Rehabilitation philosophies, theories, and practices have changed dramatically over the last decade. Clinicians have conceptually moved from simply evaluating and treating the area of symptomatic complaint to encompassing evaluation and treatment of the area as part of a linked system. Mechanical and neuromuscular imbalances in other regions of the limb or trunk might contribute to the symptoms. The purpose of this article is to help you incorporate exercises designed to improve core stability into your rehabilitation programs.

Core Stability

Consider the core as a cylinder encompassing the entire trunk. The top and bottom thirds of the cylinder are fairly rigid. The top is the rib cage; the positioning of the rib cage influences the function of the shoulder girdle. The bottom is the pelvis; the position of the pelvis influences the function of the legs and the positioning of the rib cage and, thus, that of the shoulder girdle. The middle third is primarily soft tissue, both anteriorly and posteriorly. This neuromuscular center guides the positioning of the upper and lower thirds. Conversely, the rigid upper and lower thirds mechanically influence the middle third’s neuromuscular center. Changing the mechanics of the system will most likely change the neuromuscular recruitment patterns (Boucher, King, Lefebvre, & Pepin, 1992). Asymmetries in static posture may alter the gamma motor feedback to the muscle spindles, changing the underlying tone of the tissue. There might be altered anticipatory postural adjustments in the feed-forward system, confounded by faulty proprioceptive feedback from injured tissue. Thus the mechanical and neuromuscular stability of the core can profoundly affect upper and lower extremity function.

Optimal core function is a combination of trunk mobility and stability. Pelvic positioning, rib cage positioning, and neuromuscular recruitment of the anterior and posterior trunk musculature must all be included in a complete core-stabilization program. See the sidebar for guidelines. The initial phases require motor relearning. Appropriate static positioning is first achieved, dovetailing into selected movement patterns involving coordination and timing of movement within the trunk itself, as well as relative to the upper and lower extremities.
Core-Stability Training Guidelines

Quality of motion
- Move only if the quality of the motion can be sustained.
- Moving with the old movement patterns reinforces abnormal mechanics and neuromuscular patterns.
- Be patient. Gains are made fairly rapidly (1 session to 2 weeks) relative to strength training (4–6 weeks).
- If a plateau is reached, change the focus by adding another movement pattern or moving to another extremity.

Training adjuncts
- Use visualization. Although only partial range of motion might be available, have the athlete visualize moving correctly through the entire range of motion.
- Give the athlete feedback on performance—Was the movement goal achieved?
- Give the athlete feedback on results—Was the movement pattern correct?
- Use as much external feedback (visual, verbal, and tactile) as needed initially. Use a model to demonstrate the movement patterns. Reduce quantity of feedback as soon as possible. Have the athlete use internalized feedback, i.e., use his or her own somatosensory system (vision, vestibular system, and proprioception).

Repetitions
Initially, few reps (3–5), frequently (every 1–2 hr as scheduling permits). Progress to approximately 10 repetitions per movement.

Movement challenges
- Work each extremity independently.
- Do not overwhelm the athlete—add in extremities as motor skills allow.
- Progress to working both arms or legs at the same time.
- Progress to simultaneously working arms or legs with the right side performing opposite motions from the left side.
- Progress to working on the diagonal—opposite arm and leg.
- Progress to altering directions of motion and/or using multidirectional motion.

Speed of motion
- Start with slow, controlled, straight-plane motion.
- Progress toward increasing speed of motion while maintaining core start-position guidelines.
- Progress toward sequentially linking movements with various speeds of motion.
- Progress to diagonal motion with increasing and varying speeds.
- Progress to multiplanar motion with increasing and varying speeds.

Resistance
The focus is motor relearning; very little resistance is needed.
- Use sport-related sticks or balls.
- Use light weights, 1/2 to 2 lb for the general population, from 2–5 lb for athletes (athletes in extensive strength-training programs—for example, football players—progress to 10 lb).