

Traditional Vs Functional Core Training for Tennis

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Traditional sit-ups, crunches and similar floor exercises have been included in most tennis players programs for many decades. Today the buzz-word is core training or some refer to it as ab work, torso training or the power zone. Your “core” refers to all the muscles in the mid-section namely: rectus abdominis, transverse abdominis, the multifidus muscles, internal and external obliques, quadratus lumborum and the spinal erectors. When properly trained these muscles provide a stable base for generating force and power.

The development of this musculature has been long documented as a necessary part of any tennis-specific training program (Levisohn & Simon, 1984). Back in 1986, Quinn found that when serving, the abdominals contracted at a very high percentage (85 to 90 percent) of their maximum contractile capacity. Similar levels of abdominal muscle activation were recorded in the production of groundstrokes, while volleying still saw the abdominals contract to above 50 percent of their maximum. Clearly the abdominals are important.

Today considerably more is understood about core training and its application to the modern game. Subsequently, training methods have changed. With factors such as the carrying of heavy tennis bags, the playing of computer games, poor posture and the focus on a single sport all proposed to contribute to problems of poor core stability in younger players (6th STMS World Congress on Medicine and Science in Tennis and LTA 2004 Sports Medicine Seminar), the need for coaches to understand the role of the core and how to train it correctly, becomes all-important. To this end, research has already shown that by developing a stable base (transverse abdominis and multifidus), players can: increase strength, increase momentum, increase control and endurance of extremity muscles, improve posture, increase racquet head acceleration and prevent injury (Sanex WTA Tour, 2001).

In tennis, maximum acceleration of the hitting limb and racquet is typically a function of how efficiently force can be transferred from the lower body to the upper body and then to the racquet. Therefore, to stimulate the force developed by the lower body, efficient stabilisation of the trunk is a must (Roetert, 2001). This then enables the trunk rotators (internal and external obliques) to contract with maximum effectiveness. If the core muscles and in particular the transverses abdominis and deep multifidus are not functioning optimally to provide stability, neuromuscular inhibition will likely occur and force generation will be compromised. When muscles are not balanced optimally to provide support and control, the body creates substitution patterns, which could then lead to injury. The shoulder, arm and wrist are overworked as they generate the power instead of the trunk.

Traditionally, the number of sit-ups performed in a minute assessed a player's abdominal muscles. This is really only a measure of rectus abdominis strength. More effective trunk evaluations today include tests by Shirley Sahrmann, and the Core Muscle Strength Test. It's nevertheless recommendable that players are evaluated by a physiotherapist to best ascertain an individual's strengths and weaknesses and determine which core exercises are best for them. In this way players can more safely advance through each stage of an exercise and more effectively progress their training programs.

The role of the trunk's deep musculature in posture and movement in controlled experimental settings has been thoroughly investigated (Hodges and Richardson, 1997). Although quantification of its tennis-specific application is lacking, most tennis trainers and coaches extrapolate the findings of physiotherapeutic research such that core stability training is central to the advancement of most tennis movements and athletic gestures (Reid and Crespo, 2002). Indeed, recent stability ball studies indicate that this form of training activates the abdominal musculature to a greater extent than other abdominal training modes, while it is also likely to lead to greater core stability, albeit this does not necessarily translate into superior athletic performance (Stanton, Reaburn & Humphries, 2002).

In traditional abdominal work it has been suggested that the deep core muscles such as the transverses abdominis are not adequately strengthened. Boyle (2004) even goes as far to say that many traditional exercises such as conventional sit-ups, straight leg raises and abdominal machines that constrain the feet or legs "are a waste of time" if you want to develop athletic power. Electromyographic studies show that whenever you lift a weight, or move to walk or run, the first muscle to fire is the transverses, followed by the internal and external obliques, and the lumbar multifidi muscles of the back. Only then does the rectus abdominus fire, and weakly at that. After all the abdominal muscles are firing and the trunk is stabilised, the prime movers of the movement begin to contract. If the transverses or internal or external obliques are weak, then all movement will suffer.

By definition "functional training" is training with a purpose. In other words it should have a positive effect on the activity or sport one is participating in. Where possible, it focuses on more functional, sport-specific multi-joint exercise as opposed to single-joint movements that isolate specific muscle groups – an activation strategy not readily observed in sports performance (Gambetta and Gray, 2002). It emphasises movements, not muscles, and encourages the training of balance.

Important points to remember when performing core stability exercises include:

- Be sure that the deep muscles are recruited. An isolated contraction of the transverses abdominis should be taught firstly in a non-functional position and then in a more upright position.
- Then have a player effectively activate transverse abdominis contraction in a static tennis specific position.
- Here you may get them to do the exercise through movement and then lastly load

them up with resistance or alter speed of movement.

- It is the quality of movement that is most important. Aim to activate the muscles, not increase their strength.

Today the functional training movement tends to emphasise wobble boards, dumbbells, medicine balls, stability balls, bands and bodyweight exercises. The important thing is to first understand the needs and abilities of the individual player before implementing any of these techniques and strategies. Companies sell “functional training equipment” as a way for coaches, personal trainers and athletes to enhance performance and add variety to a training program. The use of much of this equipment, especially unstable equipment such as stability balls, wobble boards, foam rollers and stability discs, has lead many people to believe that the minute someone uses one of these pieces the exercise is “functional”. Remember that just because an exercise is challenging it does not mean that it is necessarily functional. Ultimately the more unbalanced, the more the stabilisers have to work to stabilise but athletes can fixate with large prime moving muscles which then defeats the purpose of stabilisation. Also at this time there is no clinical evidence that training on unstable surfaces actually improves sport performance. The important concept to understand is that almost everything boils down to “specificity” and ensuring that the right contraction is obtained before progression can occur.

Unstable equipment is only one modality that should be used sparingly at best. It is important to remember that everything has a time and a place in a training cycle. The art is to recognise when it is appropriate and necessary. This criticism of sit-ups and crunches is not meant to imply that abdominal strengthening is redundant. On the contrary, it is important to strengthen all trunk muscles so that none of them exhibit a strength deficit during 'functional' activities. More important than that is learning the correct techniques since efficiency of movement and prevention of injury depends more on correctness of technique than on strength of individual muscle groups alone. Ultimately a real understanding of programme design and exercise science coupled with a knowledge of the player’s needs, abilities, and psychology will have the greatest “functional” effect on overall performance.

REFERENCES

- Boyle, M. (2004). *Functional Training for Sports*, Human Kinetics: Champaign, IL.
- Elliott, B., Reid, M., & Crespo, M. (2003). *Biomechanics of Advanced Tennis*. ITF Ltd; London.
- Gambetta, V., & Gray, G. (2002). *Following the Functional Path*. (Online). Available: www.gambetta.com
- Hodges, P.W., and Richardson, C. A. (1997). Contraction of the Abdominal Muscles Associated with Movement of the Lower Limb. *Physical Therapy*, 77, 132-144.
- Levisohn, S.R., & Simon, M.B. (1984). *Tennis medic: Conditioning, sports medicine and total fitness for every player*. Saint Louis; The C.V. Mosby Company.
- Quinn, A.M. (1986). *Abdominal and Lower Back Muscle Involvement in Selected Tennis Strokes*, Unpublished manuscript, University of Illinois, Champaign, IL.
- Reid, M., & Crespo, M. (2002). Core Stability in Tennis. *ISBS Applied Proceedings*, Caceres.
- Reid, M., Quinn, A.M., & Crespo, M. (2003). *Strength and Conditioning for Tennis*. ITF Ltd; London.
- Roetert, E.P. (2001). 3-D Balance and Core Stability. In B.Foran (Ed.) *High Performance Sports*



- Conditioning* (pp119-138). Human Kinetics: Champaign.
- Sanex-WTA Tour. (2001). Core Stability. *In Physically Speaking*, March, 2001.
- Stanton, S., Reaburn, P. & Humphries, B. *Swiss Ball training: current research and future recommendations*. Australian Conference of Science and Medicine in Sport, 2002.
- Van Aken, I. (2003). Planning Physical Training During Tournament Play. In M.Reid, A. Qunn and M. Crespo (Eds). *ITF Strength and Conditioning for Tennis* (pp 211-216) ITF Ltd; London