0.05$).

Results: The mean age of participants was 21.6 ± 2.2 years, and mean weight was 65.09 ± 9.5 kg. Pain was reported as mild (56%), moderate (39%), severe (2.9%) and absent (2.1%). Shoulder was the most affected area (14.2%), while 51.8% reported pain in multiple regions. Sleep deprivation (< 8 hours) was reported by 47.5% of athletes, and 37.7% reported low health satisfaction. A significant association was found between upper and lower extremity pain ($P < 0.05$). Although statistical analysis revealed no significant association between pain intensity and well-being ($P = 0.857$), athletes with moderate pain frequently exhibited compromised well-being, suggesting a potential clinical trend that warrants further investigation.

Conclusion: Upper and lower extremity pains are significantly associated with each other among young overhead athletes; however, pain intensity is not related to general well-being. Sleep deprivation is common and may contribute to performance and recovery challenges.

Keywords: Lower extremity pain; Overhead athlete; Pain intensity; Personal Wellbeing Index-Adult (PWI-A); Upper extremity pain; Visual Analogue Scale

Citation: Mustafa A, Tauqeer S, Zahid M, Noreen K, Hizbullah, Munir S, Sajid M, Fatima M, Nazir I, Ijaz M. Association of upper and lower extremity pain intensity and well-being among young overhead athletes. *Anaesthesia, pain intensive care* 2026;30(2):160-164. DOI: 10.35975/apic.v30i2.3132

Received: September 09, 2025; **Revised:** October 13, 2025; **Accepted:** October 13, 2026

1. INTRODUCTION

Overhead athletes in sports such as badminton, tennis, softball, swimming, baseball, volleyball, and handball perform repetitive overhead movements that may cause microtrauma in surrounding muscles, leading to shoulder and elbow injuries. Scapular dyskinesia, often resulting from pectoral muscle imbalances, can contribute to sub-

acromial impingement syndrome (SAIS), altering shoulder kinematics and increasing the risk of injuries such as rotator cuff tears, SLAP lesions, and multidirectional instability (MDI).¹ Efficient overhead motion requires proper coordination among body segments, particularly in scapular positioning and rotation.^{2,3} Trunk and lower back pain are also common

in overhead athletes, often linked to high training workloads and excessive match play. Professional athletes who specialize in a single sport from an early age face greater risks of overuse injuries, whereas multi-sport participation and careful management of training intensity may help reduce these risks.⁴ One common deficit among athletes with shoulder impingement syndrome (SIS) is reduced isometric strength of the scapulohumeral muscles, which can be improved through manual therapy combined with progressive resistance exercises.⁵ Overuse injuries remain the most frequent musculoskeletal problems in overhead athletes, arising from an imbalance between training intensity, exerted force, and recovery time.⁶ Shoulder overuse injuries are more prevalent than elbow injuries, particularly among younger athletes with developing musculoskeletal systems. Understanding age-dependent overuse patterns is critical for early detection, management, and prevention.^{7,8} Sports such as softball, baseball, and tennis show the highest rates of elbow and shoulder overuse injuries, with baseball reporting the greatest incidence of elbow pain, while softball, handball, and volleyball demonstrate even higher prevalence of shoulder injuries.⁹ Female athletes also appear to have a higher risk of lower extremity injuries, though the underlying causes remain unclear.¹⁰ Athlete well-being is equally important for performance, with sleep, mental health, and recovery serving as critical determinants. Inadequate sleep is associated with reduced physical performance, increased injury risk, and delayed recovery. Sports that emphasize leanness and aesthetics may increase the risk of eating disorders and unhealthy dietary practices, whereas non-aesthetic sports, such as volleyball and bodybuilding, do not typically impose strict weight-control demands. This study aims to investigate the association between upper and lower extremity pain intensity and well-being among young overhead athletes, providing insights that may aid in the prevention of major injuries in overhead sports. The findings are expected to emphasize the importance of effective pain management, supportive environments, and adequate resources for student-athletes.^{11,12} A previous study carried out in Japan in 2017 primarily focused on the physical burden of overhead sports but did not incorporate psychosocial dimensions, whereas the present study, conducted in Pakistan, also incorporates the mental well-being of athletes.

2. METHODOLOGY

This was a cross-sectional study. Participants with age 18-25 both genders who played overhead sports (volleyball, badminton, handball, baseball, judo, tennis, swimming or softball) competitively for at least 3 times per week competitively for 6 months, and gave their written informed consent were included in the study. Participants who were not willing to participate or did not play overhead sports. Players with any congenital deformity or disability or for recreation purpose only,

were excluded from the study. In this cross-sectional study, 141 overhead athletes were included in accordance with a non-probability convenience sampling technique.

The data was collected through a self-administered demographic questionnaire that gathered data on demographics, BMI, arm dominance, pain presence, type, and intensity. It included sports type, practice intensity, injury history, and athletic experience. Participants reported pain in upper and lower limbs, training frequency, weekend activity duration, sleep hours, and competitive level, using both categorical and numerical responses. Pain (VAS) scale for evaluating the pain intensity, and well-being through pre-structured (PWI-A) questionnaire, then distributed and analyzed using SPSS version 27.00. Pain intensity (VAS) is a 0-10 rating scale and categorized into no pain (0 points), mild (1-3 points), moderate (4-6 points) and severe (7-9 points) and worst imaginable pain (10 points) (13, 14). The Personal Wellbeing Index – Adult (PWI-A) is a validated 7-item scale measuring subjective well-being across seven domains: standard of living, health, achieving in life, relationships, safety, community connectedness, and future security. Each domain is rated on a 0–10 scale, with higher scores indicating greater well-being. The PWI-A demonstrates high reliability ($\alpha > 0.85$) and strong cross-cultural validity, making it suitable for global comparisons. PWI-A consists of 100 points, which was further categorized into “challenged” (0-40 points), “compromised” (41-69 points) and normal (70-100 points) (15). Sample size was calculated using non-probability convenient sampling technique. Written consent was obtained from all athletes, and the importance of the study was explained to them before they filled out

2.1. Statistical analysis

Data were analyzed using SPSS version 27.00. Continuous variables were summarized with mean, standard deviation, minimum, and maximum values, and visualized using histograms. Categorical variables were presented as frequencies and Percentages with bar charts. The Chi-Square test was used to examine associations between upper and lower limb pain intensity, and between pain intensity and well-being. However, the analysis was limited to Chi-Square tests, with no adjustments for potential confounders such as gender, sport type, or training load.

3. RESULTS

Majority of the subjects were between 18 to 25 with a mean age of 21.60 ± 2.23 years and a mean weight of 65.09 ± 9.505 kg. Most participants (88.7%) were right-handed. Pain intensity varied, with 56.0% experiencing mild pain, 39.0% moderate pain, and 2.9% severe pain and only 2.1% had no pain. Majority of the subjects experienced shoulder pain. 12.1%

Variables	Categories	N (%)
Gender	Male	73 (51.8)
	Female	68 (48.2)
Dominant arm	Right arm	125 (88.7)
	Left arm	16 (11.3)
Types of sports	Swimming	20 (14.2)
	Judo	35 (24.8)
	Badminton	41 (29.1)
	Volleyball	45 (31.9)
Practice per day weekends (hrs)	≤ 4	103 (73.0)
	> 4	38 (27.0)
Training per week (days)	≤ 2	28 (19.9)
	3 to 4	68 (48.2)
	5 to 7	45 (31.9)
Practice intensity	Not hard	74 (52.5)
	Hard	67 (47.5)
Sleep duration (hrs)	≤ 8	67 (47.5)
	> 8 to 9	55 (39.0)
	> 9	19 (13.5)

reported combined elbow and shoulder pain. Other most affected region was thigh, then shin, 9.2% reported pain. Multiple pain regions were reported by 51.8% of athletes. 44.0% had 1-2 years of experience. Only 6.4% had over six years of experience. Prolonged athletic careers are linked to

overuse injuries or, ACL/PCL tears. 28.4% rated their life satisfaction at 8 out of 10. 19.9% rated it 7 out of 10, while 8.5% reported lower satisfaction (≤ 5). 22.0% rated their health satisfaction at 8 out of 10. 14.2% rated it 7 out of 10, while 37.7% reported moderate to low satisfaction (≤ 6), reflecting concerns related to injury and recovery. 24.8% expressed strong satisfaction (10 out of 10) with feeling safe. 17.0% people reported 8 out of 10. Regarding the sleep duration, 47.5% reported less than 8 hours of sleep, which is linked with poor recovery and increased risk of injury. Only 13.5% reported over nine hours of sleep. The young overhead athletes observed in this study were players from volleyball 31.9%, badminton 29.1%, judo 24.8%, and swimming 14.2%. 47.5% reported "hard" practice. 52.5% reported "not hard" practice. Chi-square test revealed a significant association between the upper and lower extremity pain.

4. DISCUSSION

The results of this study showed that most young overhead athletes reported mild (56%) or moderate (39%) pain, with only a small proportion experiencing severe pain (2.9%). Shoulder pain was the most

PWI-A Subscale	N (%)
PWI-A overall satisfaction wth life	0 to 4 (Challenged) 29 (20.6)
	5 to 7 (Compromised) 53 (37.6)
	8 to 10 (Normal) 59 (41.8)
PWI-A standard of living Domain	0 to 4 (Challenged) 28 (19.9)
	5 to 7 (Compromised) 48 (34.0)
	8 to 10 (Normal) 65 (46.0)
PWI-A health Domain	0 to 4 (Challenged) 36 (25.5)
	5 to 7 (Compromised) 42 (29.8)
	8 to 10 (Normal) 63 (44.7)
PWI-A life achievement Domain	0 to 4 (Challenged) 30 (21.3)
	5 to 7 (Compromised) 40 (28.4)
	8 to 10 (Normal) 71 (50.4)
PWI-A personal relationship Domain	0 to 4 (Challenged) 32 (22.7)
	5 to 7 (Compromised) 43 (30.5)
	8 to 10 (Normal) 66 (46.8)
PWI-A personal safety Domain	0 to 4 (Challenged) 49 (34.8)
	5 to 7 (Compromised) 28 (19.9)
	8 to 10 (Normal) 64 (45.4)
PWI-A community connectedness Domain	0 to 4 (Challenged) 34 (24.1)
	5 to 7 (Compromised) 38 (30.0)
	8 to 10 (Normal) 69 (49.0)
PWI-A future security Domain	0 to 4 (Challenged) 17 (12.0)
	5 to 7 (Compromised) 48 (34.0)
	8 to 10 (Normal) 76 (53.9)
PWI-A spiritual Domain	0 to 4 (Challenged) 3 (2.1)
	5 to 7 (Compromised) 29 (2.0)
	8 to 10 (Normal) 109 (77.3)

frequently reported complaint. Statistical analysis revealed a significant association between upper and lower extremity pain, indicating that dysfunction in one region may predispose athletes to compensatory strain and injury in another. This pattern supports the kinetic chain theory, where impaired movement or weakness in

Table 3: Chi-Square test of association between upper and lower extremity pain; Lower limb pain * Upper limb pain Cross tabulation

		Upper limb pain				Total	P value
		No pain (0)	mild (1-3)	Moderate (4-6)	Severe (7-9)		
Lower limb pain	Mild (1-3)	4	29	3	9	45	.000
	severe (7-9)	18	18	0	7	43	
	no pain (0)	23	8	2	8	41	
	moderate (4-6)	2	2	6	2	12	
Total		47	57	11	26	141	

one segment can contribute to overload elsewhere.

Table 4: Chi-Square test of association between pain intensity and well-being

Pain Intensity* Well-being Cross tabulation

Pain Intensity (VAS)		Well-being (PWI-A)			Total	P value
		challenged	compromised	Normal		
1-3 (mild pain)		15	33	31	79	0.857
4-6 (moderate pain)		13	22	20	55	
7-9 (very severe pain)		0	2	2	4	
0 (no pain)		0	2	1	3	
Total		28	59	54	141	

However, since no biomechanical assessments were conducted, the underlying mechanisms remain speculative. These findings are consistent with Aldanyowi et al. (2024), who reported that 55% of athletes experienced at least one acute injury within six months, with overuse injuries contributing more to reduced mental well-being. Similarly, athletes in this

study who reported moderate-to-low health satisfaction ($\leq 6/10$) highlighted the combined burden of injury and recovery challenges on overall well-being.¹⁶ Findings also align with Jones et al. (2023), who emphasized the importance of hip and core coordination in overhead movements to reduce stress on the shoulder and elbow. Athletes with greater hip–core efficiency demonstrate more stable kinetic chains and are less likely to develop scapular dyskinesia and overuse injuries. Similarly, research in swimmers, badminton players, and tennis athletes has highlighted a dual risk of shoulder overuse injuries and lower limb conditions such as ACL tears, particularly due to rapid single-leg stance transitions required in competition.⁴ The PWI-A was used to assess multidimensional well-being (standard of living, health, achievement, relationships, safety, community, future security), categorizing athletes into normal and compromised groups. Results showed an almost even split, with many reporting good life and community

satisfaction but moderate-to-low health satisfaction

(37.7%) and sleep deficits (<8 hours in 47.5%). While pain intensity did not significantly correlate with PWI-A categories, compromised well-being frequently coexisted with moderate pain, injury burden, and poor recovery patterns. These findings align with Aldanyowi et al. (2024) on injury-related well-being decline and Charest & Grandner (2020) on sleep deficits. Nearly half of participants reported sleeping fewer than eight hours per night, a factor linked to inadequate recovery. Charest et al. (2020) noted that even elite athletes frequently experience sleep deficits, particularly before tournaments, which may compromise health and performance.^{16, 17} Likewise, Kroshush et al. (2019) underscored that despite the critical role of sleep in training and recovery, athletes often fail to meet recommended sleep durations due to academic, athletic, and social demands. Although this study did not statistically test sleep against pain outcomes, the descriptive trends suggest a potential link worth exploring further.¹⁸

5. LIMITATIONS

Data collection relied on self-reported measures, which may introduce bias. The cross-sectional design restricts the ability to establish causal relationships between pain and contributing factors. The sample was limited to overhead athletes aged 18–25 years, which reduces the generalizability of findings to younger or older populations.

Additionally, external factors such as nutrition,

psychological stress, and socioeconomic status were not assessed, despite their potential influence on pain and well-being. To establish evidence-based practices, randomized controlled trials (RCTs) are needed to identify effective prevention, and rehabilitation. Furthermore, incorporating mandatory rest periods and educating athletes on the critical role of sleep in recovery and performance are essential steps to enhance both athletic outcomes and overall health.

6. CONCLUSION

On the basis of these results, it was concluded that a significant association was observed between upper and lower extremity pain among young overhead athletes. However, this does not establish a causal relationship, and further longitudinal studies are needed to determine directionality. The findings also indicate that a majority of young overhead athletes were sleep-deprived, which may impact their performance and recovery.

7. Data availability

The numerical data generated during this research are available from the authors.

8. Conflict of Interest

No conflict of interest declared by the authors.

9. Authors' Contribution

All authors are responsible for the conceptualization, preparation, editing. All authors have approved the final draft.

10. REFERENCES

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