

Shoulder Injury in the Overhead Athlete

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The overhead throwing motion is an extremely skillful and intricate movement that places extraordinary demands on the shoulder joint. When throwing, the shoulder undergoes tremendous forces at angular velocities that reach 6,000 to 7,000 degrees per second. It is these high forces, which are repetitively applied, that lead to shoulder injuries.

The thrower's shoulder must be loose enough to throw but stable enough to prevent symptoms. This is a phrase referred to as the "throwers paradox." This balance is frequently compromised and leads to injury of surrounding tissue. Shoulder pathology can present as pain, decreased performance, decreased strength, decreased mobility, or range of motion.

Most throwers exhibit an increase in external rotation (ER) and decrease in internal rotation (IR) of the throwing shoulder. This loss of IR is referred to as "GIRD" or glenohumeral internal rotation deficiency. The total rotational arc of movement of the shoulder is approximately 180 degrees.

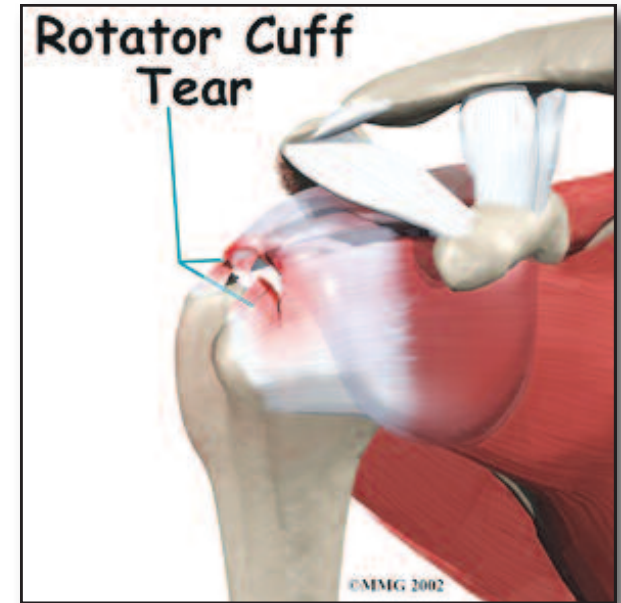
Research states that in overhead athletes ER is around 9 degrees greater in the throwing shoulder and IR is 9 degrees less. Pitchers exhibit an average of 137 degrees of ER and 40 degrees of IR. Starting pitchers are less susceptible to this change because of decreased pitching frequency, number of pitches, and

proper rest/stretching. Relief pitchers however, appear in more games, throw on consecutive days, warm-up in the bullpen often, and are brought in with less preparation.

Throwers laxity involves the hypermobility of the joint capsule in the front of the shoulder. This acquired laxity from repetitive throwing allows for excessive ER range of motion. This combination allows a pitcher to generate greater acceleration and velocity when throwing.

Investigations have revealed bony adaptations to the throwers shoulder as well. The humeral head of the throwing shoulder has been shown to have a 17-degree increase in retroversion. This increase would also result in greater ER and decreased IR. Research has shown that this bony adaptation had the greatest change in adolescent baseball players around ages 12 to 13, when the growth plates are wide open.

Another parameter that may cause injury in the overhead athlete is strength imbalance. To provide proper dynamic stability to the shoulder, the rotator cuff should have a 3:2 ratio in the strength of internal rotators to external rotators respectively. Research of baseball players has shown that this ratio is closer to 2:1.



Proper posture and position of the shoulder blade is also essential for the overhead athlete. The shoulder blade needs to be in the correct position so it can function as a cohesive unit with the upper arm. A baseball player needs good strength of the muscles that retract and depress the shoulder blade in order to prevent a loss of IR. Oftentimes fatigue of these muscles can set in late in the season and injuries may occur.

Overhead athletes may have one or more of these adaptive changes for symptoms to occur. A healthy shoulder complex will have correct range of motion, strength, flexibility, and mobility to prevent more serious injuries such as tendonitis/bursitis, rotator cuff tears, internal impingement, SLAP lesions, and Bennett's lesions.