

# Stay Balanced

The pelvic muscles support the entire body, so any injury in that area can impair performance. **STUART HINDS** outlines causes and treatments of pelvic muscle imbalance.

Whether you ride MTB, road or track at the elite or the amateur level, it should not matter—balance in the muscles in and around the pelvis is a must to ensure strong performance, but also to help prevent a range of non-specific symptoms and related conditions.

The purpose of this article is to increase the awareness of soft tissue therapy and its effectiveness in aiding injury prevention and helping cyclists to maintain performance. Specifically it presents an overview on the assessment and treatment of the soft tissue structures directly influencing the pelvic balance in relation to a cyclist's performance.

Having been involved with soft tissue treatment to athletes of all levels, I have found that cyclists and runners share a common trait when presenting with non-specific lower body dysfunction—the majority have muscle imbalances in the pelvis.

As an amateur cyclist I have personally experienced pelvic muscle imbalance and how frustrating it can be. It involved a long process of often unsuccessful treatments to finally having it resolved successfully with soft tissue therapy to balance the pelvic muscles, so it is with this first hand experience that I have developed a particular interest in this area and it's ultimately what led me to write this article. I would be interested if the readers of this magazine want to share their experiences of a similar nature.

## What Is Pelvic Soft Tissue Imbalance?

Pelvic muscle imbalance is mentioned in biomechanical and sports medicine literature as a possible factor in a range of conditions and is highlighted in some of the articles of this magazine from time to time.

The pelvis has 29 muscles that originate or insert onto it, some of which are the largest and the most powerful muscles in the body. If tightness occurs in one or two of these muscles (overload) other muscles of the pelvis will be affected

due to the close proximity. Tightness of a muscle can alter the normal mechanics of the pelvic joints, especially whilst exercising, and this can lead to muscle imbalance and also possible asymmetry to the structure and a decrease in function (references 1, 2, 3, 4, and 5).

Pelvic soft tissue balance can be explained as the treatment through the use of soft tissue therapy to the tight, restricted muscles of the pelvis, which are involved in creating imbalance.

## Why Is It Important?

The pelvis forms a solid base for the action of many of the muscles that are critical in cycling performance. The interaction of the pelvic muscles and their bony attachments will determine how efficiently and effectively power is transferred to the pedals.

Pelvic Muscle Imbalance (PMI) is not classified as a stand alone condition it usually presents as part of a larger condition so symptoms of PMI can be specific or varied and include:

- Non-specific poorly localised lower back pain.
- Lateral (outside) or medial (inside) knee pain.
- Adductor (inside leg) tightness and/or soreness
- Buttock and hamstring tightness—upper or lower in nature.
- Anterior lateral lower leg aching and/or tightness.
- Fatigue, decrease in endurance on efforts, hill climbs, gradients, etc.
- A lack of pedal symmetry (wrestling with bike), uncoordinated on the pedal stroke.

## Why Does It Occur?

Why imbalance occurs can be a difficult to determine, however some common triggers include:

## Structural Compensation

These are usually involved with overuse or repetitive abuse or poor work posture. For exam-

ple, when sitting at workstations for long periods, the pelvis will tend to roll backwards, the spine will shorten to a slouching position placing hip flexor muscles in a lengthened position. Over time these muscles adapt to this lengthened position. Hip flexors are important as they are integral in maintaining flexibility to the lower spine and to pelvic muscle balance. These actions all have consequences. On the bike, lengthened hip flexors can cause shortening of the hamstrings, thus placing increased load elsewhere in the body.

## Trauma, Falls And Accidents

Untreated or poorly treated injuries can create compensations.

## Equipment

Bike frame size, seat height and position, head stem length and handle bar positioning can all lead to incorrect cycling biomechanics, which results in overloading and creating imbalances. Your seat height can be a compromise between aerobic efficiency, aerodynamics, power and injury prevention.

## What Happens To Overloaded Muscles?

Skeletal muscles can be categorised into two groups, Phasic or Postural, based upon their major functional tendency. Research into muscle function over the last 20 years has provided us with this theory. Postural muscles under load or stress will tend to shorten whereas Phasic muscles are likely to weaken. See Table 1 for the characteristics of the two types of muscle.

A more detailed understanding of this theory is outside the scope of this article, but it should be noted that predisposition to the muscle type can be modified in some muscles groups, depending on the stimulus (References, Linn et al 1994, see also 7, 8, 9, 10, 11, 12)

The following muscles influence the soft tissue pelvic condition:

Postural Muscles: Hamstrings; Hip Flexors; Triceps Surae; Erector spinae; Quadratus Lumborum; Piriformis and the Short Adductors.

Phasic Muscles: Tibialis Anterior; Gluteus Maximus and Medius; Vastus Medialis and Lateralis; Gluteus Minimus; the Long Adductors.

## Assessing Injury

In the assessment of the soft tissue components we are observing the Range of Movement to the following muscles. We compare them bilaterally so as to find out what muscle groups are restricted:

Hamstrings	vs	Quadriceps
Hip Flexors	vs	Erector Spinae
Hip Abductors	vs	Hip Adductors
Internal Rotatores	vs	External Rotatores
Iliotibial Tract	vs	Peroneals/Tibialis anterior (Lower leg)

We also look at the Soleus and Gastrocnemius of the calf. If there is restriction to one or more groups of these muscles, then it places increased load and tension on other groups.

## Structural Assessment

The current osteopathic type of structural

assessment procedure others are enhanced energy techniques. This means the structural assessment plan is then developed physical assessment

## Leg Length

Over the last few years there has been a lot of interest in the art of especially the 'Australia January



Correct Alignment of the pelvis will be effective and fun



Set Up Check U effective and fun

assessment procedures employed by myself and others are enhanced through the use of muscle energy techniques to address pelvic anomalies (6). This means measuring differences of the bony prominences at the pelvis and lower extremities, the structural assessment should reveal associated soft tissue restrictions to be treated. The treatment plan is then determined on the outcome of the physical assessment.

**Leg Length Differences**

Over the last year I have read with much interest the articles of Steve Hogg on positioning especially the 'DIY Positioning' in *Bicycling Australia* January/February 2003 in which he

highlighted such issues as a twisted pelvis and functional leg length discrepancies and how to compensate for these.

As a soft tissue therapist, the treatment of the twisted or torsional pelvis is similar terminology to having pelvic muscle imbalances. It has been my experience that in assessment of a PMI, it is not uncommon to find functional leg length discrepancies, in fact I feel it is an indication that there is an imbalance in the pelvis. Functional leg length discrepancies are commonplace when treating a pelvic imbalance and there is an opportunity to correct the length discrepancy (6).

It is important to make sure the difference is structural and not functional before accommodating the changes. Proper physical assessment is needed to establish if a structural or functional discrepancy is present. Listed below are the two types of discrepancies with assessment, causes and treatment options.

**1) STRUCTURAL DIFFERENCES**

"Structural differences occur when different length osseous (bones) structures are present." (4)  
**Assessment:**

X-ray of lower extremities. Measurement of bony landmarks and other techniques.

**Possible Causes:**

Congenital from birth or surgery. Femoral / tibial length differences.

**Treatment:**

Correction with orthotics using heel lift with orthotic inserts or orthopaedic shoes. Correction is possibly warranted for individuals with a difference of 6 to 7 mm or more.

Soft tissue or structural therapy is possible if asymmetry is present. A program of physiotherapy, podiatry and strength conditioning is beneficial.

**2) FUNCTIONAL DIFFERENCES**

"Functional differences occur with symmetry of pelvic alignment, asymmetrical pronation or supination or unilateral contractures." (4)  
**Assessment:**

Physical assessment. As per the Structural

Assessment if difficult to clearly assess.

**Possible Causes:**

Rotational patterns, usually medial, internal rotation of the pelvis, knee and or foot and ankle.

Soft tissues shortening in pelvic muscles leads to pelvic tilts or rotations and even soft tissue lumbar and thoracic restrictions.

**Treatment:**

Soft tissue therapy for pelvic asymmetry muscle imbalances of the thoracic and the lumbar regions, etc.

Again, a program of physiotherapy, podiatry and strength conditioning is beneficial.

**Treatment Aims**

- Restore balance to agonist and antagonist muscle relationships.
- Restore the range of movement to restricted muscles.
- Relaxation of the hypertonic muscles.
- Lengthen restricted connective tissue.
- Help restore pelvic joint mechanics.
- Reduce pain/ soreness.
- Improve function, pedal symmetry, endurance and strength.

**Real World Examples**

The following is a case study of PMI that presented whilst I was on the Tour of Tasmania in 1998:

The cyclist presented with the following symptoms whilst racing: Mild to moderate right lower back, buttock pain with left hamstring tightness, anterior-lateral lower leg tightness and aching followed by poorly localised bilateral hip adductor soreness. Associated with this was a feeling of fatigue and weakness on hill climbs and efforts in breakaways and on low-moderate gradients.

All of these symptoms started a week before the tour and had gradually increased. The cyclist sought my help on the third day of the tour. Previously he had been competing in Belgium kermesse races, where he had recently crashed, badly bruising his right shoulder and hip.

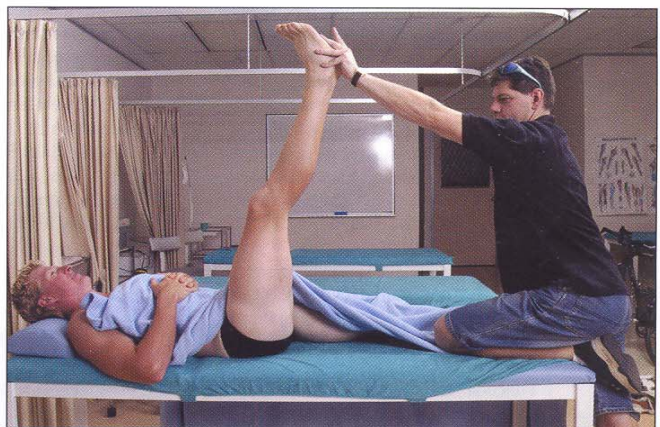


**Correct Alignment.** If one leg is longer than the other, the pelvis will be out of balance when standing. Orthotic inserts are one way to re-align the hips.

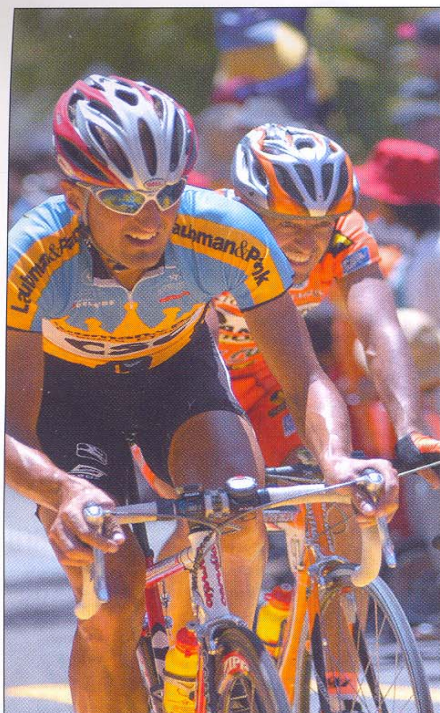
Photos: Darren McNamara



**Set Up Check Up.** The correct bike set up is vital to position the body in the most effective and functional way to avoid injury and maximise performance.



**Discovering Imbalances.** A thorough assessment for pelvic muscle imbalances involves checking for muscle tightness.



#### Assessment:

My soft tissue assessment revealed a restriction in the range of movement of the following muscles:

- Right Hip Flexor short (Psoas Major/Rectus Femoris).
- Right Iliac Height High (Quadratus Lumborum).
- Left Hamstring short (SLR)
- Left Tensor Fascia/ Gluteus Medius
- Left passive lumbar rotation
- Left Peroneus Longus and Brevis
- Right lateral gastrocnemius short (dorsiflexion)
- Right Hip Adductors short
- Right External Rotatore stretch produced buttock pain

#### Treatment:

Soft tissue treatment was aimed at restoring mobility and length to the right hip flexors, right trunk lateral flexors, left hamstring/sacrobuterous fascia, left antero-lateral lower leg, right (medial) tibialis posterior, left internal hip rotatores, right hip adductors and right hip external rotatores.

During the next day of competition there was a fairly flat stage with mild-moderate gradients. At the end of the stage there was a clear understanding that the stage went fairly well and symptoms had reduced considerably with slight

adductor/hamstring tension, however lower back symptoms and weakness on efforts had dissipated and a feeling of strength had returned. As the tour continued, I was able to provide ongoing treatment throughout the remaining tour with complete resolution of symptoms.

It is the intention of this article to present the view of assessment and treatment of muscle imbalances to the pelvis, however the following points are to be investigated to enhance the long term resolution:

#### Possible Causes Of PMI:

- Seat Height: Requires a biomechanical assessment to assess cycling posture.
- Intrapelvic Instability: Treated by pilates and physiotherapy.
- Peripelvic Strength: Turning on and off the required muscles.
- Motor Control/Functional Stability: Exposure to the right stimulus—riding on rollers helps with natural stabilisation mechanisms.
- Trauma: Accidents, direct injuries, falls, etc.

#### Preventing PMI

The following are tips on how to help avoid PMI and other related dysfunction, we should be aware that this will not guarantee that PMI won't develop however.

- Regular soft tissue therapy to address areas of soreness/stiffness and restriction.
- Regular stretching routine.
- Have your bike set up by a professional.
- Train within your capabilities. Have a structured training program set by someone who has qualifications and experience and is familiar with your capabilities and goals.
- Assessment and treatment for injuries sustained from trauma, falls, accidents and postural considerations.
- Strength and conditioning for peri pelvic, intrapelvic and functional instability.

The associated factors in pelvic imbalance may coexist, so therefore it has been my experience to send clients for referral on both biomechanical considerations to address strength and conditioning in relation to any of the associated factors (physiotherapy etc) and also the training fundamentals to a specialist coach.

A referral for muscle-strengthening and movement coordination is an integral key to the effectiveness and stability of the pelvic imbalance.

Some previous articles of interest in *Bicycling Australia* include:

'Avoiding Back Pain' by Emma Colson, *Bicycling Australia* June 1998, Vol 9 No.5

'High Performance Stretching' by Susan Everett, starting in *Bicycling Australia*, April

1998, Vol 9 No 3.

See also Emma Colson's article on stretching, titled 'Stretch Your Abilities' in this issue of *Bicycling Australia*.

In closing, it should be noted that pre-existing lower back intervertebral disc pathologies, apophyseal joint injury, stress fractures, spondylolisthesis or any severe constant pain is not to be confused with PMI. Further examination by sports physician or physiotherapist may be required to rule out these pathologies.

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**Table 1. Characteristics of Postural vs. Phasic muscles. (9)**

	Postural	Phasic
Type	Slow twitch (White)	Fast twitch (Red)
Respiration	Anaerobic	Aerobic
Function	Static/Supportive	Phasic/Active
Dysfunction	Shorten	Weaken
Treatment	Lengthen	Facilitate/Strengthen

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