The term functional rehabilitation encompasses a wide range of therapeutic exercise. In this context, the term function refers to movement patterns that require motion from more than one joint and in more than one anatomical plane. The purpose of this article is to help you understand how trunk stability improves upper quarter function.

The Role of Functional Stability for the Upper Quarter

Rehabilitation of the shoulder has predominantly focused on glenohumeral joint (GHJ) motion and strength. Repeated failures have forced clinicians to look beyond their focus on the GHJ and consider the entire shoulder girdle when rehabilitating an injured shoulder. Dr. Benjamin Kibler (1998a) has expanded our awareness to consider the arm as the distal link of the kinetic chain that begins at the leg, courses through the hip and trunk, and continues through the upper quarter, involving the shoulder girdle, the GHJ, and the arm, with the hand as the terminal link. Each portion of the linked system is responsible for generating and transferring force.

Thus, evaluation of functional stability for the upper quarter involves assessing not only shoulder-girdle stability but also core stability involving the hip and trunk. Kibler (1995) demonstrated that 54% of the forces generated in the tennis serve come from the trunk and lower quarter. Hip and trunk core stability provides a stable platform for shoulder-girdle movement. Kibler and Chandler (1995) suggest that a 34% increase in rotational velocity will be seen at the shoulder to compensate for a 20% decrement in force production at the hip and trunk.

Core stability refers to the functional stability of the trunk. It is a combination of appropriate biomechanical alignment from the pelvis to the shoulder girdle, with efficient and coordinated neuromuscular recruitment of the trunk. Although the trunk needs to work in a coordinated fashion, it can be helpful to consider it in thirds. The lower third comprises the hips and pelvis, influenced by the mechanics of the hip joint, pelvic inclination, and neuromuscular recruitment around the pelvic girdle. The middle third is primarily muscular, including the rectus abdominis, the internal and external obliques, and the trunk extensors. The lower portions mechanically influence the positioning of the upper third—the rib cage and the shoulder girdle. The mechanics influence the neuromuscular recruitment of the scapular and upper back muscles affecting GHJ and distal extremity function. Therefore, core stability must be addressed first in order to successfully establish functional stability of the upper quarter.
Stabilizing the core consists of addressing static postural alignment and facilitates appropriate anticipatory postural activity of the feed-forward system. Incorporating weight bearing and functional movement patterns reorganizes the feedback system. Functional motions integrate the neuromuscular coordination between the trunk and the upper extremities. The body as a linked system is now prepared to move without the individual having to first consider static start position, available motion, or scapula stabilization. Functional stability has been achieved.

**Principles of Core Stability**

Core stability, scapula stability, and shoulder joint function all require assessment when an athlete presents with shoulder pain such as an impingement. Functional stability of the core and upper quarter is visually assessed, beginning with a static postural evaluation. The athletic trainer or therapist should observe the angle of pelvic inclination, assessing for neutral but most likely seeing an excessive anterior tilt. Neutral pelvis is defined by Kendall and McCreary (1983) as the anterior superior iliac spine lying in the same plane as the pubis symphysis when assessed in static posture. The clinician should note static scapula position. The scapula will most likely appear protracted and elevated, with scapula winging (Kibler, 1998a).

The optimal movement pattern is extremity mobility, with the core or trunk remaining stable. The pelvis should also be positioned in neutral with dynamic motion of the upper and lower extremities. With upper quarter motion, watch for excessive lumbar lordosis, scapula protraction, and elevation instead of rotation.

The purpose of addressing core stability is to realign the pelvis, rib cage, shoulder girdle, and GHJ. Appropriate alignment facilitates neuromuscular recruitment patterns from proximal to distal. This process requires motor relearning to allow for reorganization of recruitment patterns from the central nervous system. Retraining core stability requires cognitive input. The movements must be slow and deliberate initially, until the new movement patterns have been learned. Movement patterns are selected to reinforce core stability with extremity mobility.

Core stabilization is initiated early in the rehabilitation program. Movement patterns must always be pain free; modify range of motion (ROM) or positioning to allow for the greatest amount of pain-free movement. Core stabilization addresses motor-control deficiencies in ROM and can coincide with application of joint-specific treatment such as mobilization, proprioceptive neuromuscular facilitation techniques, or active assisted ROM. Core stabilization is the foundation for movement and is initiated before strength-training, conditioning, and agility activities. The ultimate goal is to have all sport teams use a core-stabilization program as a preventive measure. Movement patterns are easily monitored by the athlete, allowing for early detection of altered mechanics or neuromuscular recruitment. Begin with core stabilization on the foam roller, stabilizing the pelvis, repositioning the scapula, and focusing on GHJ motion. Begin functional stability of the upper quarter with scapular stabilization. Progress to traditional strengthening, power work, skill, and agility. A detailed presentation of core-stabilization retraining can be found in the article, “Core Stability: Creating a Foundation for Functional Rehabilitation,” pp. 6–13 in this issue.

**Functional Stability of the Shoulder Girdle**

**Coordinating Core Stability With Upper Quarter Mobility**

Coordinating core stability with shoulder-complex stability does not mean that there is a series of exercises for the core and a series for the shoulder complex. It means that the selected exercises for scapula stabilization should incorporate stability work for the core. Focusing on the upper quarter, the muscles that connect from the trunk to the scapula can be worked concentrically and eccentrically in quadruped (hands-and-knees) position. Establish a quality start position as follows:

- Hips, knees, shoulders flexed to 90°
- Arms aligned under the shoulders
- Thighs aligned under the hips
- Thighs hip-width apart
- Lower leg shanks aligned with knees
- Cervical spine in neutral
- Scapula depressed and gently adducted