

# TRUNK STABILITY by Calvin Morriss, PhD.

The contents of this article were presented by Calvin Morriss to an Academy Managers' and their fitness advisers' meeting. Trunk stability is an area of fitness that is receiving increased attention and could be a critical factor in players' longevity. Attention to the subject is given at Premiership and senior international level and it is a part of the National Academy fitness curriculum.

If any player is encouraged to carry out any of the exercise(s) related to the article, he must have a qualified fitness coach to advise him as some of the training can be dangerous if not performed correctly.

Calvin Morriss' PhD is in Biomechanics. He has a background as the Head Strength and Conditioning Coach to UK Athletics and for the past two years he has been with the RFU as National Academy and 7s Fitness Adviser.

#### What exactly is trunk stability for a rugby player?

It is the ability to hold good posture of the torso when high loads are applied to it, including occasions such as:

- Running with maximal effort, including acceleration and deceleration.
- **Contact**, such as tackling, rucking and mauling.
- Set piece play at scrum and line-out.
- **Training**, in particular with weights.
- **Not playing**, when sitting, standing and sleeping.

#### What does the research tell us?

The following extracts were taken from Stuart McGill's excellent text, 'Low Back Disorders: Human Kinetics' (2002).

- "Achieving stability is not just a matter of activating a few targeted muscles, be
  they multifidus, transverse abdominis or any other. Sufficient stability is a moving
  target that continually changes as a function of the three-dimensional torques
  needed to support postures."
- "Quantitative data have confirmed that no single abdominal exercise challenges all of the abdominal musculature while sparing the back."
- "Generally, preserving the neutral lumbar spine will solve many of the safety issues, but this depends upon the ability to take the shoulders and hips to extreme ranges in the range of motion."



#### The rugby player's back.

These are general observations but fairly representative of most rugby players.

#### **Typically:**

- Lordotic (hyper-extended low back).
- Kyphotic (flexed upper back).
- Anterior tilted pelvis.
- Tight hip flexors.
- Externally rotated femur.
- Limited hip ROM (range of motion).

Playing and training with intense effort and with these postural problems can often result in:

#### **Typical consequences:**

- Hyper-mobile lumbar spine (lax ligament support).
- Chronic 'stiff' back.
- Very limited ROM.
- Tight hamstrings.
- Tight groin.
- Tight calves.
- Prominent muscle groups/actions.

#### Can training help with these problems (above)?

One factor that may be linked to alleviating these problems is **muscular endurance**. Research suggests that:

- Muscular endurance is related to reduction in back troubles in the non-athletic population. (McGill, 2002.)
- McGill's work also suggested that back problems can be alleviated in the large part by improving and then grooving the motor patterns of the abdominal musculature.
- There will be an improved, grooved motor pattern with better muscular endurance.
- The ability to use all 'available' musculature will be improved.
- Considering the contact nature of the game of rugby, there will be a development in the ability to co-contract the abdominal wall independently of any lung ventilation patterns. There is a real need to keep the abdominal wall tight, independently of the breathing cycle; contraction must not rely on whether you are breathing in or out.



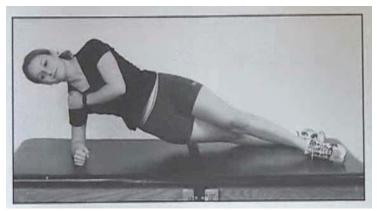
This is all part of what can be a vicious circle. Poor posture leads to the inactivation of important muscle groups. This gets progressively worse, with elevated back pain and the sequence goes on. If the subject could learn to re-activate the muscles and hold a better posture, McGill has shown a very high rate of pain reduction.

# <u>Muscular endurance tests.</u> (Testing a movement, knowing that it depends largely on the mentioned muscle groups.)

#### • Lateral bending:

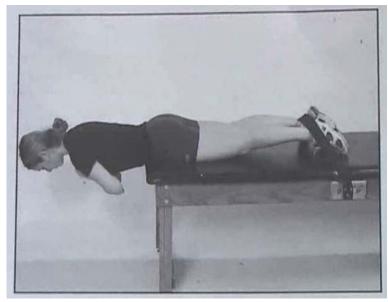
Side plank

Transverse Abdominus (TA) , Obliques, Quadratus Lumborum, Erector Spinae.



#### • Extension:

Horizontal back extension. Erector Spinae, Longissimus, Ilicostalis, Multifidi.





#### • Flexion:

60° flexibility test. Erector Spinae, Longissimus, Ilicostalis, Multifidi.



In the flexion test, the support is a board angled at 60°. The time of the test starts when the support is pulled away from the athlete.

All the tests are time based – how long can you stay there? There must be control; the time is taken when control ceases. Elite athletes should be aiming for a minimum of two minutes before the next stage of torso training. Times at all three tests can be improved with simple repetitions of the three exercises.

Players must not also train strength at the expense of endurance. If the strength to endurance ratio becomes greater than 4, there will probably be a pre-disposition to lower back problems. (Although McGill does not describe his test of extensor strength, it is likely to be using an isokinetic device.) Simply observing the ratios in the table below, suggests that extensor endurance is a critical component of torso health. Ninety percent of these back problems occur in flexion.

Right-side bridge/left-side bridge	>0.05
Flexion endurance/extension endurance	>1.0
Side bridge/extension endurance	>0.75
Extensor strength (Nm)/extensor endurance (s)	>4.0



### Range of motion.

Compromised hip flexion exacerbates too much lumbar flexion and extension.

- This is very important in **squats**, **cleans and deadlifts**. If the player does not have a range of hip motion, the spine ends up in a poor position.
- Once the range is improved, that range of motion can be tested even further with exercises such as single-leg squats, split squats, lunges and good mornings. (Photos below)

#### Good mornings.





- The bar is held on the shoulders.
- Bend forwards at the waist so that the chest is parallel (or as close as possible to parallel) to the ground.
- Raise the upper body to the starting position.

**The power-clean** is a basic strength exercise and two examples of technique show how the range of motion affects the lift.



Good range of movement at hips and elbows.



Poor range of movement at hips.

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# The back squat.







### Clean, squat, press.















Good morning.

(See photographs above.)

# Overhead stability.



The lumbar spine is locked in neutral and the motion takes place about the hips and knees.



To make ROM requirements even harder, the weight can be above the head. This means that:

- The ROM in the shoulders is challenged,
- as is the ROM in the thoracic spine.
- An even greater challenge is made on holding a good lumbar position.

It is very important to realise that this exercise does not have to involve heavy weights. For beginners, a broomstick on the shoulders will suffice; the challenge is to hold the stick above the head whilst squatting with the heels on the ground.

Overhead stability does require a good ROM in the shoulder joint and it can be improved with practice Some appropriate exercises would be:

- Overhead squats.
- Overhead lunges/lunge walks.
- Dumbbell (DB)/Barbell (BB) presses or jerks.

Up to this point I have dealt with exercise where the trunk is held in a static position while the limbs move freely. However, there will be a need to improve trunk stability with rotational exercises.

#### **Rotational exercises.**

Rotational exercises should *not* be combined with flexion or extension and the type of appropriate exercise would come from:

Plate twists.









# • Barbell twists.







# • Cables.





# • Cable and dumbbell rotations.







• Medicine ball and powerbag explosive movements.

In the rotational exercises, the weight should be handled in short, sharp movements. A progression can bring in a lighter weight that is held further away but moved more slowly.

#### **Conclusions:**

- Stability depends upon the appropriate recruitment of appropriate muscles with appropriate force at the appropriate time.
- No one exercise trains the whole trunk.
- No one exercise suits everyone.
- Gain postural control and motor patterning before high force, high strength exercises.
- Muscular endurance is important for lasting control.
- Get ROM in shoulders and hips.
- Get strong safely.
- Specific problems require specific solutions, which will mean using physiotherapy.