

Effects of Previously Playing an Overhead Throwing Sport in Shoulder Range of Motion, Strength, and Humeral Retroversion

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Humeral retroversion (HR) is the twisting of the proximal humeral head about the long axis.^{1,2} Research has shown that repetitive stress from playing an overhead (OH) sport increases HR on the dominant side.³ The OH motion produces torque and distraction forces about the throwing shoulder joint, causing soft tissue and osseous changes to occur, resulting in a bilateral difference.⁴ Previous research suggests while increased external rotation (ER) can be protective in an active OH athlete, excessive HR may contribute to upper extremity injury.^{1,3} There is a paucity of data regarding the effects of this adaption. Therefore, the purpose of this study was to investigate the effects of prior OH sport participation compared to no OH sport participation on glenohumeral range of motion (ROM), strength, and HR.

Fifty-one college-aged individuals participated. Participants were split into two groups: (1) those with previous participation in an OH sport ($n=23$, 20.2 ± 1.04 yrs, 167.0 ± 14.5 cm, 70.9 ± 13.3 kg) and (2) those with no previous participation in an OH sport ($n=28$, 20.6 ± 0.88 yrs, 168.8 ± 6.3 cm, 68.5 ± 14.9 kg). Inclusion criteria were pain, injury, and surgery free for at least the past six months. Following a health history questionnaire, we measured bilateral shoulder internal (IR) and ER ROM using an inclinometer, isometric shoulder strength using a handheld dynamometer, and HR using an ultrasound machine (Figure 1). For bilateral shoulder passive ROM, isometric strength and HR testing, the participants were positioned supine on a treatment table with 90° of shoulder abduction and elbow flexion. The ROM inclinometer and isometric dynamometer were positioned in the same place for both tests. Placement was on the dorsal side of the distal ulna styloid process for IR and on the ventral side for ER. For HR, the examiner rotated the participant's humerus so that the bicipital groove appeared in the center of the ultrasound image. Another examiner then placed a digital inclinometer along the ulnar border with the

forearm kept in neutral rotation and recorded the ulnar inclination angle with respect to the horizontal line. All testing measurements were recorded for three trials and averaged for analysis. Data were non-normally distributed; therefore, a Mann-Whitney U test was used to determine group differences with an alpha level set a priori, $p=0.008$. A Wilcoxon T-test was used to analyze bilateral differences within each group with an alpha level set a priori, $p=0.0167$.

Results showed no significant differences between groups for all dependent variables, and no significant bilateral differences for any variable for the non-OH sport. The Wilcoxon T-test revealed a significant bilateral difference between the dominant and non-dominant in the OH group for HR ($Z=-3.118$, $p=0.002$) and IR ROM ($Z=-3.423$, $p=0.001$).

The bilateral difference found in the OH sport group for HR is significant as it indicates prior sports participation may have residual osseous effects that clinicians need to consider when evaluating shoulder injury or pain in adults. Understanding if there are residual effects from playing an OH sport could help examine injury risk later in life.

Statement of Research Advisor

Abigail's research has established normative data on a small subset of overhead athletes that will allow for more in-depth exploration into humeral retroversion and long-term osseous effects with upper extremity injury susceptibility.

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Figure 1: Analysis of humeral retroversion using ultrasound machine; internal rotation represents the positive direction and external rotation represents the negative direction.

References

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