N PART 1 OF THIS column we examined kinetic-chain relationships between the shoulder, hips, and spine. It has been well documented that activity- or sport-specific shoulder function (e.g., throwing or serving) involves the transfer of ground-reaction and lower extremity forces through core musculature to the upper extremities. Therefore it is crucial that the upper extremity be examined not only as a single unit but also as one of many interdependent links of the kinetic chain. Application of these principles in rehabilitation should also assimilate the same concepts. In Part 2, I address taking a proactive role and implementing a preventive exercise program that can aid in proper neuromuscular development of the shoulder complex during kinetic-chain integration.

Exercise Selection

Selection of preventive exercise should address the demands of both the sport and the position played. Concentration should be on all components of muscle contraction (eccentric, isometric, and concentric) throughout a full range of motion at varied speeds. Stabilization of the hips and spine provides a secure base from which scapulohumeral kinematics can occur. The “drawing-in maneuver” (contraction of the transverse abdominis) is essential to perform throughout all phases of movement in order to develop and maintain core stability and activity-specific functional posture.

The following exercises incorporate core stabilization and strengthening with functional shoulder movement. The tempo used for each exercise will correspond to the training phase in which you wish to work (stabilization, strengthening, or power). Three numbers are provided, representing the duration (in seconds) for each type of muscle contraction occurring during the exercise (eccentric, isometric, and concentric). For example, if an exercise is performed at a 4/2/2 tempo the eccentric contraction occurs over 4 s, the isometric occurs over 2 s, and the concentric occurs over 2 s. Stabilization exercises are performed at a 4/2/2 tempo, strengthening exercises at 3/1/1, and power exercises at 0/0/0. The slower 4/2/2 count focuses on eccentric strengthening and balance required for core stabilization; 3/1/1 tempo provides a faster repetition speed for strengthening, enabling the athlete to work at higher loads with the focus still on eccentric contraction; and 0/0/0 tempo is to be performed as quickly as possible while maintaining functional posture in order to train sport specificity. These tempos are merely guidelines and can be adjusted in accordance with patient response and movement goals. Following are a few exercises integrated into the year-round strength-training programs for Colorado State University—Pueblo’s volleyball and softball athletes.

Pillars (Sagittal, Frontal, and Transverse Planes)

Sagittal With Transverse Reach

The athlete is in a modified push-up position (on forearms). The athlete “draws in” and squeezes the gluteals, forming a straight line (aligning the head with the spine, spine with the hips and lower legs) with the body. One shoulder or hip is then moved in a D2 shoulder/hip, flexion/extension pattern (Figure 1). Reaches...
and starting positions can be performed in multiple planes of motion on both stable and unstable surfaces, with or without external resistance. D2 flexion/extension patterns are commonly used because they closely relate to overhead throwing or striking motions.

**Transverse Medicine-Ball Slams**

The athlete starts by holding the medicine ball overhead (over the desired shoulder). He or she is instructed to “draw in” and perform a cross-body chopping pattern emphasizing opposite-hip external rotation relative to the pelvis with flexion and ipsilateral hip internal rotation with flexion. When the ball reaches the level of the head, the athlete slams it into the ground with the head, arms, and torso continuing to follow through (Figure 2). Modifications of this exercise include various triplanar throws, increased external resistance, and varied speed of execution.

**Wall Walking**

An elastic resistance band is placed around the wrists, and the athlete leans against the wall in a standing push-up position. With knees bent, the athlete is instructed to “walk” (using the hands) a predetermined distance while maintaining tension in the band. During each step taken the abdominals are to remain “drawn in” prone pillar with D2 flexion and extension.