Leg Length Inequality
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Step One: Leg Length Inequality (LLI)
Differences in leg lengths can either be structural or functional in nature. Structural LLI is due to anatomical causes, such as unequal growth rates, fractures, lesions, and degeneration. Far more common is functional LLI, which results from physiological responses secondary to biomechanical stresses along the kinetic chain. The most common cause of functional LLI is excessive pronation (a rolling-in of the foot) that produces an apparent shortening of the limb.

![Before: Patient standing barefoot | After: Patient standing on their Foot Levelers](image)

When a patient is standing, a difference in leg length results in an uneven foundation for the pelvis, causing various postural shifts in response. Eventually, specific degenerative changes will be seen in the hip joints, pelvis, and spine. During gait the foot/ankle complex will over pronate, causing excessive inward (medial) rotation of the entire lower extremity. The increased rotational forces are transmitted up the leg into the pelvis, especially the sacroiliac (SI) joint.

Clinical research confirms correlation of pain and LLI in 79-89 percent of patient’s studied. Presenting symptoms may include chronic or recurrent sciatic pain, unilateral hip symptoms, and pain in the lower back or along the thigh. The structural misalignment typical of prolonged LLI affects muscular pull and the amount of weight borne by the joints.

When weight and pull fall abnormally on the musculoskeletal system, serious and often subtle consequences eventually occur. The body’s adaptation resources become exhausted, endurance is reduced, and strain on the body increases. A vicious cycle of ‘misalignment’, muscle fatigue, and ligament stress is created.

Step Two: Proprioception.
Proprioception is defined as “sensing the motion and position of the body.” Our bodies are equipped with several interrelated mechanisms to sense and provide this necessary information. Specialized nerve endings are present in the soft tissues of the musculoskeletal system which interact with the central nervous system and coordinate our body movements, our postural alignment, and our balance.

The muscular system is the largest system in the body, and it is the muscles which are responsible for maintaining postural alignment and moving body segments. The most important sensory nerve endings for controlling this massive system are the muscle spindle fibers. Specialized nerve sensors are found throughout the musculoskeletal system, in all skeletal muscles, and in every ligament, joint capsule, and articular connective tissue.

The three areas of greatest proprioceptive importance are:
1. the foot,
2. the spine (generally but particularly the sacro-iliac joints), and specifically,
3. the upper cervical spine.

Step Three: The LLI-Proprioception connection.
The foot is one of the areas of greatest proprioceptive input. LLI commonly arises from ‘misalignments’ (excessive pronation) in the feet. LLI
affects muscular pull, which leads to muscle fatigue and ligament stress. Muscles and ligaments are the source of a large number of the body’s nerve endings and proprioceptive sensors. When muscles and ligaments are under continual strain, the body’s ability to maintain proper proprioception is negatively affected.

What Can Be Done?
The clinical management of LLI depends on the type of leg length inequality (functional or structural), the degree of inequality, and the age of the patient. Foot Levelers’ custom-made Spinal Pelvic Stabilisers (SPS) orthotics are valuable for most LLI cases because they are custom designed to support all three arches of the foot and hence reduce the proprioceptive ‘noise’ of poor foot biomechanics.

The SPS base is leather so that the orthotic surface is dynamic in nature during the gait cycle as opposed to the splinting effect of rigid and semi-rigid plastic orthotics. Another helpful adjunct is the use of exercise bands anchored to the ankle to perform a series of ankle exercises. Of course, adjusting the spinal pelvic and lower extremity joints has a direct effect in normalizing receptor responses.

Patients with proprioceptive imbalances benefit from various external supports to help them achieve proper body positioning. These include SPS Orthotics from Foot Levelers for the foot and ankle, cervical support pillows for chronic neck pain, and chair supports to provide alignment of the back during sitting.

Heel Lifts
Custom-made, flexible SPS Orthotics can make an immediate impact on leg length inequality and the body’s proprioceptive functioning by improving postural alignment. When you order Foot Levelers stabilisers for a patient with excessive LLI, it’s important to request a 3mm, 5mm and 7mm detachable heel lift.

Fit your patient with the custom-made stabilising orthotics and allow them to break them in over a six week period. Recheck the LLI and your indicators should show an improvement. This step alone can improve the LLI by 5mm on average.

If the LLI needs further balancing, add the 3mm lift for a 3-week period. You can keep increasing the heel lift by replacing the 3mm lift with the 5mm etc. Add the 5mm for 5 weeks and then reassess.

The maximum lift I would recommend is 7mm otherwise the foot becomes excessively flexed and the patient will have difficulty getting their foot in their shoe. You will need to advise your patient to have their shoes built up if they require a lift greater than 7mm.

The main clinical gem I can share with you about heel lifts is to add them slowly and be very conservative with your recommendations. Even a 3mm heel lift can have a significant impact on the patient’s biomechanics which can lead to an excessive firing of nociceptors.

For more information on heel lifts and Foot Levelers orthotics call Synaptic Design 1800 800 963

References