


## What is core stability & core strength?

The segments of the human body are arranged as chains comprising muscles and joints in series. The three major segments are *the upper torso* (head & neck, shoulders, and upper back), ***the core*** (lower torso, pelvis and hips), and *the legs*. Segmentation is a trade off: Too much freedom and our bodies could not generate and transmit enough force (e.g. a snake or jellyfish); too little and our bodies would behave like those of an elephant – very strong but not a lot of mobility. Even so, mobility comes with the risk of instability.

The core is the least stable segment in order to provide the human body with a centralised mobility zone. However, the spinal column passes through this segment and muscles are needed to provide limits to this instability in order to protect the spinal column (from damaging forces) and enable efficient transmission of forces during movement. That is the role of the core stabilisers.

Our core muscles are analogous to the guide ropes of a tent. Without any wind, tent poles will keep a tent upright but when the wind begins to blow it will collapse without guide ropes. Our core muscles do the same. Lying flat on our backs there isn't much need to stabilise the body, but the instant we sit or stand the core must stiffen to avoid the collapse of the torso (and with it the rest of the body).

The core is not one muscle or even a few. It is many muscles working together. There are two different types of muscles involved: deep postural stabilisers and superficial mover muscles. Core stability is the capacity of the two layers of muscle to work together to stabilise the upper body with respect to the lower body. The most important function of the core stabilisers is to demobilise the lumbar spine – sacrum – pelvis unit. Poor positioning of the structures in this unit is the most profound core stability deficit and, alongside weakness of the hip stabilisers (more below), is a principle reason humans experience limitations of gait (running economy) and power (speed and agility, and global strength). The capacity of any chain will settle at the level of the weakest link and for many people this is the core segment.

 CORE STABILITY IS AN ASSESSMENT OF POSITION (TORSO RELATIVE TO THE LOWER BODY AND PELVIS)

 CORE STRENGTH IS A MEASURE OF CAPACITY

As the two descriptions together imply, enhancing core stability involves 1) raising the strength and capacity of muscles and 2) teaching the body to use groups of muscles more effectively. The first step in such a process involves measuring or assessing weakness (termed deficits). Deficits may involve weakness of specific muscles or the failure of postural function – the shapes and positions of the bodies segments and joints. In general, an exercise program should begin as specifically as possible and progress outward to the global segments and chains.

There are three basic patterns of core stabilisation:

1. Bracing of the abdomen and pelvis from the front (anterior). This prevents the pelvis and lower back from collapsing forwards
2. Stabilisation of the lower torso from behind (posterior) acts against too much flexion and rotation (of the torso) in the horizontal plane

3. Stabilisation of the hips to limit rotation of the pelvis about the other two axes (read '*Posture in sport*' for more information about this)

Various combinations of these three patterns are used to stabilise the body at any given moment.

Modern *Western* lifestyles bring about common core deficits and patterns of postural deconditioning. The most significant of these are weak stabilisers in the core segment itself, chiefly transversus abdominus (TvA) as this is also a pelvic stabiliser, and weakness of the external hip rotators (posterior gluteus medius [PGM]). PGM is a primary hip and pelvic stabiliser. The mobile interface of the spinal column and pelvis means that anything affecting pelvic position will, in turn, reposition the lower spine and thereby affect core stability.

Weak posterior torso stabilisers and positioning of the upper torso and shoulders is also commonplace. The segments of the body weigh a lot. Human locomotion (walking, running, jumping etc.) involves propelling the body forward and this generates significant forward momentum of the torso. The posterior stabilisers must be strong and activate together correctly to prevent the upper torso from over-flexing and twisting. Poor postural function in the shoulders is a common deficit and tends to accompany weakness of the TvA muscle as they have a common cause: sitting uninterrupted at a desk for long periods. Poor posture is a big problem as it deconditions muscles creating a vicious cycle that leads ultimately to injury and the breakdown of global physical capacities (more information is available in '*Posture in sport*').

Muscle tightness can also impair core stability. The primary core stabiliser, transversus abdominus, is a long wide muscle that wraps around the front of the lower abdominal area like a big belt. Its activation pressurises the abdominal cavity acting against excessive extension (forward collapse) of the lumbar spine. On the other hand, the lumbar extensors, like the hip flexor muscle Psoas, pull the lumbar spine in to extension. These muscles have the opposite function to that of the TvA muscle. The stability of a joint or segment of joints is determined by the balance of forces acting about it. If the transversus muscle is weak and the lumbar extensors and/or hip flexors are tight then the resulting imbalance reduces stability. In this way, the stability of the core segment is a measure of the risk of an injury to the muscles and tissues (spinal column) contained within it.

### **SUMMARY:**

- Core instability is a profound problem in Western societies – we sit for too long and have poor global posture
- The critical role of core stabilisation in the function of the body means that a weak core affects everything: physical strength, athletic capacities, and injury-free
- The core can be easily strengthened and made more stable but an assessment of weakness and postural function is essential.
- Improved posture and joint positioning is the key to maintaining a strong core and efficient body. An efficient body reinforces its capabilities and capacities through physical application moment to moment, day to day, across all activities. The reverse is also true.

### **RELATED READING:**

-  Posture and sport - (<http://sportperformance.co.nz/resources.html>)