

APPLICATION OF UPPER EXTREMITY PLYOMETRICS FOR REHABILITATION AND PERFORMANCE ENHANCEMENT IN ELITE TENNIS PLAYERS

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High level tennis play requires repetitive activation of the rotator cuff and scapular musculature to stabilize, accelerate, and decelerate the glenohumeral joint to prevent injury and allow for optimal performance. The modern game of tennis is highly dominated by serves and forehands. Some estimates report that 75% of all shots by elite level players are forehands and serves (1). Serves and forehands are characterized by powerful concentric internal rotation of the shoulder. Research performed on elite level tennis players with isokinetic testing has shown muscular imbalances due to selective development of the internal rotator muscles without concomitant development of the external rotators on the dominant “tennis playing” extremity (2,3). Additionally, research has not shown increases in posterior rotator cuff or

scapular muscle strength following tennis play alone in elite players indicating the need for supplemental strengthening of the posterior rotator cuff and scapular musculature to improve muscle balance in the dominant shoulder of the elite tennis player (4). Exercises to improve muscle balance and local muscular endurance have been advocated to both prevent injury and enhance performance in tennis players (1, 4).



Plyometric Exercises for the Shoulder

Understanding the specific demands of high level tennis play allow the clinician to more optimally select exercises that will provide the best stimulus and sport specific training for the rotator cuff and scapular muscles. The position of the glenohumeral joint in tennis seldom involves abduction angles greater than 90 to 100 degrees (5). Elliott et al (5) have documented abduction angles of 83 degrees during the maximum external rotation phase (cocking) of the service motion in elite players. Exercises therefore

that train the shoulder and scapular muscles at or near 90 degrees of abduction would be indicated.

Plyometric exercises are characterized by an eccentric contraction immediately followed by a strong powerful concentric contraction of the muscle. This closely simulates functional muscle work in the tennis player and provides an optimal sport specific training stimulus for the rotator cuff and scapular muscles. Several studies have used upper extremity plyometric exercises to improve rotator cuff strength and functional performance (6,7,8). A recent study by Carter et al (8) showed improvements in throwing velocity and concentric and eccentric internal and external rotation strength following an upper body training program that included plyometric exercise.

Two exercises are recommended for use in throwing athletes and elite tennis players to improve rotator cuff and scapular strength for both end stage rehabilitation as well as performance enhancement. The studies contained in this article have recently been subjected to a research paradigm and found to produce high levels of EMG activity in the posterior rotator cuff and scapular stabilizers (9). These exercises can be initially performed using a 0.5 kg tan **Thera-Band® Soft Weight**, progressing to a 1.0 kg yellow Soft Weight as pictured. Multiple sets of 30 seconds are recommended in the 90/90 prone plyo exercise and multiple sets of 15 to 20 repetitions are used in the reverse catch plyo. These exercises can be

performed as part of the end-stage rehabilitation program or in a performance enhancement program to develop better muscle balance (by focusing on the posterior rotator cuff and scapular muscles).

90/90 Prone Plyo Exercise

Start Position: Lie face down on a plinth or supportive surface. Shoulder is abducted 90 degrees and the elbow bent 90 degrees. Hold a small 0.5 or 1.0 kg Thera-Band Soft Weight in your hand. The shoulder should be in 90 degrees of external rotation such that forearm is parallel to the ground.



Exercise Action: Rapidly drop and catch the ball by opening and closing the hand around the ball, allowing the ball to move very little (several inches up and down) during the timed set of exercise. Repeat several sets of 20-30 seconds in duration.



90/90 Plyo Reverse Catches

Start Position: Kneel on one knee (right knee for right shoulder exercise, left knee for left shoulder exercise) with the arm in 90 degrees of abduction and 90 degrees of elbow flexion. The shoulder is positioned in 90 degrees of external rotation such that the forearm is in a vertical position. The palm should be facing forward with the wrist extended slightly. A partner is needed to stand several feet behind the athlete with a Soft Weight (0.5 to 1 Kg). The athlete looks backward toward the partner waiting to accept the tossed ball.

Exercise Action: The partner tosses the Soft Weight underhand to the athlete leading the hand by a few inches whereby the athlete grasps the ball and catches it, continuing into a motion of internal rotation until the forearm is nearly horizontal (parallel to the floor). As the ball is decelerated, the athlete immediately and explosively throws the ball backward using a forceful concentric external rotation movement. The partner catches the ball and returns the ball back to the athlete using another underhand toss.



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