

**Vol 3, 2008 CEC ARTICLE: Special Medical Conditions Part 2:
Shoulder Maintenance and Rehab
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SHOULDER GIRDLE STABILIZATION

Knowledge of the anatomy and biomechanics of the shoulder girdle is essential for developing safe and efficient programs for clients to improve the strength and stability of this complex joint and muscle group. A strong and stable shoulder girdle is essential for numerous activities including lifting an item, dressing, and reaching overhead.

Effective movement of the shoulder joint requires not only the glenohumeral joint to perform properly, but the acromioclavicular, sternoclavicular, and scapulothoracic joints as well. The shoulder cannot achieve full elevation without the contribution of the upper thoracic vertebrae, the first and second ribs, the manubrium, the scapula, and the clavicle.

The rotator cuff provides the glenohumeral joint stability; if the muscles of the rotator cuff are not functioning properly, the arm cannot be elevated over the head. The glenohumeral joint consists of the humerus and the scapula which fit into one another in what is called a “ball and socket” joint. Although it allows the most movement of any type of joint in the body, it is also the most unstable of the joints.

The functions of the rotator cuff muscles are to stabilize the shoulder by holding the humeral head in place, depress the humeral head in the socket so the deltoid muscles can elevate the arm, and assist with arm rotation. The muscles that form the rotator cuff are named supraspinatus, infraspinatus, teres minor, subscapularis. When the arm is elevated, the glenohumeral and scapulothoracic joints move in a 2:1 ratio to each other called the scapulohumeral rhythm.

The glenoid labrum, a fibrocartilagenous lip located inside the glenoid fossa (scapula) allows greater congruity between the humerus and scapula by deepening it up to 50%. Additionally, the joint is stabilized by the joint capsule, the tendons

of the rotator cuff, the glenohumeral (superior, middle, and inferior) ligaments, and the coracohumeral ligament.

If the external rotators of the shoulder are weak, the greater tubercle will impinge on the coracoacromial arch when abducted and will result in pain and impingement syndromes. Other problems related to impingement include abnormal deltoid and rotator cuff coupling, incomplete external rotation during full humeral abduction, and tightness in the pectoralis major, teres major, and subscapularis. If the upward rotator muscles of the scapula are weak, the following will be evident: abnormal scapulohumeral rhythm into abduction and flexion, tightness in opposing muscle groups of the levator scapula, rhomboids, and pectoralis minor, and an inability to raise the arm fully due to the unopposed downward pull of the deltoid and supraspinatus muscles.

Shoulder tendonitis or inflammation of the tendon, is a common injury due to the relatively poor blood supply to the tendons of the rotator cuff. Bursitis or inflammation of the bursa sack is another common injury and like tendonitis, should be treated with ultrasound, electrical stimulation, ice, range of motion exercises, and eventually, strengthening.

Impingement syndrome, a condition in people of all ages is caused by strains from increased activity, direct injury to the shoulder, aging or degeneration of the tendon with use, and acromial spurs. As the shoulder is elevated on someone with impingement syndrome, the supraspinatus or bursa becomes pinched underneath the acromion or against bone spurs and results in inflammation, pain, and possible tendon tears. It is initially treated with non-steroidal antiinflammatories, rest, ice, and physical therapy.

Additional shoulder injuries include rotator cuff tears, AC and SC joint dysfunction, shoulder dislocation, biceps tendon rupture, adhesive capsulitis/frozen shoulder, and arthritis. Due to the multitude and complexity of the shoulder conditions, no one other than a physician should attempt to diagnose or prescribe treatment for a shoulder injury.

Health screenings are collected to identify health conditions and factors that put a client at risk when participating in an exercise program. They also determine if a

client may need referral to a health care professional before beginning an exercise routine, assist in the design of an appropriate exercise program, identify contraindicated activities, fulfill legal and insurance requirements for individuals or facilities, and to encourage and maintain communication with the client's healthcare provider. Helpful questions include those related to a history of surgery, rehabilitation or any other treatment the client has undergone.

Full range of motion for reaching overhead as well as lateral and medial rotation requires adequate flexibility in a number of different muscles including pectoralis major, pectoralis minor, latissimus dorsi, trapezii, the rhomboids, posterior deltoid, infraspinatus, and lateral and medial rotators. Tests for range of motion listed in their respective planes include reaching the arm as high overhead as possible, full abduction to the side, reaching behind the back and reaching behind the head. Not only can the range of motion be analyzed by observing the different exercises, the quality of movement, any difference in capabilities between the shoulders, and any pain or muscle substitution can be evaluated.

The one repetition maximum (1-RM) is a test that determines the maximum amount of weight the client can move for one repetition while maintaining proper form. It is an objective way to measure muscle strength and should only be performed on a healthy client. To calculate, multiply .0278 by the number of repetitions completed to the point of fatigue, then subtract the answer from 1.0278. Finally, take the weight lifted in pounds, and divide by the answer from the previous calculation. (i.e. $\text{Weight Lifted} / (1.0278 - (.0278 * \text{number of reps completed}))$). Although 1-RM is just an estimate it provides the fitness professional with one way of documenting a client's progress in an exercise program.

When planning an exercise routine for clients returning from a shoulder surgery or injury, it is important to closely evaluate each of the following factors before starting the routine: resistive weight, repetitions, speed, and type of contraction. Ideally, the client will begin with low weight, slow, controlled movements while utilizing proper form and posture throughout the range of motion for the exercise prescribed. Resistance bands and hand weights are the primary source of resistance (in addition to gravity) for the majority of shoulder strengthening exercises.

In addition to shoulder strengthening, shoulder flexibility is essential to keeping the muscles balanced and properly coordinated for shoulder movement. Fifteen major muscles attach to the scapula. During thoracic kyphosis or the rounding of the upper back and shoulder, changes in the direction of the scapula and orientation of the humeral head can be altered dramatically. This condition causes the rotator cuff to be contracted continuously in order to maintain joint stability and prevent inferior subluxation of the humerus. Without proper strengthening and flexibility of the scapular stabilizers, pathologies such as impingement, rotator cuff injuries, or nerve disruption can occur. Because the scapula must change positions during any posture change, strengthening and stretching the muscles around it is paramount to keeping it healthy.

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1. What type of joint is the shoulder joint?

7. Match the shoulder condition with its description:

- a. tendonitis
- b. Bursitis
- c. rotator cuff tear
- d. impingement
- e. biceps tendon rupture

- 1. Characterized by severe pain lifting overhead
- 2. Long head of biceps torn
- 3. Narrowing of space where supraspinatus tendon exits coracoacromial arch
- 4. Inflammation of bursae sacks
- 5. Thickened tendon (s)

16. How many muscles need to be adequately strengthened and flexible to permit full range of motion for the shoulder?

17. How is a range of motion test performed?

18. What information can be gleaned from a range of motion test?

19. T or F, personal trainers should attempt to diagnose any shoulder pain before continuing with a workout session?

20. T or F, although the shoulder is the most mobile joint, it is also the most unstable and prone to injury?

21. T or F, a resistance band is a viable source for resistance when performing shoulder exercise for rehabilitation?