

# *The One-Leg Standing Test and the Active Straight Leg Raise Test: A Clinical Interpretation of Two Tests of Load Transfer through the Pelvic Girdle*

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*Published in the Orthopaedic Division Review - 2005*

I read with interest and some concern the discussion in the last issue of the Orthopaedic Division Review on evidence based practise and how it is impacting our clinical practise. Of concern was the statement made by Peter Huibregts in his article "Lumbar spine coupled motion: A literature review with clinical implications" that "At this time, no evidence-based diagnostic tools in either history or physical examination seem to be available to the primary care manual medicine practitioner to determine the nature of these inter-individual differences" (how the lumbar spine couples in motion and how to use this information for treatment technique selection). Fair enough, however – now what do I do if I want to treat my patient? On what do I guide my technique selection for the restoration of function i.e. mobility and stability? In the same issue, Diane Jacob eloquently reminds us of Melzack's post Cartesian neuro-matrix theory that "proposes that most of what is called chronic pain is neurological malfunction more than it is physical, tissue based dysfunction" therefore using pain provocation tests (which they do have reliability and sensitivity for the pelvic girdle – Laslett & Williams 1994) is not the way to go either. Both Richard Rosedale and Scott Whitmore quote Sackett who feels that "Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values'. I like this sentence a lot - to be an evidence-based clinician, Sackett suggests that we must use a combination of evidence from the research, clinical expertise and patient input; not just research. To the working clinician this must ring true since we need many more clinical tests/techniques than are currently 'scientifically reliable, valid, sensitive and specific' to assess and treat our patients.

Recently, two tests of load transfer through the pelvic girdle have been scrutinized scientifically; the one leg standing test (also known in Canada as the ipsilateral and contralateral kinetic test or Gillet test (Hungerford et al 2004)) and the active straight leg raise test (Mens et al 2001, 2002). I'd like to explain how these tests can help the clinician when prescribing a specific exercise program for stabilization of the pelvic girdle. Parts of what follows is 'proven' in the scientific literature and part still remains based on clinical experience; evidence-based practise ala Sackett. The following descriptions of these tests is taken in part from the 3<sup>rd</sup> edition of the Pelvic Girdle (Lee 2004).



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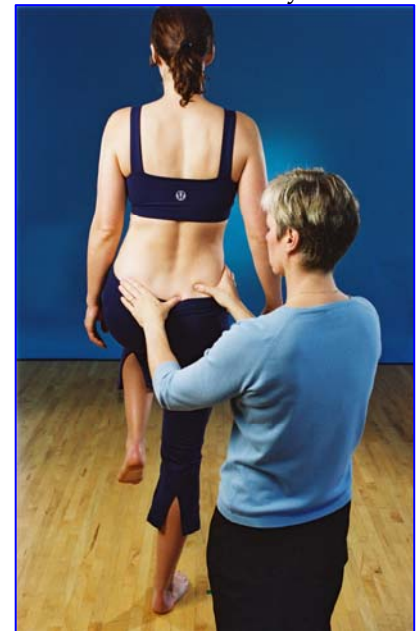
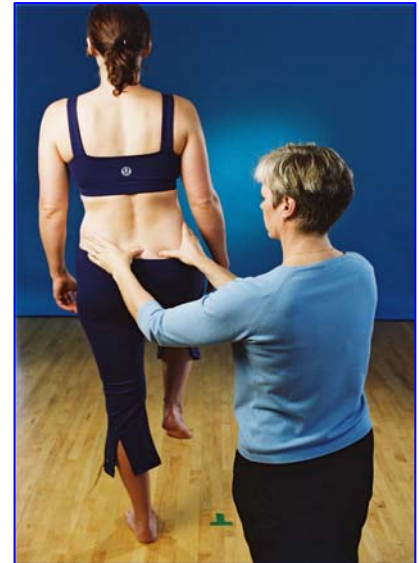
## *One Leg Standing Test*

This test is also known as the Gillet test, stork test or kinetic test and examines the ability of the low back, pelvis and hip to transfer load unilaterally (support phase) as well as for the pelvis to allow intrapelvic rotation (Hungerford et al 2004). Initially, the patient is instructed to stand on one leg and to flex the contralateral hip and knee towards the waist. The ability to perform this task is observed. The pelvis should not anteriorly/posteriorly/laterally tilt nor rotate in the transverse plane as the weight is shifted to the supporting limb. The test is repeated on the opposite side. Subsequently, the intrapelvic motion which occurs during this task can be examined as follows:

1. Hip flexion phase (ipsilateral kinetic test): With one hand, palpate the innominate at the inferior aspect of the posterior superior iliac spine (PSIS) and at the iliac crest on the non-weight bearing side. With the other hand, palpate either the median sacral crest at S2 or the ILA of the sacrum on the same side as the innominate being palpated.

Instruct the patient to flex the ipsilateral hip (same side you are palpating) and note the posterior rotation of the innominate relative to the sacrum. Compare the amplitude and quality (resistance) of this movement to the contralateral side. This is not a test for mobility of the *sacroiliac joint* but rather a test of osteokinematic motion of the low lumbar vertebrae, the innominate and the sacrum. Many factors can impede osteokinematic motion, the sacroiliac joint is one. The motion should be symmetric between the left and right sides of the pelvic girdle.

2. Support phase: On the weight bearing side, with one hand, palpate the innominate at the inferior aspect of the posterior superior iliac spine (PSIS) and at the iliac crest. With the other hand, palpate either the median sacral crest at S2, or the ILA of the sacrum, on the same side as the innominate being palpated. Instruct the patient to flex the contralateral hip (side you are not palpating) and note the motion of the innominate relative to the sacrum (contralateral kinetic test). Especially note the movement that occurs as the weight is transferred onto the supporting leg (initial loading) and the contralateral leg is coming off the ground. The innominate should either posteriorly rotate or remain still *relative to the sacrum* (in a posteriorly rotated position; what is observed will depend on the starting position of the innominate (Hungerford et al 2004)).



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A positive test occurs when the innominate anteriorly rotates or internally rotates relative to the sacrum (failed load transfer through the pelvic girdle) (Hungerford et al 2004) or flexes relative to the femur (failed load transfer through the hip joint). This is a less stable position for load transfer both through the pelvis and the hip.

Clinically, if the patient can transfer weight through the leg without losing the stable position for the sacroiliac joint (sacral nutation/posterior rotation of the innominate) then the pelvic girdle is stable. This will require optimal form closure, force closure and motor control. If during the weight transfer the innominate is felt to move out of its stable position (internally and/or anteriorly rotate) then a diagnosis of failed load transfer within the pelvic girdle can be made and further tests are required to identify why the pelvic girdle is no longer able to transfer load. Some intrapelvic causes could be:

1. loss of articular stability of either the sacroiliac joint/s or pubic symphysis – loss of form closure
2. loss of neuromyofascial stability – loss of force closure/motor control. This is a huge component and may relate to timing of specific muscle activation, strength or endurance of both the local lumbopelvic stabilizers or the global thoracopelvic and/or hip stabilizers.

Obviously, many more clinical tests are needed to differentiate the above. The one leg standing test can also be used clinically to determine a patient's progress, for example to determine when the patient is ready to begin vertical loading exercises.

### *Active Straight Leg Raise Test*

The supine active straight leg raise test (ASLR) (Mens et al 2001, 2002) has been validated as a clinical test for measuring effective load transfer between the trunk and lower limbs. When the lumbopelvic-hip region is functioning optimally, the leg should rise effortlessly from the table (effort can be graded from 0 – 5) and the pelvis should not move (flex, extend, laterally bend or rotate) relative to the thorax and/or lower extremity. This requires proper activation of the muscles (both in the local and global systems) which stabilize the thorax, low back and pelvis. Several compensation strategies have been noted (Richardson et al 1999, Lee 2004, Lee & Lee 2004)

when stabilization of the lumbopelvic region is lacking. The ASLR test can be used to identify these strategies. The application of compression to the pelvis has been shown (Mens et al 1999) to reduce the effort necessary to lift the leg for patients with pelvic pain and instability. It is proposed (Lee 2004) that by varying the location of this compression during the ASLR, further information can be gained which will assist the clinician when prescribing exercises to improve motor control and stability (Lee 2004, Lee & Lee 2004).




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The supine patient is asked to lift their extended leg off of the table and to note any effort difference between the left and right leg (does one leg seem heavier or harder to lift). The strategy used to stabilize the thorax, the low back and the pelvis during this task is observed. The leg should flex at the hip joint and the pelvis should not rotate, sidebend, anteriorly or posteriorly tilt relative to the lumbar spine. The rib cage should not draw in excessively (over-activation of the external oblique muscles), nor should the lower ribs flare out excessively (over-activation of the internal oblique muscles). Over-activation of the external and internal oblique will result in a braced, rigid rib cage that limits lateral costal expansion on inspiration. The thoracic spine should not extend (over-activation of the erector spinae), nor should the abdomen bulge (breath holding – valsalva). In addition, the thorax should not shift laterally relative to the pelvic girdle. The provocation of any pelvic pain is also noted at this time.

The pelvis is then compressed passively and the ASLR is repeated; any change in effort and/or pain is noted. The location of the compression can be varied to simulate the force which would be produced by optimal function of the local system. Although still a hypothesis, clinically it appears that compression of the anterior pelvis at the level of the ASIS's simulates the force produced by contraction of lower fibres of transversus abdominis (and the anterior abdominal fascia) and compression of the posterior pelvis at the level of the PSIS's simulates that of the sacral multifidus (and the thoracodorsal fascia). Compression of the anterior pelvis at the level of the pubic symphysis simulates the action of the anterior pelvic floor whereas compression of the posterior pelvis at the level of the ischial tuberosities simulates the action of the posterior pelvic wall and floor. Compression can also be applied to one side anteriorly and simultaneously to the opposite side posteriorly. You are looking for the location where more (or less) compression reduces the effort necessary to lift the leg; the place where the patient notes 'That feels marvellous!' Further examination of the lumbopelvic core musculature (i.e. response to a verbal cue to contract) confirms or negates the findings of the ASLR test and confirms which muscles require retraining. The ASLR test can be used throughout the treatment program to guide the clinician as to how to add or modify the exercises given, i.e. when to start with transversus abdominis vs. when to start with multifidus.

### *The Active Straight Leg Raise Test and Sacroiliac Belts*

External support of the pelvic girdle (taping or a belt) is used only as an adjunct to the restoration of force closure. Damen et al (2002ca,b) were able to show using Doppler imaging that the stiffness of the SIJ increases when a belt is applied to the pelvis. There are many sacroiliac belts on the market and most will be effective in providing some degree of compression (Vleeming et al 1992). However, patients sometimes require more or less compression than a general belt can supply and often it is difficult to specify the location of the compression (bilateral anterior, bilateral posterior, unilateral anterior and/or unilateral posterior). This led to the development of a new sacroiliac belt – The Compressor (Lee 2002) (For distributor sources – see  Compressor – this website).

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Essentially this belt consists of a light fabric material which is wrapped around the pelvic girdle and secured with Velcro™. The compression straps are then attached to the belt specifying the location of compression. The straps can be overlapped (doubled up) to increase the amount of compression at that location. Four straps of two different lengths are included with the belt. The active straight leg raise test is used to

determine exactly where and how much compression is needed. If bilateral anterior compression of the pelvis (approximate the ASISs) allows the patient to lift the leg with less effort, then two straps are applied by anchoring each band laterally and pulling them to the anterior midline (pubic symphysis). One band is applied at a time. If bilateral posterior compression of the pelvis (approximate the PSISs) allows the patient to lift the leg with less effort, then two straps are applied by anchoring each band laterally and pulling them to the posterior midline. One band is applied at a time. If unilateral anterior compression and unilateral posterior compression is the most effective, then one band is applied anteriorly and one band posteriorly. Once the bands are applied, the ASLR is repeated. The patient should notice a marked difference in the ability to transfer load through the pelvic girdle through a reduction in the effort required to lift the leg when either supine or in standing. The same principles and tests are applied if tape is used instead of the Com-pressor.

Initially, the pelvis should be taped or supported by a belt whenever the patient is vertical (i.e. standing, sitting or during any activity of daily living). As force closure returns, the patient should wean off the belt by reducing the amount of compression (loosen the tension in the compression straps) and finally removing the belt altogether for short periods of time (begin with ½ hour). Ultimately, they should be able to eliminate the need for any external support.

The one leg standing test and the active straight leg raise test are now being used world-wide in ongoing research of function and dysfunction of the pelvic girdle. They are often used for establishing inclusion criteria and also for monitoring clinical outcomes. For the practicing clinician, they can be used, in part, to establish a diagnosis of failed load transfer through the pelvic girdle (instability) and subsequently as monitoring tools of progress. However, many more, as yet, non-validated tests are required for treating the pelvic girdle in clinical practice. By integrating the 'best evidence' with 'clinical expertise', perhaps we will eventually answer the question "What is the best way to restore optimal function of the lumbopelvic-hip region?" In the end, we may discover that there is more than one way and thankfully so.



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## *References*

- Damen L, Spoor C W, Snijders C J, Stam H J 2002a Does a pelvic belt influence sacroiliac joint laxity? *Clinical Biomechanics* 17(7):495
- Damen L, Mens J M A, Snijders C J, Stam J H 2002b The mechanical effects of a pelvic belt in patients with pregnancy-related pelvic pain. PhD thesis, Erasmus University, Rotterdam, the Netherlands
- Hungerford B, Gilleard W, Lee D 2004 Alteration of pelvic bone motion determined in subjects with posterior pelvic pain using skin markers. *Clinical Biomechanics* (19):456
- Laslett M, Williams W 1994 The reliability of selected pain provocation tests for sacroiliac joint pathology. *Spine* 19(11):1243
- Lee D 2002 The Com-pressor available online from [www.optp.com](http://www.optp.com)
- Lee D 2004 *The Pelvic Girdle*, 3<sup>rd</sup> edition Elsevier Science
- Lee D, Lee LJ 2004 *An Integrated Approach to the Assessment and Treatment of the Lumbopelvic-hip Region - DVD*. [www.dianelee.ca](http://www.dianelee.ca)
- Mens J M A, Vleeming A, Snijders C J, Stam H J, Ginai A Z 1999 The active straight leg raising test and mobility of the pelvic joints. *European Spine* 8:468
- Mens J M A, Vleeming A, Snijders C J, Koes B J, Stam H J 2001 Reliability and validity of the active straight leg raise test in posterior pelvic pain since pregnancy. *Spine* 26(10):1167
- Mens J M, Vleeming A, Snijders C J, Koes B W, Stam H J 2002 Validity of the active straight leg raise test for measuring disease severity in patients with posterior pelvic pain after pregnancy. *Spine* 27(2):196
- Richardson C A, Jull G A, Hodges P W, Hides J A 1999 *Therapeutic exercise for spinal segmental stabilization in low back pain – scientific basis and clinical approach*. Churchill Livingstone, Edinburgh
- Vleeming A, Buyruk H, Stoechart R, Karamursel S, Snijders C 1992 An integrated therapy for peripartum pelvic instability: a study of the biomechanical effects of pelvic belts. *American Journal of Obstetrics and Gynecology* 166(4):1243

