



Pronation

Foot pronation is used to describe a direction of movement of the foot relative to the body. Pronation is a relatively complex motion, and to describe it in a simple manner it is movement of the foot inward towards the mid-line of the body. Motion in the opposite direction is supination.

Pronation can be observed and measured qualitatively and/or quantitatively. Qualitative observations assess pronation as either excessive, normal, or less than normal amount of motion. Often pronation is assessed indirectly from examination of shoe wear pattern. Being a skeptic how a shoe deforms can be a result of foot movement when walking/running, but it can also occur as a result of how one takes his shoes off, or how a shoe is stored in the closet. Quantified measurement of pronation is recorded in degrees of rotation about an axis. The total amount of pronation varies from individual to individual and can be as little as 3 degrees of motion to as much as 15 degrees. Foot pronation can be measured on an examination table, but most would agree measuring pronation during walking/running provides more valuable information. Slow motion video of walking/running can enhance the accuracy of measuring foot pronation.

In the long distance running community rightly or wrongly pronation has assumed a position of importance and some controversy. Pronation is thought to be important factor related to running injuries. Pronation is not necessarily a bad thing it is a normally occurring joint movement. Pronation may be considered pathologic if the amount of pronation exceeds a threshold which can contribute to injury. Part of the controversy is debate among health care professionals regarding what is the threshold pronation which contributes to injury.

Some investigators have found a strong relationship between excessive pronation (Willems, TM 2007) and injury; whereas other investigators have found no relationship (Whiteford, D 2007). There seems to be a relationship between pronation and injury, but the relationship can be complex and confounded by other variables. What might cause an injury in one runner may have no influence in another, making it difficult to sort out. Other variables which relate to pronation are excess body weight (obesity), alignment of adjacent joints, particularly the hip, running technique/style,

and the degree of fatigue (Headlee, DL 2007). Excess pronation may only occur when a certain level of fatigue occurs.

Treatment/Intervention:

An internet search will result in a plethora of treatment options. By far the majority of suggested treatments involve shoes, shoe inserts, and foot orthotics.

A study measuring pronation indirectly by looking at pressure measurements concluded that motion control shoes decreased medial pressures (greater pronation) when compared to neutral shoes (Cheung RT, 2008).

A meta-analysis of the scientific literature concluded the using foot orthoses in the prevention of first incidence of lower limb overuse conditions concluded their use is warranted (Collins, N 2007). The use of foot orthoses for individuals who already have injury is inconclusive. The quality of this research was generally poor. In order to determine the effectiveness of interventions dealing with foot pronation and injury there are two parameters the symptoms and the signs measured. The symptoms are the pain related to the injury. The sign is the degree of pronation. An inherent problem when it comes to measuring the sign of the change in the amount of pronation, is that there is such a relatively small amount of motion to begin with (3 to 15 degrees). Studies which have measured the ability of orthotics to control pronation report an average decrease in the amount of pronation of 2 degrees.

Interestingly in the scientific review by N. Collins (2007) there was no difference between the use of custom and prefabricated foot orthoses in the prevention and treatment of lower limb overuse injuries.

It is important to recognize that there are additional and/or supplemental interventions to manage excessive pronation besides shoes, shoe inserts and orthotics, such as, strengthening exercises, discontinuing stretching exercisers, core strengthening exercises, and gait training/modification (barefoot running).

ME Feltner demonstrated that pronation can be decreased by a strengthening program of foot and ankle muscles (1994). Often if excessive pronation is observed there is abnormal movement of the lower leg, knee, thigh, and pelvis. Several investigators have shown a relationship between weak hip girdle muscles and lower extremity injury, and they have prospectively improved strength and function of hip girdle muscles with a resolution of injury (Fredericson, M 2005). Investigators at

the U. of Delaware have shown that conscious modification of running form and technique results in improved movement and mechanics of the lower extremity including pronation, as well as, resolution of injury. Using slow motion video analysis I have observed an individual with excessive pronation, and by suggesting changes in running technique have been able to eliminate the excessive pronation. I have observed individuals running in shoes pronate excessively, and when asked to run barefoot, they eliminate the excessive pronation.

Excessive pronation may be one of the factors which contribute to a running injury. Understanding and managing excessive pronation can be complex and confusing. Recognize that there are multiple options in terms of interventions to decrease excessive pronation, including: strengthening exercises, avoiding improper stretching exercises, core strengthening exercises, gait retraining and modification of running form to name just a few.