What is Proper Fit?

► Ideally, a good shoe is a comfortable one that provides the appropriate amount of support.
► It has a minimal break-in time, incredible durability, keeps your feet dry, and doesn’t give you blisters or bunions.
► Shoes are usually manufactured for ideal feet.
► The reality is that very few people have ideal feet.
► This presents a problem with fit.
► Remember, something has to flex, and if it’s not the shoe, it’s going to be you!
► A few basic facts and sometimes, when required, the use of the appropriate orthotic or therapy, can greatly aid in the perfect person/boot fit.

Most runners problems . . .

1. Wrong shoes, poorly fit shoes
2. Too much mileage on shoes
3. Bad technique
4. Poor anatomy – genes (Alignment)
5. Bad orthotics or no orthotics (usu. Bad)
   1. Good orthotic in bad shoe, bad orthotic in any shoe
6. “the thigh is in control of the hip”
   ► the glutes are too small and the quads and hamstrings are too big or too tight
Review of Gait Cycle: walking

Graphic Summary of the Gait Cycle

- The Sole (also called the outsole)
  - the part that comes in contact with the ground.
  - made of rubber and provides for some degree of shock absorption and traction. It can be sewn, cemented, or part of the midsole.
  - Remember that the heel is supposed to strike the ground at approximately a 16° angle, lateral from the center of the heel (crash zone).
  - The force is then transmitted from the sole of the shoe, up the lateral column of the foot and across to the first metatarsal for propulsion. This can be assisted by a "rocker" which is a "drop" put into the front portion of a shoe, to ease walking and assist in toe off.
  - Different shoes have different rockers. This seems to work better in stiffer shank shoes (more torsional rigidity) to ease some of the stress off of the 1st MTP joint (Hallux rigidus/painful bunions).
  - A flare (widening) of the sole of the shoe, particularly lateral can be important for stability on uneven surfaces. A lateral flare provides extra stability upon heel strike, but it speeds up the rate of pronation. This flare must extend the length of the sole, otherwise injury can occur at the mid tarsal joint as the foot comes through mid stance. A medial flare can help prevent overpronation, as the foot comes through mid stance. Again, it must run the length of the shoe.
Lateral flare vs. medial flare

- 2006 Nike Cesium...strong medial flare with 3 degree intrinsic varus post
- Soft crash zone
- Shoe promotes supination
- WRONG choice for genu varum, tibial varum or medial knee OA
  - Pushes knee outside of sagittal plane!! This will give knee-hip pain in most!

The Midsole-

Midsole material is very important, as it will accommodate to the load imposed on it from the person as well as any gear they may be carrying. It serves as the intermediary for load transfer between the ground and the person.

- Softer density material in the heel of the shoe absorbs the forces during heel strike and is good for impact and shock absorption.
- The stiffer the material, the more motion control.

Duodensity/Dual-density Midsoles

- This means that two of the midsole is softer on its lateral aspect, to absorb force and decrease the velocity of pronation during heel strike and midstance, with a firmer material medially that protects against overpronation as you come through midstance and go through toe off.
- Companies make variances within this category
  - Asics 1110 and 2110 (stability but shifted dual density)
The Midsole-
sandwiched between the sole and the upper

► The Crash Zone and Entry Zone:
► Softer Crash Zone: ie. Adidas supernova Line, Saucony Trigon Lines, Nike Triax
  ▪ Good for pronator (flat flexible arch) but danger for supinator (high rigid arch)
► Beveled Entry Zone:
  ▪ Good for pronator but danger for supinator
  ▪ Why?...it will keep the pronator on the outside of the shoe longer
  ▪ Rather, it will allow the supinator to stay on the outside longer
  ▪ On the contrary, putting a pronator in a wide buttressed lateral counter will make them pronate faster, faster and thus deeper

The Shank- this can be within the midsole or last

► The Shank is the stiff area of the shoe between the heel to the transverse tarsal joint.
► It corresponds to the medial longitudinal arch of the foot, provides torsional rigidity to this shoe and helps to limit the amount of pronation and motion at the subtalar and mid tarsal joints.

The Last-
“the shape or how the shoe is assembled”

► The last (look inside the shoe on top of the shank) is the surface that the inside of the shoe lays on, where the sole and upper are attached.
  ▪ Shoes can be board lasted, slip lasted or combination lasted.
  ▪ A board lasted shoe is very stiff and has a piece of cardboard or fiber overlying the shank and sole (sometimes the shank is incorporated into the midsole or last). It is very effective for motion control (pronation) but can be uncomfortable for others, who does not have this problem.
  ▪ A slip lasted shoe is made like a slipper and is sewn down the middle. It allows great amounts of flexibility, which is better for people with more rigid feet.
  ▪ A combination lasted shoe has a board lasted heel and a slip lasted front portion, giving you the best of both worlds.

When evaluating a shoe, you want to look at the shape of the last.
  ▪ When laying the heel and drawing an imaginary line along the sides of the shoe determines the last is straight, semi curved or curved. The imaginary line, you are testing for equal amounts of shoe to be on either side of the line.
  ▪ Shoe have either a straight or curved last. The original idea of a curved last (banana shaped shoe) was to help with pronation. A curved last helps people who are pronators, but not people who have a flat foot.

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The Upper- the sides and top of the shoe

► This is the part above the midsole that holds your foot on the sole. It is usually made of leather, nylon, Gore-Tex or some other man made material.

The Heel Counter- the back of the upper

► This is considered part of the upper.
  - A strong, deep heel counter with medial and lateral support is also important for motion control
  - Lateral support especially for people who invert a great deal or when you're going to place an orthotic in the shoe which inverts the foot a great deal.
  - The lateral counter provides the foot something to give resistance against. This needs to extend at least to the base of the fifth metatarsal, otherwise it can affect the foot during propulsion.
  - A deep heel pocket helps to limit the motion of the calcaneus and will also allow space for an orthotic.
  - The heel counter should go right above the calcaneus, hugging the Achilles tendon.

The Heel Counter- “the back of the upper”

► Construction errors
  - Not infrequently the rear of the top cover is not set square into the heel counter
  - Sometimes this can appear to be a vamp-counter interface offset and sometimes it is a mid and outersole problem as in this case.
The Toe Box

► The toe box should be generous enough to prevent crowding and pressure on the metatarsal heads.

- The widest portion of the shoe should parallel a line bisecting the metatarsal heads. Excessive pressure can result in bunions and/or hammertoes.

► When measuring feet and determining shoe sizes, do it both sitting and standing and on toes.

- because the laxity of ligaments can become very evident, especially when the foot is weight-bearing.

- If the person has greater than one size of splaying in both length and width when going from one position to the other, go for the bigger size.

- Always use ball length rather than sole length.

- People usually buy smaller shoes because when you pronate, there is less volume in the mid foot. A small size shoe will feel better.

- Use a Brannock Device to help you if you are not sure – that is what it is for!

The Insole—the removable inner footbed

► This is the part of the shoe that most people remove to insert an orthotic.

► They have come a long way in construction and make a big difference in shoe fit.

► Usually made of some type of foam or EVA material.

► Some of the newer ones are dual density foam.

► “Superfeet” are a fake out but provide a bit more than the EVA foam that comes with the shoe.
The 9 Steps to proper shoe fit

Step #1
▶ Determine the usage of the shoe. Will it be for running, scrambling, light hiking, heavy backpacking or mountaineering?

Step #2
▶ Ask if they have problems with their feet, knees or hips?
▶ 1. If foot pain is it corns, blisters, bunions, ankle or lower leg? Where are these problems located?
▶ 2. If knee, is it front, inside or outside?
▶ 3. If hip, is it front, back or side?
▶ This will often give you clues as to problems they may have with their boots and/or feet, knees or hip.
Step #3
► Perform a foot evaluation while they are sitting and standing. Watch them walk. Note any obvious visual abnormalities.

Step #3
► Note whether standing barefoot if their knee rests inside, on, or outside the sagittal plane.
Flat foot.
Q. Stability Shoe?  
A. YES !

► Good shoe choice !

► Flat foot, YES
► Use a stability shoe ?
► NO !
► It will bring the knee further "outside" the plane of knee bend or knee movement and virtually guarantee knee pain and meniscus injury

Step # 4

► Determine their foot type. Do they have a low, medium or high volume foot?
Step # 5

- Measure the foot in a standing position. Measure the width of the foot at its widest point. Always use the larger of ball or sole length.

The Brannock Device

- Knowing the true length of your patient's foot and
- how to determine shoe fit

The Brannock Device... The Industry Standard for Over 70 Years

- Designed in 1927, The Brannock Device® foot-measuring device
- Shoe sizes and foot sizes are not the same.
- The foot needs adequate room within the footwear for comfort and performance.
- The Brannock Device foot-measurer is designed to indicate the correct shoe size allowing enough room for comfort.
- By providing a starting point for fitting, the device eliminates guesswork.
- Three functional aspects, heel-to-toe, arch, and width measurements. These three measurements are critical for properly fitted footwear.
- Today's footwear is carefully engineered, designed and manufactured for maximum performance and comfort. To bring out those qualities footwear must be properly fitted. No matter how well the footwear is crafted; an improper fit will negate all other aspects. People spend three fourths of the day in their shoes so a properly fitted comfortable shoe is essential for satisfaction.
Why Heel-to-Ball Is Essential

This illustration shows two feet which are the same length, but each require different size shoes. There are different fittings for short-toed feet and long-toed feet. Proper shoe-fitting incorporates not only overall length (heel-to-toe measurement) but also arch length (heel-to-ball measurement). Shoes are designed to flex at the ball of the foot, how much room is left in the toe box length is irrelevant. Correct fitting properly positions the ball joint in the shoe and provides room for the toes so they are not confined.

Without Utilizing Heel to Ball Measurement

Improperly fitted shoes can cause a variety of foot problems in addition to general discomfort and shoe breakdown. If the arch of the foot is not positioned properly in the shoe, the foot will become fatigued and uncomfortable.

The Brannock Foot-Measuring Device® Ensures Correct Fit

The foot above is correctly fitted. The arch of the shoe and ball joint of the foot meet at the same point. The foot arch is correctly positioned in the shoe. The foot and shoe bend at the same location, with the arch fully supported, allowing the toes to remain straight. There is ample space in front of the toes to allow adequate ventilation. This will ensure a correct and comfortable shoe which will keep its shape.
INSTRUCTIONS FOR USE

1. Prepare the Device
   ► Prepare the Brannock Foot-Measuring Device® as shown in the photo. The width bar should be set to its widest position and the arch length indicator should be slid back, so the foot can be positioned easily on the device.
   ► Note: Some devices have dual calibrations for the heel-to-toe, arch, and width measurements. Be sure to read the colored area which corresponds to the calibration you are fitting.

2. Position the Foot
   ► Have the customer remove their footwear and stand, placing their right heel into the right heel cup. The customer should stand with equal weight on both feet to ensure that the foot being measured has elongated and spread to its maximum size. Be sure the heel is properly located against the back of the heel cup, by grasping the customer’s ankle and device together, as illustrated in photo.

3. Measure Lengths
   ► Heel-to-Toe Length
   ► Press the toes flat against the base of the device and look straight down over the longest toe (not necessarily the first toe) to read toe length. Make sure the customer’s socks are snug against the toes (without drawing the toes back) to yield an accurate measurement.
3. Measure Lengths

► Arch Length (Heel-to-Ball)

Place your thumb on the ball joint of the foot (as shown in the photo to the right). Slide the pointer (A on diagram) forward so the inside curve of the pointer fits the ball joint of the foot and the two high ribs come in contact with your thumb. When the pointer is properly located, the lower middle rib will be against the ball joint on the side of the foot (B on diagram). This yields the arch measurement. The arch length represented in the diagram is 8 1/2.

4. Find the Correct Shoe Size

► Compare the arch length to the heel-to-toe length and use the larger of the two measurements as the correct shoe size. If the arch length and heel-to-toe length are the same, this will be the shoe size. If the heel-to-toe length is larger than the arch length, then fit to the heel-to-toe size. If arch length is larger than heel-to-toe, then fit to arch length.

► EXAMPLE:

<table>
<thead>
<tr>
<th>HEEL-TO-TOE MEASUREMENT</th>
<th>ARCH MEASUREMENT</th>
<th>SHOE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>8.5</td>
<td>8.5</td>
</tr>
<tr>
<td>8.5</td>
<td>8</td>
<td>8.5</td>
</tr>
</tbody>
</table>

► It is important that both measurements be taken and compared to find the proper shoe size. Simply using the heel-to-toe length may result in an improper fit.

5. Measure the Width

► Slide the width bar firmly to the edge of the foot. Locate the customer's shoe size (as determined in step four) on the sliding width bar. Find the width measurement which lines up to the shoe size on the width bar. If the shoe size falls between widths, choose a wider width for a thick foot, a narrower width for a thin foot.

► If the foot is extremely fleshy or has a high instep, it may be necessary to fit an extra width wider. If the foot is extremely thin, compress the foot slightly with the width bar and determine the size while holding the bar in this position.
6. Measure the Other Foot

► Reverse the device end-for-end and measure the other foot following the steps described above. Be sure to measure both feet, then fit the larger foot. It is common to have feet of different sizes.

7. Remember the Fitting Process

► When used properly, the Genuine Brannock Foot-Measuring Device® is designed to indicate the correct shoe size. This is the first step in the fitting process. Due to differences in manufacturing, styling, and other variables, it is up to each fitter to be knowledgeable of shoe styles and fit characteristics. It may be necessary to make compensation in sizing to achieve a proper fit for each individual customer. The fitting process often involves trial fittings to ensure that the proper size was selected.

Step # 6a

► Determine the flexibility of the forefoot. Do they pronate a great deal?

► Soft Rule: the more flexible they are, the more controlling a shoe they need…..but, you need to know where their knee is!

► ie. A flexible foot should need a stability shoe, BUT, if that shoe pushed their knee outside the forward plane of motion (ie. Pushes knee outward) then it is possibly the wrong shoe.
Step # 6b
► Determine if they
► have a tendency to go “knees in” or “knees out”
► This will help with your choice of a neutral cushion shoe or a stability-motion control shoe.
- had to flare feet out to bring knees forward again
- External hip rotation

Step # 6c
► Determine if they have normal Ranges Of Motion (ROM)
1. Loss of big toe range
   BIGGIE
2. Loss of knee flexion
3. 

Step # 7 and 8
► Good sock choices.
► Try on the shoes.
Give lacing tips if needed.
Step # 9

► Test the shoe for fit and function. How do they feel while standing and walking on flat ground? They should have:
  ► Good heel lock (little heel lift in trail runners, < 1/8 inch in medium weight hikers and < 1/4 inch in heavy hiking/mountaineering boots)
  ► Adequate arch support, especially when weight bearing
  ► No pressure over the top of the foot under the laces
  ► Flex point at the 1st metatarsophalangeal joint (ball of foot)
  ► Room in the toe box
  ► No pressure at cuff or gussets on shin
  ► Walking up an incline, the flex at the ball of the foot should not change significantly and the heel should not lift more than previously
  ► Walking down an incline, the toes should not touch the front of the shoe and there should be no more than 1/4” of forward movement of the foot

► If you do all of the above, you will send your patients the message that you really know what you are doing.
► You will arm them with the information that they truly need to make a good shoe purchase.
► The will leave your office with:
  ▪ their Brannock measurements (no more toe-box pinching for size which is loaded with errors)
  ▪ They will know not to measure future shoes via the toe box space “the big pinch!”
  ▪ The proper shoe type for their foot type
  ▪ Proper shoe for their knee type
  ▪ Lacing options for arch height issues and heel slippage
  ▪ Confidence in their physician
  ▪ If you talk while you work, they will understand their feet better, understand why they got the shoe you gave them

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