

# FUNCTIONAL ANATOMY AND BIOMECHANICS

## CREATING A STRONG AND STABLE SHOULDER

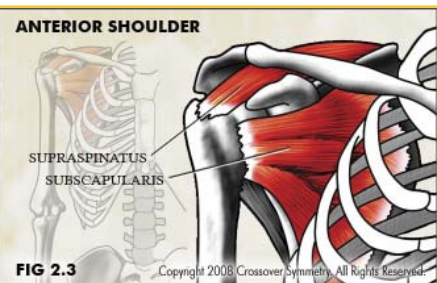
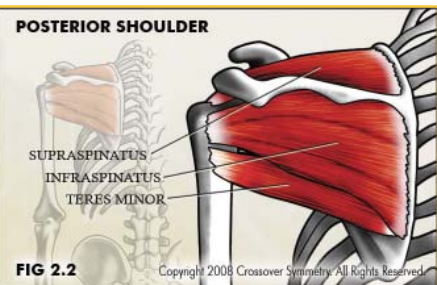
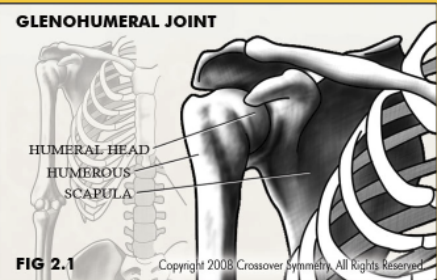
Written By Jim Moran, PT, Shoulder Specialist  
*An Excerpt From The Crossover Symmetry Training Booklet.*

## THE ANATOMY OF THE SHOULDER

**THE GLENOHUMERAL JOINT** (shoulder joint) is inherently mobile by architectural design. It is a ball and socket joint, but unlike the ball of the hip joint, which is almost entirely surrounded by the socket of the pelvis, the ball of the glenohumeral joint sits in the socket like a golf ball on a tee (Fig. 2.1). Instead of relying on the socket to provide stability, the shoulder relies on a delicate balance between the static (ligament) and dynamic (muscle) stabilizers to control the position of the humeral head (ball) in the joint.

**THE ROTATOR CUFF** is comprised of four muscles that are attached to the scapula. The supraspinatus, infraspinatus and teres minor are located on the posterior (back) side of the scapula (Fig. 2.2) while the subscapularis is located on the anterior (front) side of the scapula (Fig. 2.3). These muscles contract during the throwing motion to hold the ball in the socket, offsetting the strong pull of the larger muscles surrounding the shoulder. They also have an instrumental role in decelerating the arm during follow through.

**THE SCAPULA** (shoulder blade) acts as a foundation to the throwing arm and has seventeen muscular attachments. It has only one small bony attachment to the body at the sternum, via the clavicle. During the throwing motion, the trapezius, rhomboids, serratus anterior and levator



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scapulae (Fig. 3.1) function synchronously to stabilize and upwardly rotate the scapula on the rib cage. At the same time, these muscles serve as postural stabilizers to enhance the static and dynamic position of the shoulder joint. Improving this postural position creates increased space above the rotator cuff and may prevent rotator cuff impingement<sup>1</sup> (Fig. 3.2).

### WHY DO SHOULDER INJURIES OCCUR?

Most injuries to overhead athletes occur from repetitive microtrauma. Some of the most common errors that can lead to shoulder injuries include:

- Insufficient strengthening of the rotator cuff and scapular muscles
- Insufficient rest between games and/or practice
- Inadequate pre-season strength, endurance and flexibility training
- Muscle fatigue during activity
- Increasing training intensity too quickly\*
- Poor mechanics

When it comes to the throwing shoulder, looser is better right up to the moment of instability. During repetitive overhead activity, the shoulder undergoes adaptive changes as a result of the violent joint distraction forces. The ligaments progressively loosen, allowing for increased ligament laxity. This added laxity provides a paradox to the athlete: performance may be enhanced, yet problems with stability may arise. Instability of the static stabilizers allows the ball to move excessively in the socket (subluxing), causing the ball to ride over the labrum, which can create a number of injuries in the shoulder. To avoid injury and maintain optimum performance, athletes must implement a comprehensive strengthening program.

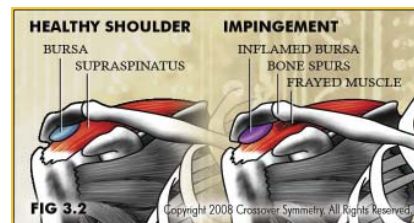
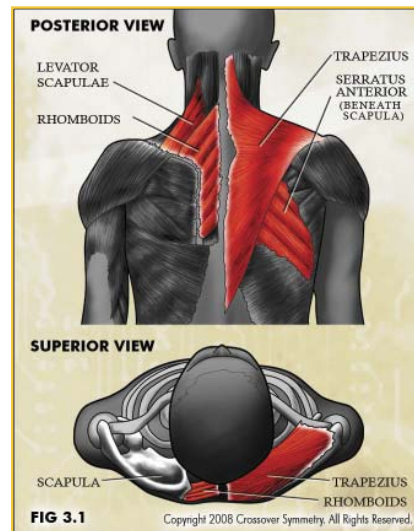
### THE CROSSOVER SYMMETRY SYSTEM

Traditional rotator cuff programs can be cumbersome and time consuming. Crossover Symmetry offers a unique, efficient and effective way to strengthen the rotator cuff and scapular stabilizing muscles with the following advantages:

- The exercises are performed in a functional upright position that strengthens the postural stabilizers of the trunk, hips and legs. This provides proprioceptive training throughout the entire kinetic chain.
- The line of resistance follows the scapular plane of movement.
- Crossing the cords facilitates strengthening through a greater range of motion.
- Symmetrical strength training promotes a more balanced workout by including the non-dominant side.
- Crossover Symmetry effectively challenges the sensorimotor system providing proprioceptive training.
- Crossover Cords come in a variety of tensions allowing for increases in resistance as strength improves.

### PLYOMETRIC PRINCIPLES OF CROSSOVER SYMMETRY

One of the major characteristics that sets the Crossover Symmetry System apart from traditional rotator cuff



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workouts is the integration of high-speed plyometrics in the Advanced Workout. These powerful plyometric exercises incorporate three types of muscle contractions; Eccentric (muscle lengthens), Isometric (muscle length remains constant), and Concentric (muscle shortens, e.g. bicep curl). A plyometric movement begins when the muscle is eccentrically lengthened, preloading the muscle with potential energy. This is followed by a short isometric contraction, and ends with an explosive concentric contraction which pulls the lengthened muscle quickly back, similar to the dynamic of a stretched rubber band. During this sequence, known as the “stretch-shortening cycle”, the muscle undergoes a contraction faster than in any other method of exercise, strengthening the fast twitch muscle fibers. Since the neuromuscular response of these fibers occurs even quicker than the brain can react, they play a vital role in decelerating the arm during overhead activity. For this reason, strengthening the fast-twitch muscle fibers by performing the Advanced Plyometric Workout will help to prevent shoulder injury and enhance the performance of the athlete.



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