



Sizing Up Footwear

Here's a comprehensive review of shoe types and proper fitting.

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Podiatrists know it only too well, but patients need to be informed and made to understand—there is no standard sizing system for footwear. Attempts have been made in decades past to introduce some conformity into international shoe sizing. The last failed attempt was in the 1950s at an International shoe conference in Europe. SATRA (Shoe and Allied Trades Research Association) made a presentation to introduce a system named Monopoint. The idea was to replace the British, French, and European sizing systems with one central system. A few shoe manufacturers tried to add it to the already existing regiment of shoe sizing charts and comparisons, but it quickly faded into obscurity.

Historically, the main reason that shoe sizing has not been standardized has been the tradition for footwear to be manufactured in many different countries. The British system, commonly thought to be inspired by Randle Holme in the Academy of Armory and Blazon in 1688, was loosely based on the width of a man's hand across the knuckles and the length of barleycorn—hardly scientific. However, they still measure horses by 'hands', don't they? Around the same period in history—the late Seventeenth Century—European shoemakers adopted a more empirical measurement system using centimeters as its basic sizing scale. French shoemakers, however, refused to follow the other European countries and created their own system called (appropriate-

ly) Paris Points based on 2/3 of a centimeter measurement.

Because France was the dominant country on the mainland European Continent in the sixteenth and seventeenth centuries, Paris Points became the standard shoe sizing system throughout Europe. Today, with China manufacturing almost 70% of the world's footwear, it would be much easier to introduce a more stan-

dardized world-wide sizing system. The biggest challenge has always been shoe toe shapes—from oblique to pointed.

American Shoe Size System

The first description of a shoe-sizing system with proportional measurements for lasts and shoes was introduced in America by Edwin B. Simpson of New York in 1880. This system, when finally adopted by The Retail Boot and Shoe Dealer's National Association, not surprisingly differed from the British system by 1 1/2 sizes, and introduced a smaller scale for women, which was (approximately) 1 1/2 sizes smaller than American men's sizes (a size 9 men's size is equivalent to a woman's size 10 1/2—1 1/2 to 2 sizes different).

The American system was also

Misconceptions and Suggestions

The following is a list of basic sizing and fitting advice that is well-

The American system

was also largely credited with introducing a width fitting system based on A, B, C width sizing.

known but often overlooked by podiatrists when advising patients how to obtain the correct fit or best fitting shoe styles.

- The shape of the shoe is determined by the last. Last shapes vary from square oblique to narrow pointed. A quick look at the sole of the shoe will usually indicate if the overall shape is suitable for a certain foot type.

- The best time to fit new shoes is in the late afternoon or evening. Feet often increase in length and width after exercise, many hours of standing or waking, and due to possible edema.

- Advise patients to fit new shoes with the same or similar hose to be worn regularly. Fitting shoes with a thin sock and then switching to a

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thick sock can cause tightness and discomfort.

- If an orthotic is recommended, advise the patient to take along the device for correct fitting when obtaining new shoes. A corrective or accommodative orthotic can increase fitting the correct shoe size by at least a half size.

- Always advise the patient to have both feet measured (preferably on a Brannock device) before attempting to choose a shoe fitting. Feet are asymmetric and are commonly a half size (or more) different in measurement. There are exceptions, but generally feet increase in size with maturity, weight gain, pregnancy, and foot deformities.

- It should be emphasized that brands (even in the same category) do not necessarily fit the same. One cannot assume that wearing, say, a

edema. Most open comfort shoe category models (sandals) are adjustable and many closed shoes have stretch panels.

- It's good to know that several comfort shoe brands and one or two athletic shoe companies offer mixed mate sizing at minimal extra cost (e.g., a size 8 right mated with a size 9 left).

- The safest and easiest fitting shoe models to recommend are adjustable sandals, and in closed shoes—running shoes or comfort shoes offered in widths with firm counters, and adequate toe spring and long-laced eyestays. Velcro closure systems work well for geriatric and arthritic patients.

The Brannock Device

At least the footwear industry has adopted a standard foot measuring

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size 9 in one category or brand will translate into the same size in another category or brand. For example, in athletic footwear, it is well known by fitters that Brooks running shoes fit small compared to most other running shoe brands. In ladies comfort footwear Aravon (the ladies comfort brand owned by New Balance) models are known by experienced shoe fitters to fit large and wide—more suitable for a wide foot or a patient experiencing

device which has been universally accepted by most countries—The Brannock (Figure 1). Charles Brannock, a Syracuse University student, built his first prototype of the device in 1926. The size system is linear and is 95-96% accurate. Sizing is incremental in 1/3 inch lengths and 3/16 in widths. There are nine width measurements (which actually vary with foot length—AAA, AA, A, B, C, D, E, EE, EEE). The preferred method of measuring the foot on the Brannock is

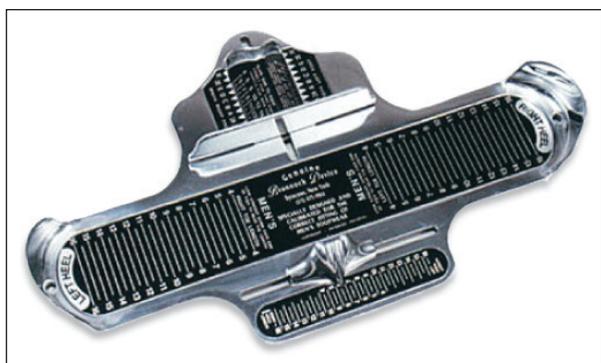


Figure 1: The Brannock shoe measuring device

standing—to allow for the foot to elongate and expand with full weight-bearing. Heel to 1st ray metatarsal head measurement is the suggested shoe size (Figure 2). Heel to toe is sock length size. The Brannock device is made in several different versions on the same metal template for men,

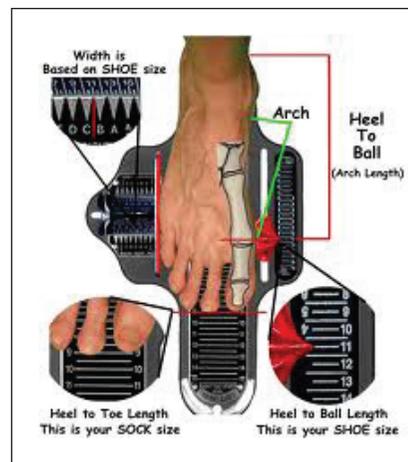


Figure 2: Measuring the foot on Brannock's device

ladies, children, athletic, and for ski boot sizing.

Modifications in Fitting Footwear

Billions of pairs of shoes are sold annually in the United States—most are not fitted by an experienced shoe fitter. Probably most shoe purchases are self-fitted off-the-shelf or, of late, 'online' by consumers. Human anatomy, although clinically standardized, is certainly unique from individual to individual. Given both of these statements, it is no surprise that much of the footwear bought today may not be a perfect fit for the wearer. Feet, due to the natural aging process, weight gain, and common foot deformities differ more asymmetrically than other parts of the body.

Fortunately there are many and varied ways that shoe fitting can be optimized. Pedorthists dedicate themselves to the study, fitting, and modifying of footwear and foot orthotics in order to give the wearer the ideal shoe function. To fit correctly, it is really important not only to size the wearer, but to have a varied stock of sizing on hand to enable the fitter (and wearer) to judge the most suitable brand and fitting by trying on the shoe. Changes can be made internally, externally, or a combination of both. In this article, we will concentrate on the possible modifications for inside shoe-fitting.

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Too Tight

Other than replacing the original-fitting sockliner with a thinner version, stretching is the only option for a shoe that is too tight and therefore uncomfortable and potentially damaging to the foot. A full range of manual expanding wooden shoe stretchers is used for this purpose. Shoe stretchers are sized 0, 00, 000, 0000 etc., according to size and width (Figure 3). They are available for men and women, and have pre-drilled holes for bunion and hammer toe plugs.

Another option for shoe-stretching is a simple machine with a screw mechanism using multiple metal foot shapes. This machine offers both width and length stretching. Width stretching is usually quite successful and most helpful for bunions, hammertoes and exostosis accommodation. Stretching the length of a shoe is more difficult due to the toe shape and the restriction of the outsole. Extending the toe box distally is possible but not highly recommended for most types of footwear.

An alternative stretching technique is the 'ball and ring' stretcher for specific areas of the shoe. Stretchers are most useful to relieve pressure in tight-fitting shoes and for patients with bunions and hammertoes. Using a chemical stretching liquid helps the stretching process by loosening the fibers in leather uppers. Stretchers also work well in mesh athletic shoes.

Too Loose—Slipping

There are a number of options and techniques that can be used by shoe fitters to accommodate a loose-fitting shoe or a shoe that slips at the heel.

Tongue Pads (that are available in several sizes) are the most common fitting aides to push the foot back in a closed shoe, thus reducing heel slippage. Tongue

pads can be used in a variety of shoe models including laced, Velcro closures, and loafers (Figure 4).

Halter Pads or Taps are cork or foam inserts that fill the forepart of a closed shoe, thus reducing the width in the front part of the shoe as well as helping to prevent the foot from slip-

ping forward. Halter pads are usually placed on top of the sockliner in open shoes. Taps are normally placed under a removable sockliner in closed shoes.

Heel cushions (or lifts) can be added to raise the heel in the shoe and add extra cushioning. Heel cushions are also helpful to lift the lateral malleolus off the top line to avoid rubbing. Added heel lifts can be a

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Additional full insoles placed under the manufacturer's removable sockliner can reduce the fitting by at least a half size. Insoles may be made from latex foam, cork, or felt. Full-

length insoles are available pre-cut in full sizes.

helpful relief for plantar fasciitis pain. Inside heel lifts to correct leg-length discrepancy (LLD) should be restricted to no more than 1 cm inside the shoe. If a larger lift is required it should be added outside the shoe.

Heel Grippers are usually a last resort used as an insert around the inside counter to stop slipping at the heel. This is useful if the wearer has a particularly narrow heel.

If more than one of the above accommodations is used, the shoe is really not a good fit. Specific off-loading inserts such as scaphoid pads, metatarsal pads, wedges, and carbon plates will affect the fit slightly and should be fitted when new shoes are purchased. Other techniques such as softening irritating edges or lining specific parts of a shoe (usually sandals) with Plastazote® or Moleskin can prevent blisters and turn an annoying pair of shoes into comfortable favorites.

Slim feet are more difficult to fit than wide feet. Slim feet may be narrow in width and or narrow in girth (around the foot). A few brands still make a slim-fitting shoe for ladies in a few models (SAS for example) that are sized as AAAA. Narrow = AA, (for

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Figure 3: Set of Shoe Stretchers



Figure 4: Shoe Tongue Pads

ladies), B = narrow for men, medium for ladies, C fitting is very rarely used today. D = medium for men, wide for ladies, E and EE = wide for men, extra wide for ladies. EEE and EEEE = extra wide. Some athletic and comfort brands offer a 6 E fitting. Again, there are no width standards; one brand's 4E width fitting may be much wider than other brands' 4E. In shoe-fitting, there is no substitute for knowing how a particular brand fits certain foot types.

Lacing Systems

It is possible to adjust the width of a laced shoe by varying the lacing pattern. Different lacing patterns can also be helpful in relieving pressure on the dorsum of the foot. A deeper eyestay design into the vamp or toe box area allows for more adjustment distally. Eyelet lacing may be conventional eyelet holes (straight line punched or reinforced), staggered (various width) eyelets, or speed/D-ring loops.

For a narrow foot, the standard criss-cross lacing method is the best. Speed rings allow the lace to be tightened evenly with one pull. Use the top-line control holes at the top of the eyestay to narrow the collar and heel opening. A suggested lacing method for a wide foot is to lace the first set of eyelets across, then vertically up

Footwear Categories

There are more categories of footwear available on the market today than ever, and most specialized footwear is now accessible through the Internet. It is impossible for a retail store to stock multiple categories of shoes. Specialized stores that concentrate on one major category have

shoe stores for the perfect fit. Most often, this type of shoe needs to have accommodations inserted such as tongue pads, halter pads (or taps), and/or heel grippers to avoid slippage.

On a wide foot, an ill-fitting loafer ends up being too tight and most uncomfortable in the dorsal region of

Men's lace-up shoes in the dress category are the most comfortable.

the best selection of models and sizes. The major footwear categories are Dress/Fashion, Athletic, Comfort/Orthopedic, Work, and Casual. Within these general categories there may be sub-categories (e.g., within athletic/sport shoes: winter sport shoes and boots are a diversified subcategory and encompass highly specialized sports.) Below is a brief description and synopsis of the major categories.

Dress/Fashion Footwear

This is still the largest-selling category within the footwear industry, but challenged strongly in volume sales by the proliferation of athletic shoes. In general, dress shoes for men are quite sensibly designed with classical styles. Men's dress shoes do not

the foot. In such instances, stretching the shoe may be the answer to relieve pressure on the dorsum. The above advice is good reason not to recommend buying shoes online—unless one knows the brand and specific model. Men's lace-up shoes in the dress category are the most comfortable.

Ladies fashion shoes are another story. In this category, comfort is a secondary consideration. The dangers and woes of fashion shoes for ladies have been well-documented both in *Podiatry Management* articles over the years and in podiatry clinics across the continent. The phrase "form follows function" has been completely thrown to the wind by ladies fashion shoe designers for centuries. Two quotes that best sum up the category are:—"It takes twenty years of wearing fashion shoes to ruin a woman's feet," and "Women are not going to stop wearing high heels because they like what it does for their legs and posture—and so do men." Fashion shoes cannot be avoided; they must be worn sparingly, admired, and tolerated. Within the ladies fashion footwear category, it would be almost impossible to offer fitting and sizing advice—it is usually ignored in favor of sex appeal. However, one general suggestion that makes sense is to recommend adjustable, open (strappy sandals) as opposed to closed shoes—the lower the heel, the better. Perhaps the only positive function for a woman to wear high heels is to make her appear taller.

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each side of the eyestay past the forefoot. Continue to cross the lacing pattern at the top.

High and low arches can be best accommodated in a lace shoe as follows: For a high arched foot (or prominent exostosis), extend the laces vertically up the eyestay past the arch or protruding area. For a low arched foot, criss-cross the lace normally until halfway up the eyestay, then loop and criss-cross to the top eyelet.

generally cause major problems for fitting or potential deformity in men's feet. Cushioning is usually minimal, although this feature has been much improved over the past 30 years.

The hardest shoes to fit in the men's category are loafers (slip-ons with no closure system.) The best advice would be to recommend a brand that makes a range of width fittings. A strange anomaly is that many men with narrow feet seem to love loafers and spend countless hours searching

Dr. Dananberg's Insolia system (a parabola halter inserted in the shank area of the shoe) helps to relieve pressure on the metatarsals and phalanges. Possibly, the best advice a podiatrist can offer a woman is to think of her high heels or platforms as 'two hour shoes.'

Athletic/Sport Footwear

Within this vast category, running shoes have become, next to flip flops, the most popularly worn shoes in most parts of the Western World. The reason is simple—they are well cushioned, breathable, and comfortable. Running shoes, offered in width fittings, are one of the easiest shoes to fit and accommodate many minor foot deformities such as hammertoes, cross-over toes, Haglund's deformity, and various exostoses. Correctly-fitted running shoes also accommodate most orthotics well.

Walking shoes have many of the same comfort and fit characteristics as running shoes. It is safe to recom-

fit and comfort. Good examples of this specialization would be ice skates and Alpine ski boots. Helpful advice for podiatrists is to work closely with coaches or specialized fitters to avoid potentially harmful foot conditions for the athlete. When treatment is required for injuries or specific conditions that may be caused by ill-fitting footwear, it's time for the podiatrist to examine the footwear—often the initial cause of the injury.

Comfort/Orthopedic Footwear (Option # 1)

Most wearers of comfort footwear have either discovered the benefits of this category earlier in life or have been advised by their podiatrist to seek out a specialized store for choice and fitting, where age dictates or foot discomfort is evident. Comfort footwear basically falls into two sub groups—open shoes (sandals) and extra-depth, closed shoes with a closure system. Running shoes are often interchanged with closed comfort

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mend to patients that they walk in running shoes but not to buy walking shoes for running. Aetrex offers an adjustable heel strap model with partial rear entry and heel lock as an additional fitting option.

The sport shoe category is vast and specialized. Court shoes are another major sub-category. Due to the length of time players wear court shoes, a tight-fitting court shoe should be avoided. Players need plenty of toe room for stopping and lateral/medial movements on the court. Certain sports, such as soccer, require shoes to be fitted snugly; the best suggestion is to recommend that competition shoes be worn minimally—only for competition. More comfortable training shoes are a better choice for practice sessions.

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shoes, mostly for men in this category (Figure 6).

A comfort shoe typically is well-cushioned and has supportive anatomical features such as a medium to aggressive longitudinal arch, deep-seated heel cradle, metatarsal pad, and possibly a toe crest. Closed shoes designed with firm heel counters often have high toe boxes and lace or Velcro® closures. Velcro is particularly helpful for arthritic patients having trouble tying laces. Many closed shoes in this category are designed with stretchable panels or straps (Figure 7). Comfort footwear is typically offered in width fittings in both closed and open shoes.

Women's comfort footwear is more popular in open toe sandal models than in closed shoes. Open shoes are easier to fit as many come

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with adjustable Velcro or buckle closure systems, and may even come in widths. Unless the foot condition is severe such as in PTTD or with Charcot foot, most other deformities, such as hallux valgus, hammertoes and bunions can be managed conservatively in a comfort sandal. Cosmetically, comfort sandals are acceptable to most women; however, closed shoes in this category are not readily accepted by women unless necessity (such as a family function) dictates forcing a woman to choose between comfort and acceptable appearance. The quest continues within this segment of the footwear industry to meet the challenge of offering more comfortable closed-fashion 'looks' that meet the critical eye of the older fashionista.

Orthopedic/Custom Footwear (Option # 2)

For more severe foot deformities and abnormalities, when a comfort shoe is not suitable, the next option to keep a patient ambulatory is a full stretch or extra-depth readymade shoe. Several companies offer models that will comfortably accommodate an AFO or gauntlet brace. P.W. Minor, Drew, and Pedors are all companies you can rec-



Figure 5: Pedors Stretch extra-depth shoe

ommend with confidence. For fitting a shoe with an AFO or to accommodate a bulky ankle brace, the full stretch or extra-depth shoe is the best choice. Many extra-depth shoes contain one or two extra insock spacers that offer additional room inside the shoe when they're removed (Figure 5).

Medicare Diabetic shoes are closed comfort shoes (or athletic models) fitted with medical foam moldable inserts in a closed shoe, designed with an ad-

justable closure system. They must be offered in a minimum of three width fittings. Diabetic footwear, to be Medicare -compliant, should be fitted by a podiatrist, pe-

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dorhist or orthotist. Diabetic shoes should be fitted generously for protection and to allow for edema, a common symptom among diabetics.

Custom-Made Shoes (Option #3)

These shoes are for the most severe or difficult fittings and often the last resort for a patient to remain ambulatory is a custom-made boot or shoe. There are still many companies



Figure 6: A typical closed ladies comfort shoe

(such as Jerry Miller and Tru Mold) and pedorthists that will custom-make a boot or shoe from a full sock casting. This may include fillers for amputees and special modifications outside the shoe such as rocker soles, flanges, and reinforced shanks and counters.



Figure 7: Stretch Mary-Jane Upper from Propet.

Post-Op Shoes

Post-operative boots and shoes are made in a variety of hard and soft styles suitable

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for protection, off-loading, wound care, and night splints. They are easily fitted and sized as youth, ladies small, medium, large, extra large and men's small, medium, large and extra large. All are made with adjustable hook and loop closure systems and firm soles. A variety of rocker soles are also available. The shoe or boot must be sized long enough to protect the toes. All are made on wide lasts to allow for bandage and splint adjustment.

Work Shoes and Boots

This practical category is sized as comfort footwear with plenty of room in the shoe or boot for orthotics or swelling. Work boots are often worn for long periods during the day in various climatic and work conditions. Hard, high toe boxes are available for protection, and non-slip lug, grease-resistant soles are common. Width fittings and quality materials are important in this category. As in the other

performance categories, there are several specialized sub-groups of work boots, such as worn by loggers (caulking), linemen, and firefighters. Military and police, service industries such as catering, may also require specialized footwear for non-slip, or

are made with a toe thong, or as a wrap-around slide. Either as sandals or flip-flops, the thong between the hallux and second ray is helpful for patients with bunions and hallux valgus. The slide wraps around (preferably with adjustable Velcro™ straps) and works

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oil and grease resistance. If extra thick or double socks are worn, this may require the fitter to increase the shoe or boot size to assure a comfortable fit.

Casuals and Indoor Footwear

Clogs, mules, slippers, and the ever-popular flip-flops fall into this catch-all general category. Flip-flops

are better for a wide foot. Slippers may be offered as slides, mules, or closed uppers and are usually made with soft linings or uppers and non-slip soles. Fitting is not usually an issue with this type of footwear, as long as the wearer does not choose a slip-on shoe that is too large. The risk of tripping is a sig-

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nificant enough danger to justify trying the slippers on in a store rather than buying them online. Better quality casual slip-ons and slippers are offered in full sizes and may offer adequate toe spring. Beware of brands that size by S, M, L, and XL if the patient has an unstable gait or uses a walker. Some patients prefer a more stable, hard slipper or mule, such as the Merrell clog for indoor wear. Diabetics should always protect their feet indoors by wearing some form of slipper.

Specialty Shoes

Specialty Footwear is a unique resource for people who require a high level of expertise to achieve comfort, optimal performance, and maintain foot health. Most types of specialty footwear are not sold in retail footwear or athletic shoe stores. Thanks to the Internet, almost any type of specialty shoe made can be bought either directly from the manu-

facturer or through a listed supplier. Dance and ballet shoes are a good example of footwear specialization. Winter sports, particularly downhill ski boots, are another huge footwear cate-

terest in specific sports activities have the expertise to advise athletes and patients as to the best footwear for performance and avoidance of injury. To understand and have the specific

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gory requiring specialized expertise in shoe-fitting. Each area of expertise is peculiar to a certain category of footwear. A separate article could be written for each specific segment:— track and field, Alpine ski boots, cycling shoes, dancing shoes, logging boots, the military, etc. Some podiatrists and pedorthists with special in-

shoe-fitting knowledge in every footwear category would require a lifetime of study. The late William Rossi, DPM elected not to maintain a podiatric practice; instead, he used his knowledge of the foot and podiatry in order to understand the interaction between the foot and foot coverings.

Summary

No one would propose that shoe-fitting is a science, or even requires a medical degree. However, the experience and knowledge required to correctly fit footwear of all types, for all ages, under all ambulatory conditions and biomechanical requirements, should not be overlooked. Podiatrists see the results of poorly- or self-fitted footwear every day. For more in-depth fitting advice on specific footwear categories, refer to experienced personnel in medical footwear stores. Many expert shoe-fitters are pedorthists who fit and work with shoes on a daily basis. In performance footwear, seek the knowledge of coaches and trainers who work with athletes in their specific sports. **PM**



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