[IMAGE]

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# The Athletic Shoe

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Although a full discussion of athletic shoes is far beyond the restraints of a small article discussion, an overview discussion of the general construction of shoes and general sport-specific requirements will be attempted. These general concepts may be helpful in advising patients engaged in running or other sports activities. However, shoe prescription is not as much a science as often assumed. Individuals have a variety of factors to consider, not the least of which is comfort. Keep in mind that even if your patient seems to fit a certain category for foot-type or activity, (s)he will often have to experiment with a variety of shoes that meet general criteria to finally arrive at the appropriate shoe..

**Shoe Construction**

The names of various sections of a shoe may vary, based on the type of shoe. Non-athletic shoes often have different named sections compared to athletic shoes. An athletic shoe is simply divided into two main components (1) the upper, and (2) the bottom. The upper is the top part of the shoe and is further divided into several sections. Beginning in the front and moving back:

- The toe box and vamp cover the toes and part of the metatarsals, providing protection for both the toes and forefoot. Preferably, the construction has as few seams as possible. When the toe box is too small, irritation may result in damage to toenails (i.e. black toenails) or irritate/initiate bunion formation.
- The lacing and tongue are crucial for proper fit and upper foot cushioning. A standard rule is that lacing should be 2-3 cm apart. If the shoe is too wide, the eyelets spread apart beyond this range. If the shoe is too narrow, the eyelets diverge.
- The quarter is the middle part of the upper.
- The back of the upper is called the heel counter. The heel counter is crucial to rearfoot stabilization. A soft heel counter provides little support. Even if orthotics are used, without assistance from a firm heel counter, correction may be entirely lost. Additionally, a firm heel counter prevents splaying of the fat pad of the heel. This is particularly helpful in thinner and older individuals who may have a thin or degenerated fat pad (fat pad syndrome is often the cause of heel pain in individuals misdiagnosed with

plantar fascitis).

The bottom of the shoe consists of the:

- outsole -- This is the bottom of the shoe and is usually composed of carbon rubber (blown rubber wears faster). Various patterns may be used. A general rule is that studs perform better in the sand; low profile bars tend to wear better on hard surfaces. The better shoes have the outsole stitched to the upper and should be one piece or are vulcanized (i.e., fused to the upper).
- midsole -- This is the most important part of the shoe for shock absorption. Many new materials are being developed to meet the demands of athletes. Generally, ethylene vinyl acetate or polyurethane have been the primary materials used. EVA wears out quickly, however, compressive set EVA lasts three times longer. Polyurethane is more dense, heavier, and lasts longer, however, may get hard in cold temperature. Newer models often have a duodensity midsole consisting of a softer material for the lateral side to soften impact (while decreasing speed at which pronation occurs) and a firmer medial side for support.
- insole -- This portion joins the upper with the bottom of the shoe.

The shoe is molded around a three-dimensional form called a last. The last may be:

- straight: generally better for the hyperpronated foot;
- semi-curved: generally better for the foot that is neither overpronated or supinated;
- curved: generally better for the supinated foot.

By looking at the bottom of the shoe, the last can be determined. Curve-lasted shoes angle in medially at the forefoot.

There are generally three types of last construction: [1]

- board construction: The upper is attached onto the midsole underneath an insole board creating a stiffer shoe (may predispose the individual to Achilles' tendon problems).
- slip-lasted: The upper is stitched into one piece and glued to the sole providing less stability, however, lighter weight and more flexibility (best for the pes cavus foot). Look at the inside portion of the shoe to determine if there is stitching around the outer lower edge. Slip-lasted is stitched all around.

- combined lasting: combines a board-lasted heel with a slip-lasted forefoot; provides rearfoot stability with forefoot flexibility.

**General Recommendations**

With regards to fit there are some common recommendations:

- Make sure that while weightbearing there is about 0.5 inches or one thumbnails between the longest toe and the end of the toe box.
- The shoe should "break" or bend at the metatarsal phalangeal (MTP) joint; test by supporting shoe and bending at the MTP area with the other hand; the "10 lb. rule" states that about 10 lb. of pressure should causes the shoe to flex (you can also press the shoe against a bathroom scale); too little flexibility leads to plantar fascitis and Achilles' tendon strain.
- With regard to materials, leather stretches and gives more support than nylon, and nylon breathes more and is easier to wash.

**Sport Specific** [2]

- running: In addition to the general recommendations made above, some specific aspects of running shoes are heel flare and toe-spring. A large lateral flare (angles outward when viewed from behind) may increase the lever arm between the subtalar joint axis and the ground causing an increased degree and speed of pronation after heel-strike, therefore, a negative flare may be more appropriate for those with excessive pronation or in need of motion control.

One difference in running shoes is a superior angulation of the distal midsole, referred to as a toe-spring. When viewed from the side, it becomes apparent that the running shoe has more superior angulation than a standard tennis shoe. The advantage is a functional shortening of the length of the shoe while decreasing the amount of range of motion that the MTP joint must move through.

In general, running shoes should be retired after 200-400 miles. This averages between 4-9 months for most runners. For a great list of brand-name shoes rated by category check out the Runner's World Shoe Buyer's Guide on American On-Line; Keyword: Runner's World. The categories used are cushioning, lightweight, motion control, stability, and trail. A full explanation of each category with recommendations is given. This helps when patient want recommendations or ask about a specific brand name and model wanting to know if it is appropriate for their foot.

- aerobics: The forefoot should be well cushioned. The shoe should be light yet provide good torsional support (test by attempting to twist the shoe while holding with both hands).
- squash/racquetball: The shoe should be light with a thin midsole; the outside should be smooth to glide on a wood floor.
- tennis: The shoe should be moderately rigid with good side-to-side control. Leather is generally better. If the athlete drags the toe on serving, recommend a shoe with extra toe-cap padding.
- basketball: High-tops are best (low-profile better on asphalt); shoe should have good side-to-side stability; leather uppers are preferred.
- walking: Flex point should be near ball of foot; outsole should be thick, and the toe-box should be spacious. A negative posterior flare at the heel will help reduce strain to the anterior musculature by reducing the velocity and range of ankle movement at heel strike.

*References*


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