

# Strength and Conditioning for Tennis

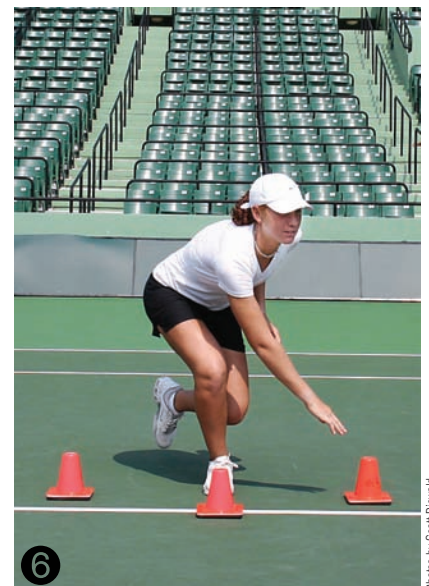
## Three Cone Touches – Lower Body Strengthening

**Purpose:** To improve leg strength, dynamic balance, and control over the core of the body and to prevent injuries in the legs.

- Technique:**
- Place three cones about 2 feet apart to form a shallow “V”.
  - Stand in the middle of the “V” about 1-2 feet from the middle cone (Photo 1).
  - Standing on the right (R) leg, perform a one-leg squat, touching the R cone with the R hand (Photo 2).
  - Bend at the knee and try not to bend much at the waist as you touch the cone.
  - Keep the knee in line with the hip and foot, and do not allow the body to fall sideways while performing the exercise.
  - Return to a standing position and repeat the squat motion, this time touching the middle cone with the R hand (Photos 3-4).
  - Stand again and perform another squat, this time touching the left (L) cone with the R hand (Photos 5-6).
  - Repeat this 3-cone sequence 3-5 times with no rest between cycles.

**Duration:** Repeat the exercise standing on the L leg and touching the cones with the L hand.

**Variations:** Mix up the hand-leg combinations (R-R, R-L, L-L, L-R) to develop greater balance and strength.



Photos by Scott Rewald

# Strength and Conditioning for Tennis

## Split Step Lunge with a Twist – Lower Body Strengthening

**Purpose:** To improve lower body strength/power, dynamic balance, and core strength.

- Technique:**
- Starting at the doubles sideline in a standing position, hold a medicine ball in front of the body (Photo 1).
  - After making a split step (Photo 2), step forward with the right (R) leg into a lunge (Photo 3).
  - In the “lunge position,” rotate the body 90 degrees to the left (L) while holding the medicine ball away from the body (Photo 4).
  - Rotate back to the front-facing position (Photo 5) before stepping forward into a standing position (Photo 6).
  - Repeat this series of movements, alternating lunging with the R and L legs, until you reach the other doubles sideline.

*Note: Always rotate to the side opposite the leg you lunge with.*

**Duration:** Lunge from the baseline to the net 1-2 times, taking 30 seconds rest between sets.

- Cautions:**
- Do not perform this, or any, exercise if it causes knee pain.
  - Do not let the knee come past the toes when performing the lunge. This places added stress on the knee.
  - Before puberty, players should use a 3-6 pound medicine ball. Older players can use medicine balls weighing 8-12 pounds.



Photos by Scott Riewatt

## Quadruped Exercise – Core Strengthening

**Purpose:** To improve strength and control of the core muscles, particularly in the lower back.

**Technique:**

- Lay a towel or mat on the court and get down on your hands and knees (Photo 1).
- Tighten your abdominal and lower back muscles by drawing the belly-button in toward the spine (Photo 1).
- While keeping a “flat back,” lift the right arm and left leg until they are parallel to the ground (Photo 2).
- Keep the head in line with the spine by looking down during the exercise.
- Return to the starting position and repeat while lifting the left (L) arm and right (R) leg (Photo 3).

**Duration:** Perform 2 sets of 15 cycles (both sides) of this exercise.



Photos by Scott Riewald

## Medicine Ball Throws – Core Strengthening

**Purpose:** To develop explosive power using the core of the body and the legs.

**Technique:** • In an open stance, stand about 3 feet away from a wall or other hard surface.

- Facing the wall, hold a medicine ball in both hands (Photo 1).
- Load the legs and rotate the torso as you prepare to throw the ball (Photo 2).
- Explode with the legs and the core as you throw the medicine ball into the wall (Photo 3).
- Catch the medicine ball on the rebound and immediately load the legs and rotate the hips and torso to get set for another repetition (Photo 4).

**Duration:** Perform 2 sets of 15 throws from the forehand side and another 2 sets from the backhand side.

**Variations:** This exercise can be performed using either an open or square stance.



Photos by Scott Riewald

## Standing External Rotation – Upper Body Strengthening

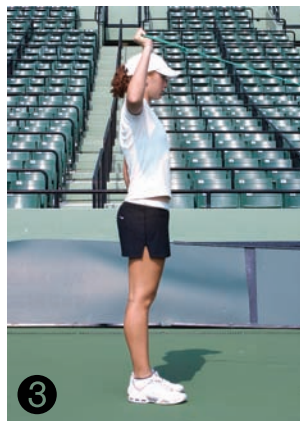
**Purpose:** To strengthen the rotator cuff, particularly in dominant arm. Use for injury prevention and to help control the arm deceleration after a serve or forehand.

**Technique:**

- Attach a piece of elastic tubing/band to a secure location—like a fence or the net post—at waist level.
- To strengthen the right (R) shoulder, stand with the left (L) shoulder closest to the fence (Photo 1).
- Bending the R elbow 90 degrees, grab the tubing so the R forearm lies across the body.
- Step away from the fence until a slight tension is felt in the band.
- Rotate the shoulder 90 degrees so that the forearm and hand move away from the body and point forward (Photo 2).

**Duration:** Perform 1-3 sets of 15-20 repetitions of this exercise.

**Variations:** Stand facing the net with the upper arm parallel to the ground and the elbow bent 90 degrees. Externally rotate the shoulder until the hand points to the sky—making sure to keep the upper arm parallel to the ground throughout the movement (Photos 3-4).



## Core Rowing – Upper Body Strengthening

**Purpose:** To improve strength in the upper back muscles and develop core strength and balance.

**Technique:**

- Attach a piece of elastic tubing/band to a fence at about waist level.
- Grab one end of the tubing and move backwards from the fence, until tension is felt in the band when the arm is straight (Photo 1).
- Set the body in athletic position and contract the core to maintain a good athletic position throughout the exercise.
- Pull the tubing back, bending the arm until the hand is near the side of the body, even with the chest (Photo 2).
- Return to the starting position while keeping the movement under control (Photo 3).

**Duration:** Perform 1-3 sets of 15-20 repetitions with each arm.

**Variations:** To make the exercise easier, loop the band through the fence and perform the movements with both arms at the same time. This requires less dynamic balance.



Photos by Scott Riewald

# Strength and Conditioning for Tennis

## Alley Drills – Movement and Agility Training

**Purpose:** To provide tennis-specific conditioning that will improve lateral movement, agility, and footwork.

**Technique:** • Start outside the doubles alley facing the net (Photo 1).

- Shuffle (side step) into the court until both feet are over the singles sideline (Photos 2-3).
- Quickly reverse direction and shuffle in the other direction until both feet cross the doubles sideline (Photo 4).
- Continue this for 10-20 seconds.

**Duration:** Repeat the exercise 2-3 times, with 25 seconds of rest between each.

**Variations:** • This exercise can also be performed without the racket.

- The player can turn 90 degrees and perform the exercise moving forward and backwards across the doubles alley.

**Cautions:** • Instruct players to stay off their heels when backpedaling to avoid falling.

- Use the cue “Keep the nose over the toes” to help players maintain proper balance.



Photos by Scott Fiewald

# Strength and Conditioning for Injury Prevention

USTA Sport Science and Strength and Conditioning Staff

In many instances, properly designed strength and conditioning programs can be used to help prevent the injuries that were discussed in the photo series. In some instances, the injury prevention centers on building strength in certain areas of the body. In others, it is a matter of improving flexibility or learning how to use the entire kinetic chain. In this article, we describe two exercises that can be used to prevent each injury that was profiled. While many of the exercises can be performed with little or no special equipment, several of the exercises require equipment that you would find in a weight room. On these pages we specifically address exercises that can be used in the prevention of hip and shoulder injuries. However, additional information and exercise descriptions related to the prevention of knee, wrist and abdominal injuries can be found on the USTA Player Development website, at [www.playerdevelopment.usta.com](http://www.playerdevelopment.usta.com), on the front page and under the Strength and Conditioning—Injury Prevention link.

## Prevention of hip injuries

The loading and rotation associated with the open stance forehand places the hip at risk for injury. Maintaining strength and flexibility in the muscles surrounding this joint can help to minimize this risk.

**Monster walks:** This exercise builds strength in the muscles on the outside of the hip—muscles that provide stability and help with lateral movement. With a piece of elastic tubing around the ankles, start at the left doubles sideline facing the net. Get into a good athletic position—knees bent slightly, body upright and facing forward, and feet slightly wider than shoulder width

apart. Maintaining this position, slowly step laterally 6 inches with the right foot. While controlling the band, lift the left foot and step in toward the right foot 6 inches. Continue this pattern while “walking” to the other doubles sideline. Repeat this exercise twice in each direction across the court.

**“Figure-4” stretch:** Maintaining flexibility as you externally rotate the hip is essential for being able to load and unload the hip without injury. The Figure-4 stretch is performed by crossing the right ankle over the left knee. Grab behind the left knee with both hands and pull it towards your chest. You will feel a stretch deep in the right hip. Perform 2-3 times daily on both sides, holding each stretch for 20-30 seconds.

**Additional exercises on the Player Development website:** Medicine ball squats and throws, medicine ball rotation drills, low to high pulls, hamstring stretch, quadriceps stretch, hip flexor stretch.

## “FIGURE 4” STRETCH



Photos by Scott Floward

## MONSTER WALKS



## Prevention of shoulder and elbow injuries

Proper timing and coordination of the kinetic chain is critical for avoiding the types of injuries that can occur in the upper body when hitting an open stance forehand. Additionally, having adequate strength in the rotator cuff and upper back can help stabilize the shoulder and prevent injury.

**Low-to-high pull described for a right-handed player:** The low-to-high pull is a multi-planar exercise that uses rotational movement patterns and integrates the entire kinetic chain. To perform this exercise, adjust a cable column weight machine so the handle starts approximately one foot off the ground. Position your body so you will have to rotate your torso to reach the handle in its starting position while also being able to bring the cable up and across your body during the lift. Using a low to moderate weight, grasp the handle with both hands at the starting position while flexing the knees and loading the right leg. Drive off the right leg while first pulling and then pushing the cable across the body so that the movement ends with both hands over the left shoulder with the arms fully extended. Perform this exercise explosively and lower the weight in a controlled manner between each repetition. Perform three sets of 15-20 repetitions.

**Straight arm rowing:** This exercise trains the muscles that stabilize the shoulder blades and help protect the rotator cuff from injury. Loop a piece of elastic tubing through a fence, or around another stationary object, at about hip level. Standing in an athletic position and holding an end of the tubing with each hand, elevate the arms so they are at an angle of roughly 45 degrees relative to the body. Step back so there is tension in the band. Squeeze the shoulder blades together and perform a rowing action by pulling the handles back towards the hips while keeping the arms straight. Return to the starting position with the body and tension in the tubing under control, and repeat. Perform 1-3 sets of 15 repetitions.

**Additional exercises on the Player Development website:** Shoulder external rotation exercises, wrist flexion and extension exercises, wrist pronation and supination.

### LOW-TO-HIGH PULL (RIGHT-HANDED PLAYER)



Photos by Scott Reinwald

### STRAIGHT ARM ROWING







Photos by Lance Jeffery

## Upper Body Injuries and the Open Stance Forehand

### Potential Problem

As Kim Clijsters hits this open stance forehand, pay particular attention to picture #4. In this picture, you see that her body is positioned so it is virtually parallel to the baseline. To achieve this position she has opened up her hips and trunk, causing a “lag” in which the right arm trails behind the plane of the body.

### Implications for Injury

The early opening of the body and the resulting arm lag during the forehand can place excessive stress on the shoulder, particularly the rotator cuff and stabilizing structures, and the elbow. Initially, this can lead to tendonitis in the shoulder. It also places the shoulder at further risk for becoming unstable, making it more susceptible to serious injury as the structures are repetitively loaded in this lengthened position. Failure to use the entire kinetic chain properly to generate power and assist the arm when the ball is contacted late can place additional stress on the inside of the elbow, particularly when the player compensates by using the wrist and forearm excessively.



## Hip Injury and the Open Stance Forehand

### Potential Problem

As Gustavo Kuerten performs an open stance forehand, pay attention to pictures 2-4 as he loads and subsequently hits off the right leg and hip. In the open stance forehand, the muscles and structures spanning the right hip are required to absorb large forces (pictures 1-2). This is followed by explosive concentric contraction of the same muscles (pictures 3 and 4), producing the power that is needed from the first links of the kinetic chain. The forces generated by the legs and trunk are ultimately transferred through the kinetic chain to the upper body. Interestingly, most would argue that this is a properly-executed stroke. However, even when performed properly, the loading of the dominant side hip is an inherent characteristic of the open stance forehand and must be considered when preventing and/or treating injuries in the lower body.

### Implications for Injury

The repetitive loading of the right hip in a right-handed player can lead to injury to the hip joint itself as well as the hip's stabilizing structures: the joint capsule, labrum, and the muscles and ligaments that support this joint. Players who repetitively load the hip can develop an injury to these structures, especially when strength imbalances and poor flexibility exist in this region. Research has shown that repetitive tennis play can create loss of motion in the hip joint. Players need excellent strength and flexibility in the hip to execute this shot properly. The exercises and stretches detailed in this newsletter can help prepare the player to handle the loads while decreasing the risk of hip injury.



Photos by Lance Jeffery

## Shoulder and Abdominal Injuries and the Serve

### Potential Problem

In the first few photos of the series, Venus Williams prepares to hit the serve using what most would consider normal technique. Please note that there is not much torso/shoulder rotation, even during the preparation phase. As the stroke continues, Venus begins to further open her body and does not drive with the legs as forcefully as she could (pictures 4–6). As a result, Venus must pull her body through the service motion using her abdominal muscles rather than push through the serve using her leg drive. Having to pull her arm through the hitting zone places added stress on her abdominal muscles and shoulder, as these areas are forced to make up for the break in the kinetic chain that results from the lack of rotation and leg drive.

### Implications for Injury

In addition to placing increased stress on the abdominal muscles, which can lead to abdominal muscle pulls, the “arm lag” position created by the premature opening up of the body can place additional loads on the front of the right shoulder as well as the inside of the right elbow joint. Rotator cuff tendonitis and labral tears in the shoulder can result from the excess loading in the shoulder during this arm-lag type positioning on the service motion. Research has shown there are significant reductions in the shoulder and elbow load when a greater leg drive is achieved.



## Knee Injuries and the Two-Handed Backhand

### Potential Problem

As Jennifer Capriati executes a two-handed backhand in which she is pulled wide off the court, we want to look at the load experienced by the right knee, looking specifically at picture 2. The potential problem we see in this picture relates to the position of her front (right) foot. The placement of the front foot is very closed and is actually parallel to the baseline. As Jennifer begins to transfer her body weight forward onto the front foot, she will attempt to rotate her hip and pelvis over a very closed leg/foot position.

### Implications for Injury

As the body rotates on a fixed or planted limb, rotation must be absorbed or taken care of by the hip and knee joints of that limb. In this example, the closed position of the foot actually serves to block or inhibit the rotation of the player's hips and trunk, thereby placing a great deal of stress on the knee. Placement of the front foot in a more open position (approximately a 45 degree angle relative to the baseline) would help to facilitate additional body rotation and decrease the stress on the hip and knee joints of the front leg.



Photos by Lance Jeffery

## Wrist Injuries and the Two-Handed Backhand

### Potential Problem

Wrist injuries appear to be on the rise in tennis and Nadia Petrova shows one potential reason why this may be so. In picture 4, you can see the extreme position and downward bending (ulnar deviation) of the right wrist as she prepares to accelerate the racquet forward to ball contact. This position is often incorporated as part of the two-handed backhand technique as players attempt to drop the racquet head further below the path of incoming ball to produce greater topspin.

### Implications for Injury

Injuries to the wrist are becoming more and more common in junior and professional tennis players and they can occur on either the thumb (radial) side or the little finger (ulnar) side of the wrist. The repetitive use and the forces experienced at the extreme ends of the wrist's range of motion (as seen in this backhand) place greater stress on the tendons that cross this joint. Extreme grips also can contribute to the apparent rise in wrist injuries. There also is a piece of cartilage on the ulnar side of the wrist (the triangular fibro-cartilage complex, or TFCC) that is loaded when the wrist is put into a position of extreme extension and/or ulnar deviation. When put in this position repeatedly, the TFCC can actually tear away from the end of the ulna bone. When this happens players may experience a clicking feeling in the wrist and/or pain. This type of injury often requires surgery to correct. As an additional note, the backwards movement of Petrova's body, as she strikes the ball, limits the linear momentum she can generate and therefore places a greater demand on the upper body segments.