In this column, in the September issue, we established the importance of assessing the mobility of the core before aggressive stability or strength training. We included two functional-movement tests, the deep squat and total rotation, and associated secondary tests to identify movement deficits. In this issue we provide mobilization and exercise recommendations that can be employed to correct functional-movement deficits before participation in traditional core-training programs begins. The emphasis of this column is on functional-movement patterns for field and court sports.

The purpose of the functional-movement tests is to identify abnormal movement patterns, and once they have been identified, mobilization and exercise interventions can be instituted to normalize the dysfunctional pattern. The exercise progressions are designed to be the foundation for enhancing overall core training. The intervention first focuses on the identified mobility deficit (isolation phase) and then incorporates the new motion into partial movement patterns (integration phase). Finally, the warm-up phase is designed to maintain the restored functional-movement pattern.

The isolation phase is designed to focus on the most limiting component of the movement pattern. The lack of mobility in a specific joint or in flexibility of a given muscle must be addressed before one can improve an entire movement strategy. The most limiting component is addressed through traditional joint mobilizations or muscle-flexibility activities. We prefer mobilizations with movement as described by Brian Mulligan¹ and exercise techniques described by Cook² and Cook and Voight.³ Other manual-therapy or stretching techniques familiar to athletic trainers can also be used.

Once basic joint mobility and muscle length have been improved, newly gained motion will be integrated into partial movement patterns. This integration is performed through a series of self-stretches, focusing on gaining motor control of the pattern. The activities during this phase place the body in postures in which proper movement strategies are maximized. When appropriate, correction of asymmetrical movement is emphasized. Once the partial patterns of the integration phase can be performed without difficulty, the athlete is progressed to the final phase.

The warm-up phase involves full-body functional-movement patterns designed to maintain the joint-mobility, muscle-length, and movement-pattern gains that have been achieved. The warm-up activities are primarily versions of the mobility screens. These activities must be performed with proper posture and positioning throughout the movement because compensatory movements will reinforce improper mechanics. These activities should be performed as part of a traditional warm-up before athletic activity or conditioning.

**Interventions for the Deep Squat**

**Isolation Phase**

**Prone Hip-Mobility Technique.** Poor lumbopelvic rhythm caused by tightness in the hip-flexor group is a problem that commonly causes an inability to deep-
squat effectively. The tightness in the rectus femoris and iliopsoas musculature disrupts the anterior and posterior rhythm of the pelvis during squatting. Iliotibial-band tightness is a common finding, as well, and can also be addressed in this position.

The athlete performs this stretch lying prone on a table with the uninvolved foot placed on the floor with the knee slightly flexed and the hip flexed above 90° (Figure 1[a]). This positioning is important to stabilize the lumbar spine during the stretch. The involved hip is aligned with the torso (no abduction), and the athlete can start by performing three to five repetitions of knee flexion to relax the rectus femoris. The athletic trainer then provides overpressure (Figure 1[b]) during the flexion movement to elicit increased flexibility. The iliopsoas can be stretched passively by extending the hip (Figure 1[c]), and the iliotibial band is stretched by passively taking the hip into abduction (Figure 1[d]). Modified contract–relax or hold–relax proprioceptive neuromuscular facilitation techniques can also be performed in these positions.

**Closed-Chain Dorsiflexion.** Another common problem that causes an inability to perform the deep squat is restricted closed-chain dorsiflexion. A common complaint athletes asked to perform this stretch is an anterior pinching sensation. To properly address this restriction, a mobilization as described by Mulligan can be employed. Then, once the anterior impingement has resolved, a closed-chain dorsiflexion stretch, with the subtalar joint in the supinated position, is performed to isolate posterior tightness. Traditional calf stretching with the knee in extended and flexed positions might also be required.

The mobilization is performed with the athlete in the half-kneeling position on a table, with the involved ankle in a partial weight-bearing position (Figure 2[a]). Begin by wrapping the web of your outside hand around the talus and as close to the joint as possible. Provide a gliding force dorsally while the athlete flexes the knee and moves forward through dorsiflexion (Figure 2[b]). A mobilization belt can be used by wrapping it around the lower third of the athlete’s leg and your hips (Figure 2[c]).