



REHAB / RECOVERY / PHYSIOTHERAPY

Basic Rehab: One-Leg Standing

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Let's explore some basic ways to assess functional strength and stability relative to the lower back, including a couple of simple tests to determine key lower back muscular stability, and several exercises and activities to normalize function.

Testing Stability

Here are a couple of simple tests, done standing. The question is, can the patient stand on one leg? As usual lately, I am riffing from concepts I gleaned from Mike Boyle. Standing on one leg, pushing off from one leg, is the essence of human locomotion. In the kinetic control model, this would be called rotation control, as you are testing asymmetric movements that involve rotation.

How do we test and record this? I appreciate that some folks like to score functional tests on a 0-3 system. I tend to keep it simpler, with a pass / fail system. (See a video of these tests at www.youtube.com/marchellerdc; "One Leg Standing Tests.")



Sit behind the patient with your right thumb on the right PSIS; left thumb horizontal on the right sacral base. Patient lifts their left leg 3-4 inches.

The load transfer test: Start by having the patient facing away from you. You will assess the stability of the right side by having your right thumb over the right PSIS, and your left thumb directly horizontal over the sacrum, at approximately S2. What happens as the patient lifts their left leg? You are not having them lift it way up, as they would in a classic Gillet Stork test. Tell them to slowly lift their left leg off the floor, 3-4 inches. You are assessing the first motion, as they shift their weight to the right leg. This is Barbara Hungerford's load transfer test.¹ She did a nice study of this testing protocol; it seems to be useful and reproducible.²

(Hungerford calls this the *Stork test*. I would prefer she didn't use that term, as it muddies up the original Gillet Stork test, which I still use as a screen for lack of SI motion.² The original Gillet Stork test may or may not be reproducible, but we need to use multiple tools, the weight of the evidence, to determine which joints are stuck.)

What happens when the patient shifts all of their weight onto the right leg? Ideally, the PSIS will posteriorly rotate, move toward you, and thus your right thumb will appear to move inferior (or at least stay still). In a failure of stabilization on the right side, the right PSIS moves anterior, or upward from your perspective. Basically, the stabilization muscles, including the gluteus maximus and the multifidi (and other stabilization muscles), should activate as the weight goes onto the right leg, and rotate the ilium backward. This moves the ilium on the sacrum toward a close-packed and more stable position. The patient is rarely aware of what is happening; that is the only downside of this test.



An abnormal response is when the right PSIS goes cephalad, indicating instability.

Repeat on the left side with your left thumb on the left PSIS, the right thumb lined up in the horizontal, on the left sacrum. The patient then lifts the right leg, and is standing on the left leg alone.

What are the clinical correlations here? Let's use a one-sided example here, which is the more common, but fix what you find. Think first of an unstable sacroiliac. The classic or usual pattern is that the right ASIS is sagittally rotated forward; what we chiropractors call an AS ilium. We can adjust or mobilize this over and over, or we can train the muscles needed to stabilize this pattern.

Think about what failure of the load transfer test is telling us. It says that when the weight is on the right leg, the right side of the pelvis is rotating forward, is not controlled, and is not able to achieve a close-packed, stable position.

How about the lower lumbar? When you find a divot, a hole, in the right multifidus at the L5 or L4 level, it means that the multifidus is not working and the muscle has atrophied to some degree. The patient loses the ability to stabilize the initial motion of the lumbar. The lower lumbar may also get stuck, with prominence on the left side, and resisting right rotation.



A normal response is when the right PSIS goes inferior, indicating proper activity of the stabilizing muscles.

Again, if the rotation continues to recur, address the underlying muscular imbalance. Don't forget how quickly inhibition and atrophy can occur with any painful condition. It doesn't matter what started the pain; the stabilization muscles will get inhibited, and this leads the patient into chronicity. (We'll talk about stabilization exercises later.)

A functional test for the gluteus medius: The next test is more specific for the [gluteus medius](#). Place your thumbs on the PSISs; your left thumb on the left PSIS and your right thumb on the right PSIS. Your thumbs should be level, horizontal with each other. Ask the patient to step forward onto their right leg in a normal gait manner. You want them to put their full weight onto the right leg.

Once the weight is forward, does the left PSIS drop inferior? If so, this is a mild Trendelenberg sign. Their right gluteus medius is not functioning optimally, and it is allowing the left hip to drop. Have the patient step forward with the left leg, and see if they drop on the right side.

This is a quick and dirty version of gait analysis. As the patient moves forward, do they drop on one side or the other? In another version of this same test, you can put adhesive paper markers, like little circles, on the patient's PSISs and watch them walk away from you. If they are weak, they will repeatedly drop on one side, the one opposite from the weak gluteus medius. The patient will usually have weakness of the gluteus medius on the same side as their overall stability weakness, but it can vary.



As the patient steps forward onto their left leg, a normal response is if the PSISs stay level.

Confirming the Findings and Informing the Patient

Let's confirm these tests in a way that informs the patient. For the gluteus medius, position the patient on their side and muscle test the gluteus medius. Make sure to line up the structures correctly; don't let the pelvis roll backward, as they will cheat with the rectus femoris and TFL.

For a confirmation of the load transfer test, ask the patient to stand on one leg. Most of you are familiar with variations on this. Ask them to start by standing on one leg. They have to stand without support; it is not OK on any of these tests for them to stabilize with a hand. The next level is to ask them to do a one-legged mini squat, about 10-15 degrees of squat. The final test is for the patient to hold the one-leg mini squat, focus on a point behind them, and then close their eyes. They should hold each of these positions for at least 10 seconds.

The patient will usually be aware that they have poor balance during one or more of these tests, usually much more obvious on one side. You should watch them as they perform the tests, of course; do they sway, do they twist, do they flex their lumbar? How is their form? You are looking for a failure of the ability to stand on one leg in terms of endurance, strength or quality of motion.



As the patient steps forward onto their right leg, an abnormal response is if the left PSIS drops inferior, indicating a lack of activation of the right gluteus medius.

Another confirmation of weight-transfer problems is to use an active straight leg raise test, or variations on one-legged bridge activity. Note if the patient rotates in the pelvis as they lift. You are testing the side that is on the table for its ability to stabilize, not the side that the leg is lifted on.

It is more cumbersome to describe these tests than to do them. These are simple and quick tests. I like to do them on my initial visit with anyone with subacute or chronic low back pain.

Rehab Exercises to Improve One-Leg Standing

What exercises do these tests lead to? For the gluteus medius, you can start with the clamshell and progress to a side step with bands. For the side step, don't forget to have the patient focus on the side that is stabilizing. Both sides of the gluteus medius are working, but the focus is on the one on the ground.

For the various one-leg standing tests, the activity I like the patient to start with is to practice standing on one leg. At the beginning, they should brace their core and focus on their connection with the ground. The patient should practice standing on that "weak" leg during various activities of daily living. Most patients will notice that putting their weight on that leg is unfamiliar. I suggest doing it while waiting in line, talking on the phone, brushing their teeth, etc.

The next step involves exercises such as functional reach and balance reach, where the patient has to weight shift with the extremities while standing on one bent leg. I learned this from Liebenson.⁴ Apparently, the term *functional reach* also refers to another functional test. Any twisting activities, such as a Frisbee throw with a band, or Cook's chop and lift with a band or pulleys, will challenge this.

It's not rocket science. It's about focusing on multi-joint functional activity, done with excellent form, while standing on one leg. It's not about one muscle. It's about the coordinated efforts of the core to stabilize while the limbs move. This is the essence of functional training. The main challenge is to learn to move in a coordinated and smooth way, stabilizing the trunk, while standing on one leg.

The average patient with low back pain or instability should not start with unstable surfaces. Don't forget to assess for and correct sacroiliac and lumbar joint restrictions. When the pelvis or lumbar are fixated, the stabilization muscles will be inhibited. I've tried to keep it simple here. Hope it helps you help your chronic low back patients.

References

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