



Orthotics



Have you been told by your therapist that you may need to wear orthotics?

Even if not, you have probably been involved in some discussions following your long Sunday run or walk about leg and foot injuries and painful muscles when the word “orthotics” has come up.

Orthotics (or more correctly orthoses) are appliances manufactured to assist the functioning of certain anatomical body segments. When applied to us runners and walkers, this refers to devices inserted into our shoes to alter the force patterns on our feet as well as on our whole body. Orthoses can also be applied, in certain conditions, to the arms and even to the spine as in a spinal brace or orthosis.

The most common reason for one to be prescribed a foot orthosis is to help control excessive pronation (see Figure 1). Notice I said “excessive” because for most of us, pronation is a normal aspect of walking and running. To understand this we must look at the biomechanics of gait—both in walking and in running. Flat foot is another common term for pronation. The gait cycle describes one stride length of the leg and is divided into two phases: the stance phase, when your foot is on the ground, and the swing phase, when your foot is in the air. The velocity of your gait determines the duration of the stance and swing phases. The faster one goes the more time is spent in swing phase and the less time in stance phase. For instance, if you are standing still, you obviously have no feet in the air and your stance phase is 100% of your gait cycle and your swing phase is 0%. For fast runners, your stance phase may be as short as 30% and your swing phase as long as 70%. Obviously a foot orthosis will not provide any support for your foot while your foot is in the air and not making any contact with the ground.

When your foot strikes the ground, you absorb anywhere from 1.5 to up to 3 times your body weight! If you weigh 125 lb and run for 10 km, you will generate several thousands tons of force through your feet, legs, pelvis and whole body.

It's a wonder we don't get injured more than we do with our sport.

When your foot strikes the ground, most people land on their heel first (although some sprinters are toe runners).

Your hind foot then pronates, or rolls inwards. This movement helps your body absorb some of those forces described above and minimize any injuries from developing. As you continue through your stance phase, in preparation for toe off and lifting your foot off the ground, your foot then starts to roll outwards, called supination. This function makes your foot a

stronger lever-arm and allows more efficient support for your muscles and helps propel you upwards and forward. So you can see your foot is going through a lot of inwards and outwards movement while a lot of force is being applied to it. If for any reason, your body mechanics are not in line, you may develop injuries anywhere up the chain of limb segments from the foot to the back. For instance, if when you land with your foot on the ground and your foot goes into too

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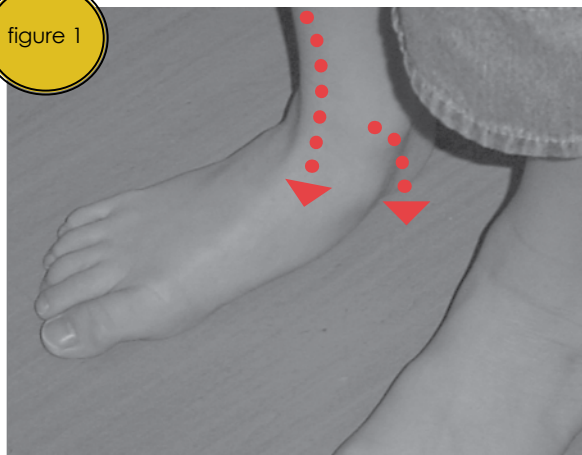
much pronation, this can lead to abnormal forces in your shinbone or in your knee. Usually, when one's foot pronates to a normal degree,

your knee also bends a little at exactly the same time. If, however, your foot pronation continues on further and longer than normal, your knee will have already started to straighten out. This can lead to the development of a condition called “runner's knee.” It can also contribute to shin splints, compartment syndromes, and over time, even lead to the development of stress fractures.

Sometimes you can see that you are an over-pronator by looking at your worn shoes or at your feet. Your feet may have the appearance of being flat with fallen arches. This is commonly seen in over-pronators. Your shoes may reveal excessive deformity of the heel counter (that portion of the shoes that supports your heel bone). Your therapist or experienced shoe salesperson may also recognize your foot condition.

A *Running Room Magazine* readers' poll asked what readers thought of orthotics: 70% of readers “loved” them and another 20% were “thinking about getting them.”

figure 1





Who needs them?

by Richard Beauchamp, MD

History of Othoses:

Orthotic usage was popularized in the late 1960s after some researchers from the University of California Berkley Laboratory (UCBL) experimented with runners using high speed cinematography. They realized the excessive pronation in runners could be controlled with a shoe device and thereby allow a runner to run faster. This discovery then lead to the common usage of foot orthoses for treatment of various foot conditions such as plantar fasciitis. The original foot orthoses were often referred to as UCBL orthotics.

If you are an over-pronator and require treatment, the most effective device is a pair of foot orthoses. **Figure 2** shows a runner's foot from behind with the heel bisector marked. Notice the correction in the marked line when a properly constructed foot orthosis is supplied. These usually are custom made and consist of more than an arch support. If you have flat feet, an arch support will do just that, support your arch. They, however, do not allow proper correction of the biomechanical abnormality, which is the excessive and prolonged pronation. You need a custom orthosis made to correct your biomechanically abnormal foot. This should be done by a certified orthotist or pedorthist.

Some mild cases of over-pronation can be effectively treated with motion-control running shoes. However, using orthotics has the advantage of allowing the user to transfer them to other shoes for use when not running.

But who needs to wear foot orthoses? Not all people who pronate require orthoses. Those people who over-pronate may be prone to injuries and do require proper corrective foot orthoses. If you are prone to injuring your body when you exercise, you require a thorough medical assessment by someone experienced in the field. You also need a gait analysis to correctly diagnose and quantify your degree of anatomical abnormality. If you do obtain a pair of foot orthoses, they may have to be gradually introduced to your sport over a one to two week period. Don't place the orthoses in your shoes and partake in an arduous race until you have become accustomed to the new position your foot is assuming. Foot orthoses should be checked for abnormal wear and tear every six months and may require replacing every three to four years (see figures 2 and 3 courtesy of Jason Goodnough, C.P.O. (c), B.C. Institute of Technology, Burnaby, B.C.). ❖



About Richard Richard Beauchamp is a runner as well as an orthopedic surgeon. His running career has spanned about 10 years and involved seven marathons. His orthopedic surgery career extends over 25 years. He is the medical director of the Shriners's Gait Lab at the Sunny Hill Health Centre in Vancouver and a clinical professor in the Department of Orthopaedics at the University of British Columbia. He runs out of the Alma Running Room along with his wife and "cookie maker," Dorothy