



If The Shoe Fits, Think Twice!

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In one of the recent trainings, a participant asked a very insightful question. “With all the technology advances in shoes, why is it that there seem to be more foot problems than ever? Are there really more problems, or does it just seem like it?”

This is a very curious problem, and yes there are more problems now than ever with respect to the feet. It is estimated that about twenty percent of the US population has foot problems. There are some strange paradoxes and potentially confusing issues when looking at the data. For instance, it is clear that foot problems decrease when income increases. (Fittracks, 2003) This is true probably because infection, ingrown nails, and corns represent a large percentage of foot problems. These kinds of problems tend to become more severe if left untreated and people with lesser financial resources tend not to seek treatment. The same is true with complications from diabetes. Unrecognized, the consequences can be severe.

On the other hand (or the other foot), what are the problems that affluence can present for the feet? One big issue is that of footwear, and its role in the health of the feet. There are two aspects to the issue of footwear:

1. Poor or ill-fitting shoes
2. No shoes at all

Much has been written about poor footwear. The effects can be devastating, as we therapists have often seen older women whose feet were deformed by terrible women’s shoes designed forty years ago. No one says it better than this quote: “Ninety percent of women wear shoes that are too small for their feet, and 80 percent of women say their shoes are painful,” said Ruth L. Thomas, M.D., a UAMS Medical Center orthopaedic surgeon who subspecializes in foot and ankle disorders. “As a result, nine times more women than men are likely to develop bunions, hammertoes and other painful foot deformities because of ill-fitting shoes. The cost of surgeries to correct these foot problems is \$2 billion per year, and if time off from work for these surgeries is included, the cost increases to nearly \$3.5 billion annually.” Wow! This is some serious money and suffering all because of shoes that do not fit. Additional advice from Dr. Thomas; “As you age, the size and shape of your feet change, which is why you need to have both feet measured regularly,” Thomas said. “Usually, as the length of your feet increases, so does the width of your forefeet; however, the width of your heels doesn’t change significantly. Most shoe manufacturers increase all shoe dimensions in a fixed proportion. When buying shoes, fit them to your forefeet rather than your heels. If there’s a large discrepancy between your forefoot width and heel width, though, it’s best to purchase shoes at a store that sells split-sized shoes (narrow heels and wider toes) made on a combination last so that your heels don’t slip up and down. Lengthwise, make sure the end of your longest toe on each



foot is about one-half inch from the end of the shoe. To ensure an all-around good fit, always try on shoes while standing at the end of the day when your feet are their largest.” (University of Arkansas, 2002)

What about shoes that do fit? What impact does the constant controlled environment of shoes have on our feet? I have a friend who is very wealthy and has a little boy under one year old.

This child has many pairs of shoes already and is seldom barefoot. The shoes are cute and color coordinated, but is this really healthy? What is the impact of depriving the feet of the rich sensory data that is lost in the protected environment of the shoe? Is the ideal supportive environment of the shoe paramount or is the freedom of sensory input and the challenge of being barefoot more important?



There are several areas of the barefoot gait that need to be addressed. Perhaps first is the concept of arch support. It is certainly true that an arch support in a shoe can create a proper arch. The bigger question is; does this artificially created arch function in the same way as a natural arch? This is where things get really questionable. Here is an extract from an article by Dr. William Rossi entitled "The Arches: Some Controversial Views", It was originally published online in the journal, [Podiatry Management](#).

Consider some realities. As already cited, the prime function of the arches is to absorb body weight shock in standing, walking, or running, and to return the absorbed energy via the elastic apparatus of the arches. They serve not only to maintain body balance but to provide the spring and propulsion for the step. The foot's arches and their associated mechanisms (muscles and tendons, fascia, ligaments, and joints) are marvelously designed for these functions. It should be obvious that the more these complex spring forces are hampered or reduced or otherwise interfered with, the less effective the whole spring mechanism will be.

Yet that is precisely what happens to the average foot with **any** form of artificial support mechanism. Loss of elasticity with increase of rigidity is common with the feet of persons 60 years and over. This is usually ascribed to the natural "aging" process. The feet not only display anatomical and functional deficiencies, but are often accompanied by distress symptoms and diminished gait mobility. Almost all the conditions involve the foot's complex arch system.

But the "aging process" theory is highly debatable. Among shoeless people of advanced years there is rarely loss of foot elasticity or gait mobility, or presence of foot distress symptoms. Among shoe-wearing people, however, the foot has been in a constrictive caged state two-thirds of the life span. There is inevitable deterioration of the foot's spring or arch system -- much the same way as a body part held in a rigid cast for a prolonged period atrophies and loses strength. It has little to do with "aging." It has much to do with shoe-caused loss of elasticity over a long period.

Another important factor is involved. Most shoe-wearing people walk on less than half of their natural plantar tread surface. This is easily demonstrated. Dampen the sole of your

foot, then place it on a paper towel. Remove your foot, then quickly draw an outline around the print. Now, examine the sole and heel of one of your worn shoes. Then compare the two soleprints. The shoe will show wear mostly at the outside-rear corner of the heel and at the center of the ball. The remaining part of the shoe bottom will show little or no wear. The worn shoe tread area will usually amount to half or less than the footprint area -- indicating that you are walking on only half of your foot.

What does it mean? The "working" half of your foot is bearing an over-load while the non-working half is unutilized -- and indicating progressive loss of strength. Why the limited shoe tread? Again, a combination of faults in shoe design and construction which negatively affect shoe tread.

A foot walking on virtually any shoe is automatically unbalanced. While an orthotic may assist in providing proper foot balance, both foot and orthotic become victim of the built-in imbalance of the shoe and hence cannot perform at full efficiency.

Common biomechanical conditions such as excessive pronation or fasciitis or tendonitis are usually treated as separate, isolated lesions. But all are linked to the arch system and cannot be separated from the failings in the foot's overall spring mechanisms.

Among shoe-wearing people there is no such thing as a fully natural or "normal" foot, either anatomically or functionally. Constantly denied its natural need and ability for constant exercise, the shoe-wearing foot has lost its capacity for normal function.

For further evidence, we turn to Udaya Bhaskara Rao and Benjamin Joseph.

"The Influence of Footwear on the Prevalence of Flat Foot"

The Journal of Bone and Joint Surgery, 74B(4), 1992, pp. 525-527.

Abstract: We analyzed the static footprints of 2300 children between the ages of four and 13 years old to establish the influence of footwear on the prevalence of flat foot. The incidence among children who used footwear was 8.6% compared with 2.8% in those who did not ($p < 0.001$). Significant differences between the predominance in shod and unshod children were noted in all age groups, most marked in those with generalized ligament laxity. Flat foot was most common in children who wore closed-toe shoes, less common in those who wore sandals or slippers, and least in the unshod.

Our findings suggest that shoe-wearing in early childhood is detrimental to the development of a normal longitudinal arch.

In Europe and America flat foot is a common reason for attendance at a children's orthopaedic clinic, but in India children are seldom brought for treatment for flat foot. The few children who do attend with this complaint are from affluent urban families and they all wear shoes. In our clinic we have never seen a child from the farming community or from the family of a manual labourer who complained of flat foot.

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The high concentration of flat foot among six-year-old children who wore shoes as compared with those who did not, implies that the critical age for development of the arch is before six years.

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Our cross-sectional study suggests that shoe-wearing in early childhood is detrimental to the development of a normal or a high medial longitudinal arch. The susceptibility for flat foot among children who wear shoes is most evident if there is associated ligament laxity. We suggest that children should be encouraged to play unshod and that slippers and sandals are less harmful than closed-toe shoes.

Another issue to be addressed is the presence of abundant nerve endings in the foot. Why would nature do that? There are some 1,300-nerve endings per square inch in the foot. This is about the same as the human hand. Would you want to wear gloves all the time? Imagine how much of the world you would miss if your hands were covered all the time. Would you feel as connected to the environment around you? Could you adapt and change according to the subtleties of what you feel? This is the reality of your feet. Not a pleasant thought is it?

One of the major tasks of your feet is to assist with balance. Your feet are constantly monitoring the changing epicenter of weight-bearing. This is a constantly changing event, with sensory input from the feet telling the gastrocnemius and soleus when to contract to sustain balance. This is crucial data and impacts the establishment of balance in the human frame. This can be especially important later in life. Consider this abstract from *Neurosci Res.* 1988 Feb;5(3):203-13.

The functional role of sensory inputs from the foot: stabilizing human standing posture during voluntary and vibration-induced body sway.

Hayashi R, Miyake A, Watanabe S.

Institute of Equilibrium Research, Gifu University, School of Medicine, Japan.

The functional role of sensory inputs from the foot in the stabilization of upright standing in humans was studied using an ischemic nerve block which was applied bilaterally at the level of the ankle. Subjects were asked: (1) to lean forward or backward by pivoting around their ankle joints; and (2) to hold a standing posture during the bilateral application of vibration (140 Hz) to the Achilles tendons. After 30-40 min of ischemia, the magnitude of maximum body leaning was equally reduced to about 70% of controls for both the "eyes-open" and "eyes-closed" conditions with bare feet. This decrease of body leaning caused by ischemia was not observed when a foot was fixed firmly on a "fixation" board. During vibration, body sway was augmented, and characteristic oscillations of this body sway around 3 Hz were observed under ischemic conditions with eyes closed and with bare feet. We concluded that foot sensation may be an important source of information for controlling the magnitude of body leaning and for stabilizing higher frequency components of body sway.

Additionally, electromagnetic activity is another reason to consider the possible effects of shoes and our health. (Cheskin, 2003) Normally, the feet are conductors of electromagnetic charges, not insulators. Certain industries, such as computer manufacturing and telecommunications use footwear that allows for electrostatic charges to be passed through the shoe so as not to disrupt sensitive devices. Most of our shoes do not allow for this, and hence build up charge. Have you noticed the signs prohibiting cell phone usage at the gas pump? The phones tend to build up charge, which then cannot be grounded through the feet. If a spark results from touching metal near the pump, it could get pretty exciting! What is the health effect of this buildup in the human body? We are only guessing at this point, but it makes sense to ground yourself by walking barefoot when you can. I remember hearing years ago that a good cure for insomnia was to walk barefoot outside in the yard for ten to fifteen minutes. Maybe the word grounded means more than we think!

What does this mean for PNMT? Remember to address the feet with care and focus for any lower extremity condition. Special care should be given to the toes for their sensory input is very important. We should encourage our clients to spend a little time barefoot each day, especially on a surface that is rich and varied, uneven and requiring sensory adjustment.

Perhaps in summary, I might use an analogy from viticulture. If the vintner provides the ideal environment for the grapes; ample moisture, fertile soil, etc., the wine produced is very low quality. Grapes that are stressed and challenged produce the rich, complex, and full bodied spectrum of essences associated with a great wine. Are feet much different? Are we?

Special thanks in this article to **Jennifer Knight** who posed the idea and did the initial research for this article. Jennifer also recommended these websites:

<http://www.icakusa.com/healthcaps/exercise/shoe.html> the case history is interesting and funny.

<http://www.runningbarefoot.org/HeelLanding.html> A web-site with an assortment of articles supporting barefoot running.

<http://www.staffs.ac.uk/isb-fw/Manuscr/Kersting19.PDF> running conditions, shoe vs non-shoe study.

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