Considerations in Footwear and Orthotics

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• Footwear • Foot orthosis • Patella-femoral syndrome • Plantar fasciitis • Flat foot • Tarsal tunnel syndrome • Medial tibial stress syndrome • Pes cavus

KEY POINTS

- Understanding the history of footwear and orthotics makes one reason why it plays such an important part in one's daily life.
- Anatomy of the running shoe helps one understand why it is paramount toward diagnosis and management of shoe-related problems.
- Barefoot running and minimalist footwear is an area of significant interest among physicians and people from various walks of life.
- Description, diagnosis, and management of various clinical conditions are highlighted at the end of the article.

TRADITIONAL FOOTWEAR

Discovery of the Oldest Footwear

Luther Cressman, a well-known anthropologist from the United States, discovered the oldest dated footwear in 1938, inside Fort Rock Cave in Oregon. It was radiocarbon dated to about 10,000 years old. The simple construction of this footwear incorporated sagebrush bark knotted together, creating an outsole with ridges for traction, a covering for the forefoot and straps to go around the heel.[1,2]

Ancient History and Footwear

Ancient Greeks started using race sandals in the Olympics to improve traction and enhance their performance in competitive running events. They excelled in footwear design, designing anything from sandals to boots, to moccasins.[2,3]

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The first sports-specific shoe was designed for playing cricket in Britain in the seventeenth century.[1] This shoe was constructed using low-cut design, leather uppers, and spikes on the outsoles. The spiked shoes also became a norm among runners participating in track and field. In early modern Olympic Games, marathon runners competed in heavy boots or shoes with leather uppers and soles, allowing for little plasticity, decreasing their performance and causing multiple running injuries, which led to another race in the world as manufacturers tried to make running shoes that were more comfortable and lighter and increased athletic performance.[1,2]

Today's Casual and Running Shoes

A multitude of shoes started to evolve in the 1800s. The evolution of footwear was taking place across the world in many different countries, including the United Kingdom, Germany, Japan, and the United States, to name a few. This evolution ultimately led to the creation of many of the modern athletic shoe companies that are known today.[2]

Multiple podiatrists, sports medicine physicians, orthopedic surgeons, scientists, athletic trainers, and physical therapists have played a role in improving the footwear and orthotic industry.

RUNNING SHOE ANATOMY

An understanding of the anatomy of a running shoe can be helpful to prevent and treat lower extremity shoe-related problems and enhance athletic performance.

Upper

The upper is the part of a shoe that covers the top and sides of the foot. The construction uses a highly breathable fabric that can prevent heat buildup, at the same time enhancing durability and providing water resistance, hence making it washable. The typical material used is nylon. Reinforcements are added as leather or synthetic leatherlike materials.

Different lacing techniques are available and increase stability and tension on the feet. The tongue is a padded piece that lies immediately beneath the lacing to provide cushioning to the top of the foot. The collar covers the ankle and has a projection that comes up above the heel to help protect the Achilles tendon from friction and irritation. This projection is called the heel counter and has a pocket for a stiffener to help control the rear foot during motion and to hold the foot in place.[1,2,4,5]

Bottom

The bottom of the athletic shoe is made up of the following components: midsole, wedge, outsole, insole, and sock liner.

Midsole

The midsole is an important part of the bottom of the shoe. It helps in providing cushioning and stability to the feet. The more cushioned the midsole, the less stability it provides to the feet; therefore, a balance between cushioning and stability to the feet is vital in a shoe. A runner often purchases a new shoe based on the "soft, cushy feel," only to develop excessive pronation and associated injuries that are directly related to the shoe selection. Purchasing the wrong type of shoe could lead to altered gait mechanics and cause injury.[2]

The midsole is commonly made of a mixture of polymer materials, including ethylene vinyl acetate (EVA) and polyurethane (PU).[4] EVA is a type of foam polymer that is light and available in multiple densities. It provides cushioning, increases shock