



Core Stability: Connecting lower core and legs.

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ABSTRACT

This article outlines some lower core and leg stability training exercises that will allow players to augment training regimens and use in home based and travel training. Players can maintain and improve lower core and leg stability with these functional exercises that work the muscle slings in closed and partially closed kinetic chain movements. These exercises are versatile, practical and transportable and can be used by a variety of different age groups including developing, professional and senior players.

Key words: Core stability, Functional strength, Pre-habilitation, Developing players, Injury prevention.

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INTRODUCTION

In the past two decades athletes at all levels and from different sports have been bombarded with “core” references and terminology. Core can mean different things to different coaches, trainers and health care professionals depending on their training, expertise and experience. For many “core” primarily means abdominals and they have had little explanation of what really qualifies as core and how to target different muscle groups effectively. As well, core training is often scheduled at the end of training sessions when the athletes may be too fatigued both physically and mentally to carry out the specifically prescribed core training.

Numerous muscles connect the ‘lower core’ lumbo-pelvic-hip complex and spine and the ‘upper core’ spine, ribs and scapular region. When activated and recruited properly this stable upper and lower core forms the foundation for all movements of the extremities. The first muscle to be recruited prior to any movement is the transversus abdominus which normally switches on in pre- anticipation of movement. But with dysfunction there is a timing delay and studies have shown that without efficient and optimal recruitment, subsequent spinal dysfunction can occur (Richardson & Jull, 1995).

The core muscles attach in groups forming functional slings from the hips through the lumbo-pelvic (lower core) to the scapula- thoracic (upper core) regions. Four slings of muscle systems have been described in the literature (Vleeming et al, 1995) (Snijders et al, 1993), these are the posterior oblique sling, the anterior oblique sling, the longitudinal sling and the lateral sling. These slings of muscles help transfer energy from the ground through the legs to the core (trunk) to the upper body and arms. Unfortunately, many commonly prescribed tennis exercises are machine based and involve or isolate a single joint only allowing movement in one plane of motion. Without full kinetic chain involvement and muscle sling

recruitment, they are not effective in connecting the core and meeting the specific demands of the modern game.

Tennis is a sport with high demands in all physical components including flexibility, aerobic stamina, anaerobic power (alactic and lactic), strength, speed, agility and technique. With increased participation by ever younger developing athletes we must be proactive in how we train these athletes. We must take steps to ensure that the windows of optimal trainability (Balyi & Hamilton, 2003) are met for all of the physical components responsible for tennis performance.

Training for tennis requires players to utilize quick movements that pass through many planes of motion and create rotational and torsional forces on numerous joints and muscles at the same time. The average point duration in tennis is reportedly less than ten seconds (Morante & Brotherhood, 2005; O'Donoghue & Ingram, 2001; Smekal et al, 2001). On average, 3 to 5 directional changes are required per point, and it is not uncommon for players to perform more than 500 directional changes during a single match or practice (Roetart & Kovacs, 2011). As well, in ‘professional players’, it was found that more than 70% of movements were side-to-side with less than 20% of movements in forward linear direction and less than 8% of movements in a backward linear direction (Weber et al, 2007). If the players alignment, balance control, connected core stability, deceleration strength and extended hip stability required for these movements is not optimal they may be at risk of injury.

INJURY CONCERNS

Very few competitive players in tennis make it through an entire season without experiencing some form of lumbar and torso issues or lower extremity and upper extremity injuries associated with kinetic chain weakness and/or malalignment syndrome issues (Petersen & Nittinger, 2013). This

malalignment syndrome can be exacerbated by the unilateral (one sided) nature of tennis strokes since in the modern game seventy five percent of the strokes are forehand or service motion placing abnormal rotational and deceleration stresses on the dominant side (Petersen, 2009). Malalignment syndrome also puts athletes at increased risk of injury and once injured, they are likely to take longer to recover or may even fail to do so at all (Schamberger, 2002). Weaknesses and imbalances of the core have been related to low back pain (Akuthoto & Nadler, 2004) and lower extremity injuries (Ireland et al, 2003). As well, a longitudinal study looked at core stability parameters and found that weakness in hip external rotation was correlated with incidence of knee injury (Leetun et al, 2004) and that decreased hip flexibility in rotation or strength in abduction (positive Trendelenburg) was seen in 49% of athletes with arthroscopically proven posterior-superior labral tears (Burkhart et al, 2000).

CONNECT THE LOWER CORE & LEGS

For tennis athletes, using closed chain free-weight, resistance band, physio ball or medicine ball exercises with varying levels of balance stability should be included as exercises to train the lower core and leg stability. These exercises help ensure proper muscle balance in the lower core by emphasizing exercises that are often overlooked and add additional force vectors of resistance to traditional training methods. Utilising closed and partially closed chain exercises with varied resistance to increase stability of the posterior oblique and anterior oblique sling helps improve the athletes' ability to accelerate and decelerate a swinging motion. Adding additional exercises to promote involvement of the lateral and longitudinal sling will further help to connect the lower core and legs improving overall stability.

Benefits of Connect the Core Stability Training
<ul style="list-style-type: none"> • Improves postural set and helps maintain correct pelvic alignment. • Improves strength of functional muscle slings that connect the upper and lower core. • Improves joint and muscle position sense (kinesthetic awareness), helping to center the joint and absorb stress. • Improves stability in a functional hip-extended position. • Improves ability to counter-rotate or dissociate the upper and lower torso and extremities. • Improves dynamic balance and movement efficiency. • Adds additional force vectors of resistance to traditional training methods. • Helps to improve athletic performance and helps the body to be able to react to unexpected events. • Provides exercises that are versatile, practical, transportable and affordable.

Table 1. Benefits of Connect the Core Stability Training (Petersen & Nittinger, 2013).

The prescribed exercises should be individualised to the age, experience and fitness level of the athlete. As a general rule start with 1-2 sets of 10 repetitions and progress to 2-3 sets of

15 repetitions. Use a slow tempo with emphasis on the eccentric (lengthening) phase of the exercise. For example doing a squat with a 3-0-1 tempo it is 3 seconds down (lengthening) 0 hold and 1 second up (shortening).

Precautions for Core Exercises	
Resistance Bands Precautions	Exercise Ball Precautions
<ul style="list-style-type: none"> • When using resistance tubing or bands, ensure they are of high quality. • Avoid placing resistance bands near heat or in direct sunlight. • Avoid sharp objects and jewellery • Start gradually and get a feel for the resistance of the bands before progressing or increasing the tension. • Regularly inspect the stretch band or tubing for wear and tear or weak spots and replace as appropriate. • Ensure that it is securely attached before applying resistance. 	<ul style="list-style-type: none"> • For individuals new to exercise, check with your physician before starting this or any other exercise program. • Check your ball for flaws before each use. • Avoid placing ball near heat or in direct sunlight. • Avoid sharp objects and jewellery. • Start gradually and get a feel for the ball before progressing.

Table 2. Exercise ball and resistance bands precautions.

WARM UP AND BRIDGING EXERCISES

Before starting this or any exercise routine do some light dynamic warm-up exercises like assisted squats followed by some lying hip work and some bridging exercises. Your goal during warm up is to have a light glow on or have sweaty underarms.



Figure 1. Assisted Squats.

Training tips:

- Hang onto something for balance taking some weight through your arms
- Switch on your core muscles

- With feet pointing straight ahead squat down slowly like sitting down in a chair
- Keep knees aligned over toes but not going past them
- Do 2 sets of 10 repetitions with a 2-0-1 tempo.

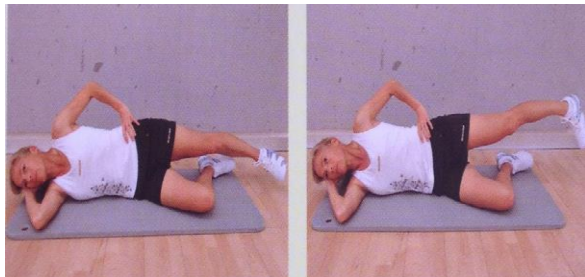


Figure 2. Side Lying Hip Abduction.

Training tips:

- Start lying on your side with bottom knee bent and top knee straight
- Switch on your core
- Point toes down to floor on top leg & raise leg up
- Do 2 sets of 10 repetitions with a 2-2-1 tempo
- Raise up hold for 2 seconds and down slow for a 2 second count.

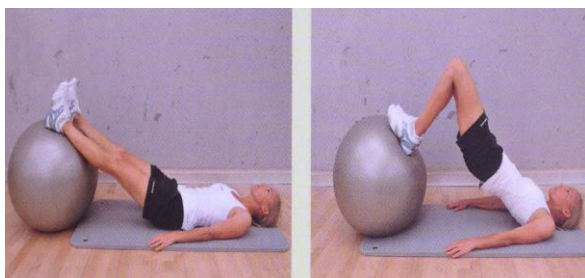


Figure 3. Supine Bridge & Hamstring Pull.

Training tips:

- Start lying on your back with lower leg & feet on a physio ball
- Place a ball between knees & squeeze lightly
- Switch on your core muscles
- Bridge up hips & pull ball towards buttocks & hold for 2 seconds & return to start position
- Do 2 sets of 10 repetitions with a 1-2-1 tempo.

CONCLUSION

This selection of lower core and leg stability exercises promote strength in regions of the lower core and leg musculature that are often weak as a result of training and playing overuse that results in fatigue, active trigger points and palpable tissue tension. This includes muscles the hip abductors (gluteus minimus and medius) (Chandler & Kibler, 1992) and the local 'inner unit' muscles of the core (multifidus, quadratus and transverses abdominus) (Kibler et al, 2006). By utilising simple equipment like balls and bands to challenge and augment the functional slings we can help players develop a stable lower core and leg platform for the extremities to skillfully move in all directions and accelerate and decelerate efficiently.

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