chapter 5
Impaired Muscle Performance

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BUILDING BLOCK 5-1
Suggested Answers

1. Muscle strength and endurance training exercises for the thoracic, neck and upper back, posterior shoulder regions (rhomboids, trapezii, posterior deltoid, posterior rotator cuff, etc.)
2. Modifying the work stations to move the work closer to her body
3. Educating the patient in proper posture while at her workstation to decrease the moment arm

BUILDING BLOCK 5-2
Suggested Answers

1. Shortened muscles: cervical/capital extensors, hamstring, pectoralis major and minor, shoulder internal rotators, gastrocnemius/soleus, hip external rotators
2. Lengthened muscles: rhomboid major and minor, middle trapezius, cervical flexors

BUILDING BLOCK 5-3

Suggested Answer: The quadriceps muscle architecture with its short tendons is designed for force production. The quadriceps are used for walking, stair climbing, and any activity requiring propulsion of the body. Rehabilitation would focus on increasing force production. Therefore rehabilitative exercises would be performed slowly to allow maximum tension development through the range of interest. In contrast, the hamstring muscle architecture with its long tendons suggests that these muscles are designed for speed. Therefore rehabilitative exercises might be performed at increasingly faster speeds through a greater excursion.
BUILDING BLOCK 5-4

**Suggested Answer:** One common approach might be to dynamically lift a free weight in the sagittal plane through a full arc of motion. However, because of the lack of strength of the lower trapezius and serratus anterior, the patient likely lifts the arm with excessive scapular elevation, recruiting the upper trapezius instead of the preferred scapular upward rotation force couple of the upper, middle, lower trapezius, and serratus anterior. This faulty pattern strengthens the upper trapezius and reinforces the faulty osteokinematic motion at the scapulothoracic joint. The patient’s activity limitation does not change (i.e., still has pain with overhead lifting) even though the straight arm lift gets “stronger” over time.

To resolve the activity limitation of pain with overhead lifting, the impairment of the specific strengths of the lower trapezius and serratus anterior must be addressed. Because these were tested at grades of fair or lower, resistive exercise against gravity is an inappropriate initial exercise prescription. Give this patient an initial exercise program in a gravity-lessened plane for the lower trapezius and serratus anterior (see Self-Management 25-3: Serratus Anterior Progression in Chapter 25). Lever arm length and ROM can be altered as needed pending the muscle test results. To ensure concentric contraction during elevation and eccentric contraction during lowering in a gravity lessened position, use resistive bands at the appropriate resistance. To ensure that an eccentric contraction of the upward rotators occur during the lowering phase, take care to ensure adequate resistance throughout the entire lowering phase; if resistance is lost, the contraction becomes concentric movement of the scapular downward rotators. After the muscle strength is above a grade of fair, initiate active exercise against gravity (e.g., bent arm progressed to straight arm) and progress to resistive exercise against gravity.

BUILDING BLOCK 5-5

**Suggested Answer:** Begin with isometric Achilles exercises at 50% of maximum voluntary contraction to fatigue at least once every 2 hours during the waking hours. If that volume of exercise is tolerated, progress to eccentric calf lowering exercise for approximately half number of repetitions as the isometrics (eccentrics will produce greater tendon strain and muscle soreness than the isometrics, so the volume should decrease initially). Increase the volume slowly until she tolerates at least 3 sets of 30 repetitions without an increase in her symptoms. Next increase the speed until she reaches her typically running speed. Once she can perform the same volume at a higher speed, slow down slightly and increase the resistance by adding weight or switching to a single leg. Work the speed back up again. At this point, it might make sense to have her increase her running (increase distance or frequency); then add new exercises.

BUILDING BLOCK 5-6

**Suggested Answer:** There are several possibilities for training alterations at this level, and periodization must be considered. The program can vary depending upon the athlete’s competition schedule and point in the training season. In general, the athlete should perform a combination of activities including weight training and plyometric training. The hurdler will need power to drive off the ground, lifting the legs over the hurdle, and speed to accelerate between hurdles. The athlete should follow a combination power and speed program, with heavy loading for force development and moderate loading for speed development. This should be combined with plyometric training and functional speed training (i.e., accelerating out of the starting blocks).