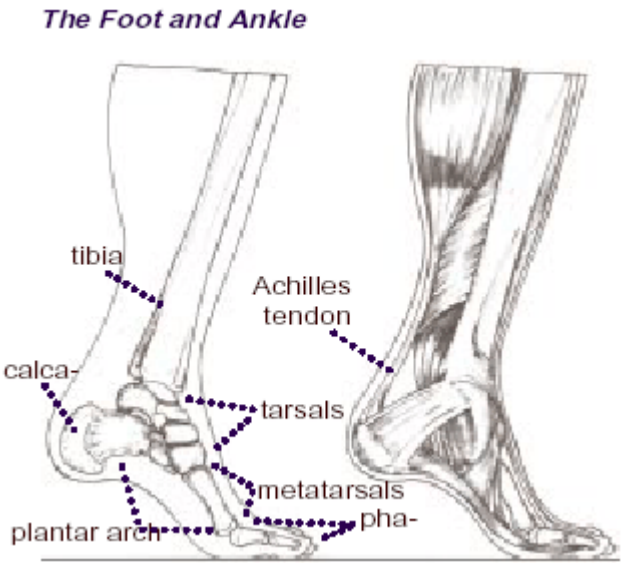
THE IMPORTANCE OF CONTROLLED FOOT AND ANKLE MOBILITY

By Mike Davis, DPT, ART

The next time you visit a shopping mall, take a little time to observe the variety of shoes on display and on the mall's patrons. Shoes are more about fashion than anything else in today's society. You will see everything from the Stiletto heel to thong flip flops. Now let's change scenes for a second and look at the fitness and athletic realm. How do people select their footwear and how does this decision impact performance? Basketball players play in high-tops while football players perform in high-tops, mid-tops, and low-tops. Remember your body responds from external stress whether its "good" stress or not, the body responds. I say this because if a female wears Stiletto heels to work everyday, her foot/ankle will



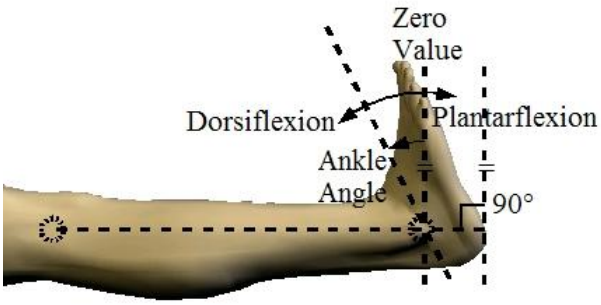
respond by shortening at the tricep surae, tightening of the medial longitudinal arch, decreased ability to absorb stress, etc, predisposing her to several kinetic chain dysfunctions. Now don t get me wrong, there s nothing like a feminine leg in heels but if one is to wear heels then one must take the time to restore or maintain proper foot function. Life is about balance. Things perform optimally when they are balanced. That s the key to an individualized exercise program. The program should reflect balance or symmetrical restoration. In order for that to occur, one must not only know what balance and symmetry means, but what are the functional demands and roles for a particular region of the body.

The foot is responsible for five basic roles.

- adjust/accommodate to varying surfaces
- provide a rigid lever for push off
- perform as a structural supportive platform
- attenuate ground reactive forces
- absorb/convert/transmit tranverse force during closed kinetic chain (CKC) activities

The foot/ankle complex is the interface by which our lower extremities interact with the ground during CKC activities. There are varying foot types that influence the foot/ankle s ability to perform these roles. The foot may exhibit a high arch (pes cavus) resulting in a supinating bias. These individuals may encounter problems with accommodating to varying surfaces, attenuating ground reactive force, and dealing with tranverse/rotational forces during CKC activities. On the other hand, one may present with a flat foot (pes planus) resulting in a pronation bias. These individuals may have problems with providing a rigid lever

for push-off, dealing with transverse/rotational forces and performing as a structural supportive platform. Right in the middle is the "neutral" foot type, which is inherently optimal for function.



The ankle is responsible for the primary motions of plantarflexion (pointing your foot), dorsiflexion (lifting your foot, like off of the gas pedal), inversion (turning your foot in), and eversion (turning your foot out). The ankle works intimately with the foot as a unit to perform/control tri-planar motions which is why it is often referred to as the foot/ankle complex. For example, in CKC activities, if an individual has a flat foot they may lack the ability to provide a rigid lever for push off. Resulting with increased stress on the muscles responsible for plantarflexion. On the other hand, if a person has tight plantarflexor muscles, over time, they may acquire a decreased medial longitudinal arch (arch) as the foot begins to over pronate to compensate for the lack of ankle dorsiflexion. The variety of compensations that can occur throughout the foot/ankle complex are many as there is not enough time to cover them all in this article. The major point here is that efficiency at the foot/ankle complex is integral in CKC activities, although it is often neglected. Now let us go back to the question presented earlier. How do people select their footwear and how does this decision impact performance?

Various athletes of multidirectional sports, such as basketball and football, choose to wear mid-top and high-top shoes in an attempt to minimize ankle sprains. Recreational runners and gym goers may choose shoes that look stylish and/or feel comfortable. While comfortable is good, it doesn't always mean appropriate. Here's the deal, when selecting proper footwear, one should select a shoe that reflects his/her foot type thereby promoting proper foot/ankle mechanical efficiency. In additional, the shoe should reflect the rigors of the activity. For example, a mid-top and/or high-top shoe may be appropriate for basketball to provide supportive reinforcement to the ankle, but there are some things to consider. Shoes are constructed on models of feet known as lasts. These lasts may reflect a flat foot (over-pronator), a high-arch foot (supinator), or a neutral foot. So it is easy to see if a shoe is made for a pronating foot, it probably isn't the best shoe for someone with a supinated foot. Various materials are used to comprise the sole of a shoe. Individuals with a supinated foot may require a material with greater shock absorptive ability due to problems with GRF attenuation. These materials affect the co-efficient of restitution which is partly why Olympic lifting shoes are more appropriate for lifts such as power cleans, jerks, power snatches, etc. opposed to running shoes. Another thing to consider is if an athlete is placed in mid or high-top shoes. Are they performing isolated and controlled mobility exercises specifically for the foot/ankle complex? As stated earlier, the body responds to external stress. In this case mid and high-top shoes provide support to the foot/ankle complex in a way that decreases mobility and stress across the ankle. As a result, the ankle may become stiff, weak, and/or exhibit decreased proprioceptive (perceptual) abilities. This is partly the reason for the increase in high ankle sprains (really peroneal strains)

and "non-contact" knee injuries in sports such as basketball. The efficiency of the kinetic chain has been compromised and now certain areas are subjected to increased levels of stress. Before we jump into some basic ways to keep the foot/ankle complex healthy, let's briefly discuss foot/ankle CKC mechanics.

In traditional terms muscle function is often discussed in terms of open kinetic chain force production (i.e. – the soleus plantarflexes the foot/ankle). Generally in CKC activities, muscles decelerate the opposite movement (loading phase) than produce (force generation). For example, during ambulation, the soleus decelerates dorsiflexion during the second phase of stance and then helps to plantarflex the foot/ankle during push-off. Plantarflexors decelerate dorsiflexion, dorsiflexors decelerate plantarflexion, invertors/evertors decelerated pronation/supination. Weak decelerators often results in dysfunctional loads elsewhere in the kinetic chain. When performing CKC acts such as stepping down/off a step and/or a single legged squat, the soleus must control the tibia during dorsiflexion. If there is a lack of dorsiflexion and/or lack of dorsiflexion deceleration, the knee will be overloaded. During a squat, the amount and rate of foot/ankle pronation must be controlled to assist in proper knee alignment. If this doesn't happen, the knee is subjected to excessive rotational/transverse plane stress. Remember when someone exhibits movement dysfunction, addressing the dysfunctional segment via isolation exercises followed by functional re-integration is an efficient course of action.

The following are some basic ways to maintain/address the foot/ankle complex.

- ankle mobility work (i.e. – reverse B.A.P.S. clockwise/counter-clockwise rotation)
- gastrocnemius and Soleus Stretching
- double and Single legged elevated calf raises
- double and Single legged dorsiflexion
- single Legged Stance with contra-lateral leg S-plane, T-plane, and F-plane driving
- single Legged Stance with upper extremity driving

These exercises should be followed up with functional integration such as squats, single legged squats, and step-ups/lunges to name a few.

Hopefully this leaves you in a state of reflection as the purpose of this article is to plant a thought provoking seed. Here are two things to remember:

- all shoes are not created equal
- proper foot/ankle function is essential as it is the interface between our body and the ground we stand on

Mike Davis, DPT, ART

Mike Davis, DPT, ART is a Doctor of Physical Therapy and Certified Active Release Technique Provider in the Northern Virginia area. He has treated high school, collegiate, and professional athletes of various sports including basketball, baseball, boxing, football, golf, martial arts, soccer, tennis, and track and field. In addition, he has experience in the in-patient neurological rehabilitative setting. He can be contacted via email at s2mdavis@hotmail.com.