# What's the BIG Deal about Pronation?!

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**About two years ago my professional life as a personal trainer, performance coach, and movement coach took a drastic turn; I attended a local Functional Movement® seminar with Lee Burton. It was at this seminar that I started to realize that there is much more practical knowledge available in the field of performance enhancement than I had previous realized. While talking with Mr. Burton I was inspired to begin thinking more "outside of the box" than I had done previously. After two days of movement analysis and corrective exercise progressions I began to think of innovative ways to help progress my athletes (and clients) more effectively than before.**

It is important to understand that during dynamic movement(s) such as walking and running, two things take place, shock absorption and joint stabilization.1. Shock absorption through knee and hip flexion, ankle dorsiflexion, and subtalor pronation; and joint stabilization takes place via the muscular and articular system1. Pronation at the feet can cause a chain reaction of knee, hip, and spine misalignment2 , and lead to many overuse injuries4. Among the most common conditions resulting from over pronation are the following: frequent ankle sprains, posterior tibialis (shin splints), arch issues (including plantar fasciaitis), and even stress fractures1,2. While there isn't direct research to back up anthropometric variables (over-pronation, femoral anteversion) and their relations to injury, many still believe that there is some correlation1.

One common issue I was seeing more and more of were people with valgus of the knees. A common problem, and a more complicated issue than often made out to be, there are numerous issues and problems which can cause or surface as a result of the valgus (knock-kneed) positioning of the legs. Mr. Burton touched on the issue of femoral internal rotation and adduction by having tubing wrapped around the knee and anchored in the sagittal plane; the theory behind the correction of this movement is that by forcing the limb into its natural tendencies, the muscle(s) which is responsible will consequently fire to prevent this movement. One issue which wasn't addressed directly was attacking the problem not only at the hip (glute medius, minimus, and maximus), but at the point of contact--the foot. How can you effectively prevent the foot/ankle from falling into a pronated (everted, abducted, and dorsiflexed) position?

While reading an article in the Journal of Athletic Training, I began to think about how important foot/ankle stability actually is. In that reading, the authors state: "Considering that the foot is the most distal segment in the lower extremity chain and represents a relatively small base of support upon which the body maintains balance (particularly in single-leg stance), it seems reasonable that even minor biomechanical alterations in the support surface may influence postural-control strategies3." The light bulb went off; it only made sense to me that by making a base more stable, you inherently create the ability to refine movements and consequently produce more power.

It was at this point which I began exploring possible corrective ideas and solutions to the problem. If the ankle falls into pronation, why not "assist" the ankle and force the foot into pronation to help turn on the supinators? It sounded good to me, thus began a quest to find a simple, valuable, and effective solution to a too common issue. The solution: foam mats, layered and placed under half of the foot in the sagittal plane. As I started to look for musculoskeletal reasons and backing of how this positioning could strengthen muscles which help prevent pronation, I dug out my "Kinesiology of the Musculoskeletal system: Foundations for Physical Rehabilitation" book by Dr. Donald A. Neumann. I should mention that this is a great book with a great deal of practical, easy-to-read, and applicable information for anyone in the field of movement. Looking at the structure of the ankle and its components lead me to the belief that proper strengthening of the medial longitudinal arch (arch of your foot; the primary load-bearing and shock absorbing structure in the foot4) is possible with strengthening of the tissues. The talonavicular joint and local connective tissues are responsible for the maintenance of the arch4; the main tissue which gives the arch its support is the plantar fascia. The plantar fascia is made up of very collagen-rich tissue;

the deep fascia is attached postural to the medial process of the calcaneal tuberosity4 from this point it blends in with the first layer of intrinsic muscles within the foot4. To sum it up: Normally, the body can passively support it's arch when standing still in an upright position, however, when dynamically moving as in a sport, the extra force causes the subtalor joint (calcaneous to evert in relation to the tibia)4 to pronate. "Flexible pes planus" is the most common form of people with "flat" or pronated feet4 .

So what does all of this mean? It means that with proper muscular development, the assistance of orthotics, and proper tissue extensibility, strengthening of the arch is possible. Proper lengthening of the peroneals (peroneus brevis, and longus) will counter-balance the main inverters of the foot (tibialis posterior, extrinsic toe flexors, and the gastrocnemius--to some degree) and keep the medial longitudinal arch (along with the transverse arch) in proper alignement4 .

This is where the exercises come into play. Adding a thin (1/4"-1/2") mat underneath the foot of a person performing a closed chain exercise forces the weak invertors (tibialis posterior, flexor digitorum longus, and flexor hallucis longus4) and the plantar flexors (gastrocnemius, soleus, and plantaris4) to actively engage. Any type of foam mat can be used: yoga, fitness, and while I haven't experimented with the Airex® Balance Wedge, that is also a possibility. Make sure to place the mat(s) in the sagittal plane and that only ½ of the foot is supported. The ball of the foot and the most medial area of the heel should be on solid ground while the little toe and the most lateral portion of the heel should be supported by the mat. This solid yet unstable environment puts the foot in a position where it can work to stabilize while still moving larger quantities of weight.

I have begun implementing these mats into programs and have found great success not only in unilateral movements, but also in bilateral movements. The "mat work" I mentioned has become an important tool for many of my athletes. The improvement in foot positioning can be seen instantly (neurally improving the muscular contractions) as the pronation is prevented/limited.

Think about the mat as another tool to help assist in proper muscular development. While it won't turn your average gym-goer into a professional athlete, it can help to develop good movement patterns and possibly relieve some aches and pains.

Don't knock it before you try it. A sample progression is listed below.

Workout: Week 1 Self Myofascial Release (lower leg) Static stretching and ankle ROM techniques5 (refer to page 135 of Mike Boyle's book, Designing a strength training program and facility) Single Leg Squat Variation w/ foam 1 x 12 each leg Single Leg RDL Variation w/ foam 1 x 12 each leg Step-up w/ toe raise (onto foam) 1 x 12 each leg

*I usually start out with one mat and about 12 reps; I will typically progress the athlete by decreasing the reps to around 10 while increasing the weight. Once I get down to 8 reps I will add a second set and work from there as I see fit. I also really like to manipulate tempo during these exercises. I've found that 4-2-1 (lower in 4 seconds, static/isometric hold for 2 seconds, and raise in 1 second) or 3-2-1 tempos work best at the beginning. Larger athletes (typically football players, wrestlers) may want to work with 2 mats. I typically place athletes who weight 200+ on 2 mats; 1 mat isn't dense enough to provide benefits to them.

Remember: Think outside of the box! Be creative and innovative in trying to find "common" sense and practical applications for the knowledge which you have learned most recently.

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1) Hintermann, Beat, Nigg, Benno. Pronation in Runners: Implications for Injury. Sports Med. 1998; 169-176. 2) Form & Function: Which way do your ankles Curve? Running & Fitnews. American Running Association. Pp 5,7. 3) Cote et al. Effects of Pronated and Supinated Foot Postures on Static and Dynamic Postural Stability. Journal of Athletic Training. 2005; 40: 41-46. 4) Neumann, Donald. Kinesiology of the Musculoskeletal system: Foundations for Physical Rehabilitation. 2002. 5) Boyle, Michael. Designing Strength Training Programs and Facilities. 2006