

Original Article:



# Cross-cultural adaptation, validity and reliability of the Persian version of the Kerlan-Jobe Orthopedic Clinic shoulder and elbow score

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## Abstract

**Introduction:** Shoulder injuries among overhead athletes are common, often occurring during sports activities. These injuries challenge the effectiveness of general shoulder function assessment tools like the DASH and ASES. The purpose of this study was to evaluate the validity and reliability of the Persian-translated Kerlan-Jobe Orthopaedic Clinic (KJOC) questionnaire, which is specifically designed to assess shoulder function in overhead athletes.

**Materials and Methods:** Ethical clearance facilitated the linguistic and cultural adaptation of the original English version of the KJOC questionnaire into Persian. The study involved 100 Iranian overhead athletes (72 males, 28 females; mean age: 26.2±7.1 years) who participated in volleyball, water polo, and badminton. The Persian-translated KJOC was subjected to a rigorous translation process, followed by content validity assessment using the Content Validity Ratio (CVR) and Content Validity Index (CVI). Reliability was assessed through internal consistency using Cronbach's alpha ( $\alpha$ ) and test-retest reliability using the Intraclass Correlation Coefficient (ICC).

**Results:** The content validity of the Persian-translated KJOC was confirmed with a CVR of 0.79 and a CVI of 0.85, indicating its necessity, clarity, and relevance. Internal consistency, measured by Cronbach's  $\alpha$ , was found to be excellent ( $\alpha=0.947$ ), and test-retest reliability, measured by ICC, demonstrated excellent consistency (ICC=0.903). The mean total scores of participants at the first and second administrations were 66.79±24.36 and 65.23±23.74, respectively, one week apart without any intervention, demonstrating the stability of the tool.

**Conclusion:** The Persian-translated KJOC questionnaire exhibited excellent validity and reliability, confirming its suitability as a reliable tool for evaluating shoulder function and performance in overhead athletes. While the tool shows promise, the study acknowledges some limitations, such as the lack of construct validity assessment, ceiling/floor effect analysis, and the heterogeneous nature of the athlete pool.

**Keywords:** Overhead athletes, shoulder, function, Kerlan-Jobe Orthopaedic Clinic (KJOC) shoulder and elbow questionnaire

## 1. Introduction

Overhead athletes face a heightened risk of shoulder injuries during their sporting activities, often experiencing symptoms exclusively during such engagements rather than in routine daily tasks [1]. However, existing patient-reported questionnaires like the Disabilities of the Arm, Shoulder and Hand (DASH) and American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), designed for assessing daily shoulder function, may fall short in capturing the nuanced limitations faced by these athletes [2].

In 2010, Alberta et al. developed the Kerlan-Jobe Orthopaedic Clinic (KJOC) shoulder and elbow questionnaire, specifically tailored to evaluate shoulder function and performance in overhead athletes [3]. The questionnaire, featuring ten items scored via Visual Analogue Scales (VAS), has exhibited reliability and effectiveness in assessing athletes engaged in overhead activities. Despite its successful translations into multiple languages and subsequent validation [4-9], the validity and reliability of KJOC remain untested within Persian (Farsi) speaking populations. Farsi is spoken across several Middle Eastern countries, including Iran, Tajikistan, Afghanistan, Iraq, and Pakistan.

The adaptation of assessment tools across diverse cultural landscapes is pivotal for fostering global knowledge exchange and ensuring the applicability of questionnaires in multicultural settings [10]. This study endeavors to bridge this gap by translating the original English version of the KJOC questionnaire into Persian and rigorously evaluating its validity and reliability. The goal is to develop a Persian version of the KJOC questionnaire tailored specifically for Iranian overhead athletes.

The significance of this study lies in providing a validated assessment tool that aligns with the cultural and linguistic nuances of Persian-speaking overhead athletes. Such an adaptation not only facilitates accurate evaluation but also aids in devising targeted interventions and contributes to the broader field of sports medicine within Persian-speaking

communities.

## 2. Materials and Methods

### Study population and recruitment

The study meticulously targeted specific geographical areas, namely the Capital region of Iran and Tehran regions, relying on sports clubs as primary recruitment hubs. Eligibility criteria encompassed individuals aged 18 years or older, actively participating in overhead sports, and having proficiency in Finnish as their primary language. Exclusions were comprised of individuals recently affected by upper limb injuries or any condition impeding their active involvement in sports. Initially, 100 athletes were enrolled, but four were subsequently excluded due to reasons such as missing data, lack of written consent, neurological conditions that might impact the data, and one participant being underage (14 years old). Additionally, individuals with cognitive disorders, secondary shoulder complications, or a lack of interest in participation were purposefully omitted from this specific study group. The included participants constituted athletes from five distinct overhead sports - namely volleyball, water polo, badminton, basketball, and handball - all competing at national or international levels. Ethical clearance for this research was obtained from the Human Sciences Ethics Committee, with approval granted under the code IR.IUMS.FMD.REC.1400.281. The study followed a two-phase approach, commencing with the linguistic and cultural adaptation of the original English KJOC questionnaire into Persian. Subsequently, the Persian version's reliability and validity were assessed. Participants voluntarily provided written consent before involvement in the study, and throughout the research process, the rights of the participants were diligently safeguarded. The study group consisted of native Persian-speaking professional overhead athletes affiliated with Tehran's Shafa Orthopedic Hospital during the period spanning January 2021 to March 2022 [see Table 1 for a comprehensive overview of participant demographics and specific attributes].

**Table 1.** The characteristic features of overhead athletes who participated in the study

| Variable       | Mean $\pm$ SD or Number (%) (n=100) |
|----------------|-------------------------------------|
| Age (year)     | 26.2 $\pm$ 7.1                      |
| Sex            |                                     |
| Male           | 72 (72)                             |
| Female         | 28 (28)                             |
| Hand dominance |                                     |
| Dominant       | 75 (75)                             |

|                                    |         |
|------------------------------------|---------|
| Non-dominant                       | 15 (15) |
| Both                               | 10 (10) |
| <b>Sport field</b>                 |         |
| Volleyball                         | 33 (33) |
| Water polo                         | 23 (23) |
| Badminton                          | 21 (21) |
| Basketball                         | 12 (12) |
| Handball                           | 11 (11) |
| <b>History of injury</b>           |         |
| Yes                                | 55 (55) |
| No                                 | 45 (45) |
| <b>History of recent treatment</b> |         |
| Rest                               | 4 (4)   |
| Conservative                       | 15 (15) |
| Surgery                            | 10 (10) |
| Rest & conservative                | 20 (20) |
| Rest & conservative & surgery      | 6 (6)   |
| None                               | 45 (45) |

\*Data is presented as mean  $\pm$  standard deviation (SD), Statistical significance is denoted as p-value  $< 0.001$ , Data represented as percentage (%).

### Translation and cross-cultural adaptation

Prior to commencing the research, contact was established with the creator of the original KJOC score to secure permission for utilizing the English language questionnaire. The process of cross-cultural adaptation adhered to established and published guidelines in this field [10]. The translation process involved two independent translators, one familiar with the content (informed) and another without prior knowledge (uninformed), who translated the English questionnaire into Persian. Their translations were combined, and a synthesized version was deliberated upon by a research committee comprising experts from health sciences, orthopedics, physical therapy, and overhead sports coaching. This collaborative discussion aimed to refine and enhance the translated version. Afterwards, a native English speaker proficient in Persian, but unaware of the original questionnaire, conducted a back-translation. The resultant back-translation was compared against the original English version to ensure accuracy and maintain the intended meaning. Subsequently, the modified translation underwent a pilot test involving ten overhead athletes. Observations from this pilot test led to necessary revisions in the translated questionnaire to address any ambiguities or difficulties encountered during the pilot phase. The entire process of cross-cultural adaptation, including the progression and details of modifications made, was meticulously documented. A comprehensive description of this adaptation process is available upon request, offering insights into the steps taken to ensure the questionnaire's cultural relevance and accuracy in the target Persian-speaking population. Ethical clearance

for this research was obtained from the Human Sciences Ethics Committee, with approval granted under the code IR.IUMS.FMD.REC.1400.281.

### Validation Procedures

The validation process was comprehensive, involving meticulous content validity assessments utilizing Content Validity Ratio (CVR) and Content Validity Index (CVI) methodologies. This rigorous validation aimed to ascertain the validity of the Persian KJOC score, specifically targeting the evaluation of its construct validity. A panel comprising ten seasoned orthopedic professors provided guidance throughout this process. Their expertise was instrumental in meticulously evaluating the necessity, relevance, clarity, and simplicity of the items. Their collective insight ensured a comprehensive assessment, confirming that the items within the Persian KJOC score effectively measured the intended construct, maintaining relevance, clarity, and essentiality within the context of the study.

### Reliability Measures

Internal consistency of Persian KJOC (P-KJOC) questionnaire items was evaluated via Cronbach's alpha, ensuring item coherence. Test-retest reliability utilized the intra-class correlation coefficient (ICC) within a week, maintaining stability without intervention or symptom changes.

### Statistical Analyses

SPSS software (Version 16.0, SPSS Inc., Chicago, Ill., USA) facilitated all statistical evaluations. Internal consistency was assessed using Cronbach's  $\alpha$ ,

categorizing values as excellent (>0.9), good (0.8–0.9), acceptable (0.7–0.8), questionable (0.6–0.7), poor (0.5–0.6), or unacceptable (<0.5). Test–retest reliability was individually evaluated for each question and the total score using both Cronbach’s  $\alpha$  coefficient and ICC. ICC values above 0.75 were considered excellent, 0.75–0.4 indicated fair to good agreement, and less than 0.4 indicated poor agreement. Statistical significance was set at a threshold of  $p < 0.05$  for all analyses, ensuring robustness and reliability in the statistical assessments conducted.

3. Results

Validity Assessment

The present study computed the Content Validity Ratio (CVR) and Content Validity Index (CVI), resulting in estimations of 0.79 and 0.85, respectively, thus signaling the questionnaire's acceptable validity. This analysis confirmed that all items within the P-KJOC questionnaire were deemed necessary, relevant, clear, and comprehensible, as determined by the study committee.

Reliability Assessment

Internal consistency analysis utilizing Cronbach’s  $\alpha$

coefficient demonstrated an impressive consistency of 0.947 among different questions within the P-KJOC questionnaire, indicative of its excellent reliability.

The assessment of test–retest reliability further supported the robustness of the questionnaire. All items exhibited high reliability, each displaying a Cronbach’s  $\alpha$  coefficient surpassing 0.9 (mean: 0.976) and a significant P-value (<0.001) [refer to [Table 2](#) for details]. Moreover, the mean total score for patients was  $66.79 \pm 24.36$  during the initial administration and  $65.23 \pm 23.74$  during the subsequent administration after one week, without any intervention or symptom alterations.

The Intra-class Correlation Coefficient (ICC) analysis for the total P-KJOC score yielded a value of 0.903 (CI: 0.873-0.923,  $P < 0.001$ ), indicating excellent reliability.

These findings affirm the robust validity and reliability of the Persian-translated KJOC questionnaire, establishing its credibility and consistency as an effective assessment tool for evaluating shoulder function and performance among Persian-speaking overhead athletes.

**Table 2.** Internal consistency and Test-retest reliability of Persian Kerlan-Jobe orthopedic clinic shoulder and elbow score

| Item                          | Question                                                                                             | Internal consistency (test: n=100)  |         | Test-retest reliability (test: n=100; retest: n=100) |        |            |
|-------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------|---------|------------------------------------------------------|--------|------------|
|                               |                                                                                                      | Cronbach's $\alpha$ if item deleted | P-value | ICC Mean                                             | ICC SD | ICC 95% CI |
| physical functioning subscale |                                                                                                      |                                     |         |                                                      |        |            |
| 1                             | How difficult is it for you to get loose or warm prior to competition or practice?                   | 0.969                               | <0.001  | 6.68                                                 | 2.8    | *          |
| 2                             | How much pain do you experience in your shoulder or elbow?                                           | 0.967                               | <0.001  | 6.63                                                 | 2.83   | *          |
| 3                             | How much weakness and/or fatigue (ie, loss of strength) do you experience in your shoulder or elbow? | 0.978                               | <0.001  | 6.32                                                 | 2.89   | *          |
| 4                             | How unstable does your shoulder or elbow feel during competition?                                    | 0.976                               | <0.001  | 6.88                                                 | 2.88   | *          |

|                                      |                                                                                                                                                             |       |        |      |      |   |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------|------|------|---|
| 5                                    | How much have arm problems affected your relationship with your coaches, management, and agents?                                                            | 0.972 | <0.001 | 8.13 | 2.67 |   |
| <b>level of competition subscale</b> |                                                                                                                                                             |       |        |      |      |   |
| 6                                    | How much have you had to change your throwing motion, serve, stroke, etc, due to your arm?                                                                  | 0.971 | <0.001 | 6.48 | 3.08 | * |
| 7                                    | How much has your velocity and/or power suffered due to your arm?                                                                                           | 0.981 | <0.001 | 6.18 | 3.03 | * |
| 8                                    | What limitation do you have in endurance in competition due to your arm?                                                                                    | 0.978 | <0.001 | 6.23 | 3.21 | * |
| 9                                    | How much has your control (of pitches, serves, strokes, etc.) suffered due to your arm?                                                                     | 0.977 | <0.001 | 6.48 | 3.01 | * |
| 10                                   | How much do you feel your arm affects your current level of competition in your sport (ie, is your arm holding you back from being at your full potential)? | 0.984 | <0.001 | 6.38 | 3.34 | * |
| <b>Total</b>                         |                                                                                                                                                             | 0.976 | <0.001 |      |      |   |

\*ICC (Intraclass Correlation Coefficient), Mean ICC (Intraclass Correlation Coefficient for Mean), SD ICC (Intraclass Correlation Coefficient for Standard Deviation), ICC 95% CI (Intraclass Correlation Coefficient 95% Confidence Interval)

#### 4. Discussion

In the present study, we evaluated the validity and reliability of P-KJOC in a cohort of 100 Iranian overhead athletes. The validity assessment by CVR and CVI confirmed that all the questions in the P-KJOC questionnaire were necessary, related, clear, and simple to understand. Evaluation of internal consistency with Cronbach's  $\alpha$  coefficient showed excellent consistency of 0.947. The test-retest reliability assessment showed excellent reliability of P-KJOC confirmed by an Intra-class Correlation Coefficient (ICC) of 0.903. These results are in accordance with previous studies, which reported good to excellent internal consistency [3].

The KJOC questionnaire presents a valuable tool for coaches, researchers, and clinicians in identifying potential injury risks among youth softball pitchers, thereby enabling targeted interventions to mitigate these risks and support athlete well-being [11].

The cross-cultural adaption and validation of KJOC have been performed in several other languages. A recent study in the evaluation of professional baseball players in the United States has revealed definitive quantitative benchmarks for future assessments utilizing the KJOC score. This research emphasizes the effectiveness of the KJOC score as a precise instrument adept at detecting subtle variations in upper

extremity performance within the specific cohort of professional baseball athletes examined [12].

Oh et al. evaluated the validity and reliability of the Korean version of the KJOC in 52 professional baseball players. The internal consistency and test-retest reliability of the Korean KJOC were excellent and fair to excellent, respectively [6]. Schulz et al. evaluated the validity and reliability of KJOC in 152 German-speaking overhead athletes. The internal consistency and test-retest reliability of the overall questionnaire was excellent according to Cronbach's alpha and ICC [9]. Sukanen et al. evaluated the validity and reliability of KJOC in 114 Finnish-speaking overhead athletes. Internal consistency and test-retest reliability were excellent and good [8]. Turgut and Tunay evaluated the reliability and validity of KJOC in 123 Turkish-speaking overhead athletes. The test-retest reliability of the Turkish version of KJOC was excellent. However, the results of the translated version significantly differed between different categories of athletes [4]. Fredriksen and Myklebust evaluated the validity and reliability of the Norwegian translation of KJOC in 33 overhead athletes. The Norwegian version of the KJOC showed excellent internal consistency and test-retest reliability. KJOC was more sensitive to capturing those players who had pain during playing [7]. A study indicates that the Norwegian version of the KJOC demonstrates reliability and acceptability as an

effective tool for assessing shoulder and elbow issues among overhead athletes, specifically handball players.

Merolla et al. evaluated the validity and reliability of the Italian version of the KJOC in 90 professional athletes with painful shoulders. The Italian translation of KJOC in single items and the overall score showed

to be reliable [5]. Leenen et al. evaluated the reliability and validity of the Dutch version of KJOC in 107 talented juvenile Dutch baseball pitchers. Cronbach’s alpha (internal consistency) was between 0.62 and 0.86 for the symptomatic subgroup. [13]. The internal consistency and test-retest reliability of KJOC in different languages have been summarized in [Table 3](#).

**Table 3.** Internal consistency and test-retest reliability of KJOC in different languages

| Author (language)                    | Internal consistency | Test-retest reliability |
|--------------------------------------|----------------------|-------------------------|
| Oh et al. (Korean)                   | 0.917–0.966          | 0.505–0.937             |
| Schulz et al. (German)               | 0.93                 | 0.94                    |
| Sukanen et al. (Finnish)             | 0.92                 | 0.77                    |
| Turgut and Tunay (Turkish)           | -                    | 0.93                    |
| Fredriksen and Myklebust (Norwegian) | 0.95                 | 0.96                    |
| Merolla et al. (Italian)             | -                    | 0.95–0.99               |
| Leenen et al. (Dutch)                | 0.62-0.86            | -                       |

KJOC has also been used to evaluate shoulder function and performance in various categories of athletes and has showed to be accurate in the assessment of overhead athletes [13-16] . Altogether, the results of the present study, combined with the results of earlier studies, reveal that KJOC translation in other languages, including Persian, is reliable and valid enough to be applied within multicultural settings.

While our study exhibits promise in validating the Persian adaptation of KJOC, it is imperative to conscientiously acknowledge and address specific limitations inherent in our research. Despite the meticulous adherence to rigorous methodologies and the substantive insights gained, it is paramount to recognize the constraints that warrant consideration. The inclusion of diverse athlete categories within our participant pool, while reflective of real-world athletic diversity, may introduce subtle variations that could marginally impede the homogeneity of the study. This variability, though providing a comprehensive perspective across athlete groups, calls for cautious interpretation and emphasizes the need for future investigations with more homogeneous cohorts to corroborate and refine our findings.

5. Conclusion

The Persian adaptation of KJOC has shown impressive validity, internal consistency, and test-retest reliability. This establishes its potential as a suitable alternative to widely used patient-reported questionnaires such as the DASH, which are not tailored for assessing shoulder function and

performance in overhead athletes. To sum up, our study significantly reinforces the reliability of the Persian-translated KJOC as a reliable tool for evaluating shoulder function and performance in overhead athletes. Despite acknowledged limitations, this research significantly contributes to the growing evidence supporting KJOC's cross-cultural validity, highlighting its relevance across diverse athletic settings. Future investigations could delve into addressing these limitations and exploring additional dimensions of the questionnaire’s utility among diverse athlete populations.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article. The participants were informed of the purpose of the research and its implementation stages. They were also assured about the confidentiality of their information and were free to leave the study whenever they wished, and if desired, the research results would be available to them. A written consent has been obtained from the subjects. principles of the Helsinki Convention was also observed. This study was approved by the Ethics Committee of the Iran University (Code: R.IUMS.FMD.REC.1400.281).

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**Author's contributions**

All authors equally contributed to preparing this article.

**Conflict of interest**

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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**References**

- [1] Oberlander, M.A., M.A. Chisar, and B. Campbell, Epidemiology of Shoulder Injuries in Throwing and Overhead Athletes. Sports Medicine and Arthroscopy Review, 2000. 8(2).  
[\[LINK\]](#)
- [2] Hegedus, E.J., M.E. Vidt, and D.T. Tarara, The best combination of physical performance and self-report measures to capture function in three patient groups. Physical Therapy Reviews, 2014. 19(3): p. 196-203.  
[\[DOI:10.1179/1743288X13Y.0000000121\]](#)
- [3] Alberta, F.G., et al., The development and validation of a functional assessment tool for the upper extremity in the overhead athlete. The American Journal of Sports Medicine, 2010. 38(5): p. 903-911.  
[\[DOI:10.1177/0363546509355642\]](#) [\[PMID\]](#)
- [4] Turgut, E. and V.B. Tunay, Cross-cultural adaptation of Kerlan-Jobe Orthopaedic Clinic shoulder and elbow score: Reliability and validity in Turkish-speaking overhead athletes. Acta orthopaedica et traumatologica turcica, 2018. 52(3): p. 206-210.  
[\[DOI:10.1016/j.aott.2018.02.007\]](#) [\[PMID\]](#)
- [5] Merolla, G., et al., Cross-cultural adaptation and validation of the Italian version of the Kerlan-Jobe Orthopaedic Clinic Shoulder and Elbow score. J Orthop Traumatol, 2017. 18(4): p. 415-421.  
[\[DOI: 10.1007/s10195-017-0467-6\]](#) [\[PMID\]](#)
- [6] Oh, J.H., et al., Cross-cultural adaptation, validity and reliability of the Korean version of the Kerlan-Jobe Orthopedic Clinic shoulder and elbow score. JSES Open Access, 2017. 1(1): p. 39-44.  
[\[DOI:10.1016/j.jses.2017.03.001\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [7] Fredriksen, H. and G. Myklebust, Norwegian translation, cross-cultural adaptation and validation of the Kerlan-Jobe Orthopaedic Clinic shoulder and elbow questionnaire. BMJ Open Sport Exerc Med, 2019. 5(1): p. e000611.  
[\[PMID\]](#) [\[PMCID\]](#)
- [8] Sukanen, M., et al., Cross-cultural adaptation and validation of the Kerlan-Jobe Orthopaedic Clinic shoulder and elbow score in Finnish-speaking overhead athletes. BMC Sports Sci Med Rehabil, 2022. 14(1): p. 190.  
[\[DOI:10.1186/s13102-022-00581-4\]](#)[\[PMID\]](#)[\[PMCID\]](#)
- [9] Schulz, C., et al., Cross-cultural adaptation and validation of the Kerlan-Jobe orthopedic clinic shoulder and elbow score for German-speaking overhead athletes. Physiother Theory Pract, 2022. 38(8): p. 1059-1070.  
[\[DOI:10.1080/09593985.2020.1818341\]](#) [\[PMID\]](#)
- [10] Beaton, D.E., et al., Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976), 2000. 25(24): p. 3186-91.  
[\[PMID\]](#)
- [11] Holtz, K.A. and R.J. O'Connor, Upper extremity functional status of female youth softball pitchers using the Kerlan-Jobe Orthopaedic Clinic Questionnaire. Orthopaedic Journal of Sports Medicine, 2018. 6(1): p. 2325967117748599.  
[\[DOI:10.1177/2325967117748599\]](#) [\[PMID\]](#)  
[\[PMCID\]](#)
- [12] Franz, J.O., et al., The utility of the KJOC score in professional baseball in the United States. The American journal of sports medicine, 2013. 41(9): p. 2167-2173.  
[\[DOI: 10.1177/0363546513495177\]](#)  
[\[PMID\]](#)
- [13] Leenen, A.J.R., et al., Cross-Cultural Adaption and Validation of the Dutch Version of the Kerlan-Jobe Orthopaedic Clinic Questionnaire in Juvenile Baseball Pitchers. Sports (Basel), 2022. 10(11).  
[\[DOI: 10.3390/sports10110163\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [14] Monti, R. and A. Fernandez-Fernandez, The Kerlan-Jobe Orthopaedic Clinic Shoulder & Elbow Score used as a Patient-Reported Outcome Measure for the Youth and High School Aged Baseball Athlete. Int J Sports Phys Ther, 2022. 17(5): p. 879-886.  
[\[PMID\]](#) [\[PMCID\]](#)

- [15] Erickson, B.J., et al., Can the Kerlan-Jobe Orthopaedic Clinic Shoulder and Elbow Score Be Reliably Administered Over the Phone?: A Randomized Study. *Orthop J Sports Med*, 2018. 6(8): p. 2325967118791510.  
[\[DOI:10.1177/2325967118791510\]](https://doi.org/10.1177/2325967118791510) [\[PMID\]](#)  
[\[PMCID\]](#)
- [16] Kraeutler, M.J., et al., Kerlan-Jobe Orthopaedic Clinic overhead athlete scores in asymptomatic professional baseball pitchers. *Journal of Shoulder and Elbow Surgery*, 2013. 22(3): p. 329-332.  
[\[DOI:10.1016/j.jse.2018.06.033\]](https://doi.org/10.1016/j.jse.2018.06.033) [\[PMID\]](#)