

Core Stability for Cycling

Musculoskeletal Physiotherapist **Emma Colson** explains with detailed exercises how to train your core off the bike so you can benefit on the bike.

I frequently see patients mention that they have been working on their 'core stability'.

Many times the 'core exercises' they have been doing consist mainly of sit-ups or some variation of a sit-up and are often surprised when I reveal to them on video tape that they are moving 'all over the bike'. They are also surprised when I ask them to stop doing all these sit-up type exercises.

Sit-ups are entrenched in our culture and especially so in the 'gym' culture. Sit-ups are mostly aesthetic; they will eventually give you the 'six pack' but that's it. The good news for those of us who don't own a six pack is that they are of no use to cyclists.

The problem with sit-ups is two fold:

1) Sit-ups for most people are non-functional. Training your abdominals to lift your trunk to your limbs does not mean your abdominals will hold your trunk still whilst driving your legs at high load during the cycling motion.

2) Sit-ups put a huge load on the hip flexor muscles. Over time the hip flexors can put stress on the attachment point at the mid lumbar vertebrae and through biomechanical load create a sheering stress at the lumbosacral junction and the L5 disc. This can create both facet pain at the mid lumbar region and discogenic back injury at the lower spine.

Firstly, let's clear up the term 'stability'. There are three distinct components:

- 1) Intrapelvic stability
- 2) Peripelvic stability
- 3) Functional stability

Intrapelvic Stability

This is dependant on Transversus Abdominis and pelvic floor muscles contracting with intact pelvic ligaments. The anatomy of TA is such that it arises from the pelvis and insets into linea alba (line in the middle of your abdomen). The TA and the Pelvic floor are the only muscles that give direct closure across the pelvis (Richardson et al).

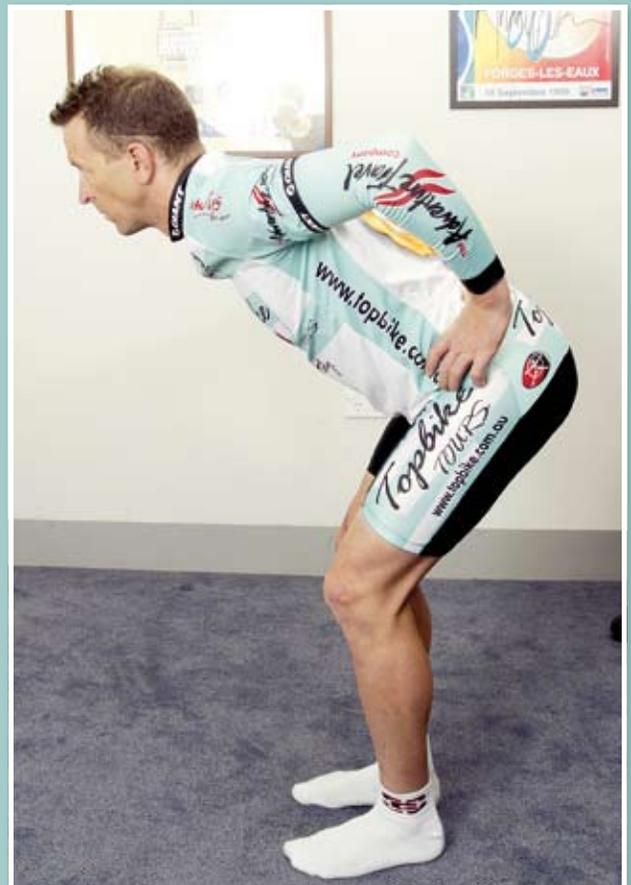
Problems here arise from two mechanisms:

- 1) Loss of the active structures that provide intrinsic pelvic closure, the transversus abdominis and the pelvic floor muscles, via:
 - a. Pain inhibition of TA via first onset low back pain (Hodges and Richardson)
 - b. Pain inhibition via joint inflammation: 'osteitis pubis', hip joint pathology, and sacroiliac/lumbar spine joint dysfunction.
 - c. A tear of the conjoint tendon/inguinal ligament disrupting the origin of TA
 - d. Past abdominal surgery inhibiting contraction or affecting the nerve supply to transversus
 - e. Tearing of the pelvic floor muscles during child birth
 - f. Weakness of the pelvic floor muscles secondary to poor toileting habits

* Exercises to contract the transversus abdominis were covered in a previous issue of *Bicycling Australia* (Jan/Feb 2005). I use ultrasound



Stand and place your hand on your pelvis in the upright position.



Tilt your pelvis forward while keeping your back straight.

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technology to teach patients how to activate these deep muscles. The best cue for most people is to initiate the transversus abdominis via contracting the pelvic floor muscles (like holding in a wee). For more information see www.lowbackpain.com.au

2) Loss of passive structures:

Pelvic ligamentous laxity: either due to body type (hypermobility), or external trauma (either single incident or prolonged postural loading), hormone induced ligamentous laxity (pregnancy). Laxity of the SIJ ligaments will cause loss of the closure of the pelvis.

Peripelvic Stability

Once the pelvis is stable and we have a firm foundation, we can look at the pelvis reacting with the rest of the body.

Pelvis on hip joint (pelvifemoral control)

Does the knee roll inwards as the subject single leg squats? Does the pelvis dip as you reach single leg stance?

Is the lack of pelvifemoral control strength or timing a problem around the hip joint (gluteus medius and gluteus maximus) or is it an inability to appropriately weight transfer onto that side due to hip, knee, ankle problems, nerve pathology or just disuse of one side due to chronic injury?

Pelvis on lumbar (and thoracic) spine (lumbopelvic control)

This is concerned with ability of the deep multifidus to contract to control the lumbar segments and the superficial multifidus to orientate the spine on the pelvis (Moseley et al).

Functional Stability

Once the muscle strength and activation patterns are in place to allow force transfer through the pelvis, linking these activities into normal activities and actions and conditioning the lumbopelvic complex can take place.

This is really just an 'on-field' extension of peripelvic stability. Once the athlete has all the necessary components to hold their pelvis stable on the femur and lumbar spine, can they coordinate that into their particular sporting activity?

I say to my patients, "You can do stability exercises until the cows come home, but unless you transfer what you have learned onto the bike you will still move all over the place." People learn differently. Different cues are needed to help people transfer stability learned off the bike to being stable on the bike. With video assessment the cyclist can view what they are doing with each pedal stroke and try to think about that when they ride.

This type of stability is more concerned with technique, coaching and video analysis. Also, as conditioning will no doubt affect the fatigue status of the athlete, high level physical conditioning allows the athlete to maintain a stable pelvis without physical fatigue, hence appropriate strength/endurance and power training as applicable to the type of cycling activity and the stage of the season.

Most gym-based strength, conditioning coaching and fitness programs fall into this category. However if the intrapelvic and peripelvic issues are not addressed initially that is where these patients break down. Conversely, if inadequate conditioning is performed prior to return to sport/competition then the athlete will break down, as there is no transmission of their rehabilitation onto the field of play.

Exercises

The photo sequence that began on page 52 is an illustrative suggestion of some exercises to replace sit-ups. (*This is not an exhaustive list—if you currently have an injury it is best to get your physiotherapist to specifically design exercises to work on your problem rather than doing these shown here*). ●

References

Richardson CA, Snijders CJ, Hides JA, Damen L, Pas MS and Storm J. The relation between transverse abdominis muscles, sacroiliac joint mechanics and low back pain. *Spine* 2002; 27:399-405

Hodges PW, Richardson CA. Inefficient muscular stabilisation of the lumbar spine associated with low back pain. *Spine* 1996; 21:2640-50

Moseley GL, Hodges PW, Gandevia SC. Deep and superficial fibers of the lumbar multifidus muscle are differentially active during voluntary arm movements. *Spine* 2002; 27: E29-E36



Drop your hands down and either hold that posture as a sustained position or slightly oscillate up and down. After a period of time you should feel a fatigue or lactic feeling in the erector spinae muscles of the lower back (this is different to back pain). This feeling should be like when you first start climbing a lot of hills out of condition.



If the previous exercise becomes easy, i.e. you can hold the posture for a couple of minutes and feel little in the lower back muscles, then you may like to add some load. Take care with this: keep the back flat, not flexed—you can load your disc.



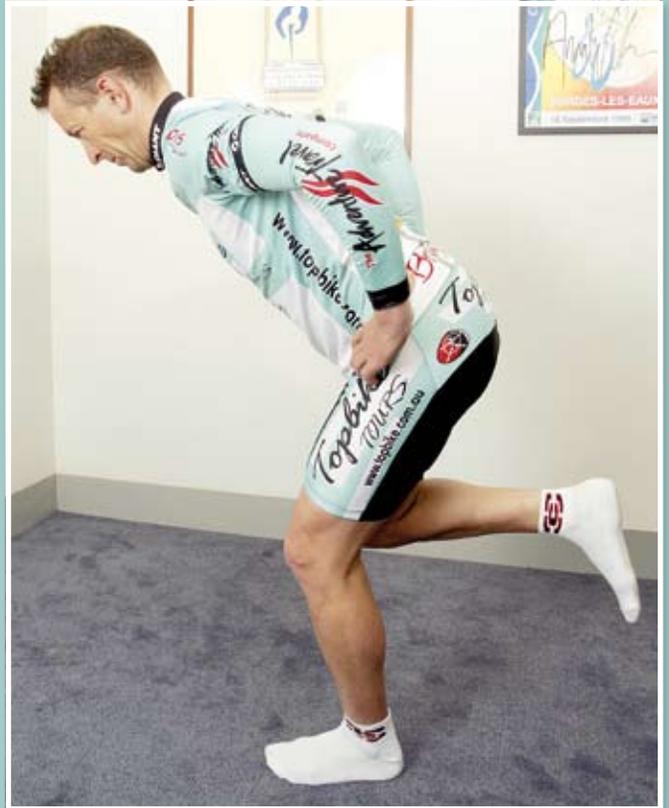
While kneeling on a pillow, place your hand forward on to the ball, keep the body straight (not by arching the back and locking the joints but by keeping a neutral spine position). Gently roll the ball forward. Some abdominal work should be felt.



To advance the above exercise, drag the ball under the body as the bottom lifts in the air. Slowly lower the ball down again, with care not to whack back into extension as you adopt position in the previous drill.



This is a more advanced version. This time hold a straight body whilst weight bearing through the elbows. Keep the whole body still and hold.



Adopt an anterior pelvic tilt and then stand on one leg. Then, move the non-weight bearing leg back and forward to simulate a cycling motion. Focus on keeping the pelvis still while the leg moves under the pelvis.



To advance the above exercise, roll the ball forward by pushing the elbows in front of the body. Do not let the back and pelvis sink.



Hold the body still with feet on the ball (at the farthest point you are able to control).



Get on the bike and focus on pedalling while holding from the pelvis up in the one position.