The Windmill Softball Pitch, Part 2: Injury Prevention

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A previous report in the November, 2010 issue of ATT (“The Windmill Softball Pitch: Optimal Mechanics and Pathomechanics of Injury”) highlighted the importance of gluteal activation throughout performance of the windmill pitching motion. Gluteal activation facilitates pelvic stabilization and efficient energy transfer from the lower extremity to the upper extremity. A proper sequence of muscle activation is necessary to deliver the windmill softball pitch (WSP) in an efficient manner. The “kinetic chain” concept refers to a series of interdependent mechanical links between body segments. In addition, a neuromuscular linkage exists, which involves a relationship between activation of the core musculature and the activation pattern of muscles that control movement of the extremities.

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Key Points

Conceptual Basis for Exercise Program

The strength and conditioning program is based on upper and lower extremity muscle activations that have been documented to occur during performance of the WSP. The gluteal muscle group has been found to have greatest high level of activation throughout the entire WSP delivery sequence. The greatest gluteal activity occurs during phases 1–4. The gluteal muscles maintain pelvic stability throughout the stride phase, which facilitates efficient energy transfer to the upper extremity for acceleration and release of the ball. Many of the exercises involve activation of the gluteal and hamstring muscles prior to initiation of other movements, because movements of the upper extremity are preceded by controlled movements of the lower extremity and core. Awareness of body position and postural control are important aspects of proper exercise performance.

Postural awareness is enhanced through development of neuromuscular engrams of movement patterns. If the athlete performs exercises with improper postural positioning, she will accentuate poor mechanics in her WSP delivery. All of the exercises are...
designated to activate the gluteal muscle group, which is a major stabilizer of the lumbo-pelvic-hip complex. Evidence suggests that poor stability of the lumbo-pelvic-hip complex is associated with a predisposition to injury.7-13 The athlete should first perform isometric exercises with maintenance of a neutral pelvic position, which will enhance awareness of postural position during subsequent performance of dynamic multidirectional exercises.14 Isometric exercises should be performed for 10 to 30 seconds.15,16 Neutral pelvic positioning can be achieved by “hollowing” the abdomen.16 When the athlete becomes fatigued and unable to maintain a neutral position, increased lumbar lordosis will be evident. If the athlete cannot maintain a neutral pelvic position during performance of isometric exercises, she should not progress to dynamic exercises. Some type of biofeedback should be provided, such as a mirror, to assist the athlete in maintaining proper postural positioning. As little as two minutes per day of postural control isometric exercise, performed twice per week for four weeks, has been found to provide a beneficial effect.16

Typical isometric exercises for development of core stability include front-plank and side-plank positioning.17,18,19 If the athlete is unable to maintain the position for 30 seconds, she should reposition to finish the 30-second period. Once the athlete is able to maintain the front-plank position, she should progress to an isometric hold with contralateral arm and leg extension (Figure 1). Hip extension should be performed prior to contralateral arm extension. Failure to maintain a neutral pelvic position will be revealed by lowering of one side of the pelvis and an inability to maintain straight alignment of the body. The contralateral positioning of the upper and lower extremity segments requires cocontraction of core and extremity muscles. Progression to a “bird dog” exercise that involves contralateral upper and lower extremity movements will further enhance neuromuscular control (Figure 2). WSP delivery requires pelvic stability during the transition from double-leg support to single-leg support, and back to double-leg support. When performing the “bird dog” exercise, there is coactivation of the hip extensor, multifidus, and longissimus muscles, which is followed by activation of the scapular stabilizers and shoulder flexors.

**Dynamic Strengthening Exercises**

After the isometric exercises can be correctly performed, the athlete should be progressed to isotonic exercises that activate the gluteal muscles. The gluteus medius is most effectively activated by resistance to hip abduction, which can be performed in a side-lying position with hips and knees in 90 degrees of flexion (Figure 3). During the stride phase of the WSP, the gluteus medius of the non-weight-bearing extremity must be activated to effectively transfer energy through the kinetic chain to the upper extremity.1,6,15,16

Elastic tubing can be configured in an X-pattern between the feet and hands to simultaneously provide resistance to the lower and upper extremities (Figure 4). While keeping the knees fully extended and the feet