COLES
Sports Therapy & Rehab

What you should know

Use of orthotics has added a new dimension in the treatment and prevention of overuse injuries of not only the lower extremity but also of the hip and back. However, there is still confusion as to what orthotics are and what they can and cannot do, along with who should and should not use them.

What is an orthotic?

The Greek work ortho literally means straight, upright and correct. An orthotic is a biodynamic device that fits into running shoes to accomplish two things:

(1) To ensure that the foot moves correctly through the various phases of running which includes heel contact, whole foot contact and toe off, the orthotic functions like a rudder to help the foot function efficiently biomechanically.

(2) To support the foot, the orthotic assists the foot and enables it to communicate and align with the rest of the body. The body is then balanced above the foot in midstride as well as when the foot is on the ground.

A true functional foot orthotic is a custom-made device prescribed by a chartered physiotherapist, podiatrist or sports injury specialist.

The science of biomechanics has provided much of the framework from which functional foot orthotics have evolved. Lower extremity biomechanics is concerned with the study of gait, food stability, propulsion and muscle action, and how they relate to human motion.

BIOMECHANICAL BASICS

To fully appreciate why some runners need orthotics and others do not, an insight into basic biomechanics will go a long way towards explaining the need for orthotics.

Our feet go through a very complex series of movements to help propel us forward. One of the most important functions of the foot is to help the body absorb shock when it hits the ground. Every time we strike the ground in running, our lower extremities experience a force between one and a half and three times our body weight.

Pronation

The foot normally strikes the ground on the outside (lateral) part of the heel. As soon as this occurs, the heel should roll in. This motion, called pronation, which absorbs shock, gives the appearance that the arch is flattening out. This mechanism of pronation reduces forces to the ankle, knee, hip and back and helps prevent impact related injuries such as stress fractures.

Once this 'pronation phase' is complete, the foot begins to roll-out or supinate slightly, creating a more stable foot position and allowing the lower extremity to achieve maximum efficiency when pushing off.

Pronation then, is a normal, necessary biomechanical motion in foot function. However, if the foot pronates too much or for too long it will remain unstable, making the lower extremity less supportive of body weight. This can result in a multitude of overuse injuries from heel or arch pain, stress fractures, knee, hip and back pain and injuries.

Pronation, therefore, is a problem only when it becomes excessive. Excessive pronation can result from several causes. Hereditary bone structure refers to our foot shape, which to a great extent, is genetically predetermined. The position of the joints can cause the foot to assume a pronated position.

Excessive pronation can also result from biomechanical abnormalities. If a certain part of the foot or leg is unable to go through the motion necessary in normal walking and running, another nearby joint may be required to make up or compensate for this lack of motion. For example, one of the most common biomechanical problems causing the foot to over pronate is a tight calf muscle. The foot needs to bend (dorsiflex) upwards five to ten degrees at the ankle for normal lower extremity motion to occur.
If this motion is unavailable, the foot will overpronate to make up for the limitation. By stretching the calf muscle properly, these forces acting on the foot can be reduced and can help to prevent lower extremity injuries.
Finally, improper shoe gear is another cause of overpronation. Running shoes that have a curved last or shape will tend to increase the amount of pronation that occurs in the foot. Many shoes are categorized as 'motion control shoes', usually made from a straight last, have more supportive materials on the inner (medial) side of the shoe to limit the amount of inward roll (pronation). They are not included to stop pronation, but rather, to let this motion occur in normal limits.
Many runners almost literally run their shoes into the ground and discard them only when they have the shoes reduced to little more than a pulp.
This can sometimes be out of necessity, due to cost, but remember that if the shoe is worn-out or broken down it cannot function in the way it was designed.
Supination
Is the opposite motion of pronation. It occurs normally right after heel strike to help the foot become a 'rigid lever' to propel toe-off. Over-supination is very rare. What is more common is under pronation which can occur with a rigid high arched foot.
A foot that underpronates is not able to absorb ground shock very well and can be prone to stress fractures. A foot that underpronates needs a shoe capable of absorbing shock well. Motion control is usually not very important in this type of foot; however, in some cases foot orthotics can help in supporting and redistributing pressure in the foot.
How do you know if you need orthotics?
Between 70 and 85 percent of all people have biomechanical imperfections, yet not all these people require orthotic control.
Most serious runners who have biomechanical imperfections end up with orthotics out of necessity.
The runner who runs fewer that 25 miles per week will not likely need orthotics unless they have a serious biomechanical weakness, but for the serious runner any biomechanical weakness will be magnified ten-fold, with the result being injury.
When a runner gets a series of nagging injuries one after the other, they are probably caused by a biomechanical flaw and can be corrected by orthotics. Runners who suffer from chronic knee pain, arch pain, plantar fasciitis, heel spurs, hip and lower back pain and certain types of muscular fatigue very often benefit from orthotics.
Will orthotics improve performance?
Performance enhancement with the use of functional orthotic devices is an area that requires more research. In theory an orthotic which improves the biomechanical function of running should have a positive effect on running. Although there is no proof that orthotics can make you run faster, by allowing your foot and leg to function more efficiently and by reducing the chance of injury, they may indeed have a positive effect on running performance.
First, it is important to consult a sports medicine specialist who regularly treats runners. Some practitioners specialize in biomechanics and the fitting of orthotics. In Ireland, seek out a chartered physiotherapist or podiatrist, and the best means of finding a good specialist is to talk to other runners, especially more experienced runners who are the most likely to be knowledgeable on the subject.

In my clinical experience I constantly see runners who present with makeshift; so called orthotic devices, fabricated from materials not suited for sports orthotics, which at best act as glorified arch supports and at worst may be damaging when worn regularly running. Biomechanics and the evaluation of feet and the prescription of orthotics is a science, so only consult a practitioner who has a good reputation and experience with treating runners. It is important to remember that while orthotic devices are dispensed to achieve optimal biomechanical control they must be part of a total treatment plan and they are not a substitute for regular stretching and strengthening exercises.

LASTS

The last of the shoe, which can be either straight, semi-curved or curved, is the shape and mould on which the shoe is built.

(a) A straight-lasted shoe is filled in on the inside or medial part of the shoe, increasing its stability and generally allowing it to fit a flat arch or suit the runner with excessive pronation.

(b) A semi-curved last, designed for the 'average' foot has a small curve and is the optional platform for the majority of runners.

(c) A Curved last is designed for those with higher than normal arches or for those who under pronate.

Brian Cole

Coles Sports Therapy & Injury Clinic
Northwood Stadium
Staffordshire
ST1 6 PA

www.colestherapy.com