Foot Facts
(Understanding your feet to prevent injuries)

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Feet are generally underappreciated. We cover our feet in shoes. We often hide our feet for some unknown reason, yet our feet are the primary anatomical structure which allows us to run. While nearly all other animals travel on four legs, humans, birds, some apes, lizards, and cockroaches (at their highest rate of speed) travel on two legs. Humans walk and run with a highly efficient bipedal (on two legs) gait. Long distance running on two legs is possible thanks in large part to our amazing foot anatomy. Understanding foot anatomy will lead to an appreciation of the job our feet do during every running stride.

The human foot contains 26 bones (28 if you count the two floating sesamoid bones on each foot). The bones of the foot form three distinct structural and functional units. The rear foot is made up of the large calcaneus and talus. The rear foot is built for weight bearing and articulates with the lower leg bones (tibia, fibula). The mid foot is made up of the navicular, talus, and cuneiform bones. The mid foot has a dual role. It absorbs shock during weight bearing and forms the stability we rely on (the arch) when pushing off to initiate the next step. The fore foot is made up of the five metatarsal bones and 14 bones in our toes (phalanges).

Foot function is responsible for the unique shape of each bone within the foot. The wedge-shaped mid foot bones allow shock absorption during pronation (weight bearing acceptance), but with muscle contraction the flexible wedge becomes a rigid supporting structure which drives body propulsion. In contrast, the beefy calcaneus and talus are weight bearing structures. Even though mid foot and fore foot running has been shown to be more efficient and decrease running injuries, humans naturally heel strike when we walk. Finally, the fore foot is the region of the foot which allows us to “feel” the road or trail when we run. Balance, agility, and proprioception are duties of the fore foot.
The skeletal anatomy of the foot must be combined with the stability and mobility provided by our connective tissue (ligaments, tendons, fascia) and muscular tissue (Intrinsic: within the foot; Extrinsic: lower leg muscles). The ability to react to uneven surfaces in a fraction of a second and rhythmically run without active concentration is made possible by the neuromuscular (nerves activating muscles) component of the foot. Continuous, two-way nerve messages from and to the foot to the spinal cord and brain result in split-second shock absorption, foot agility, and propulsion power.

Given the anatomical and physiological complexity of the foot, it is no wonder runners frequently experience foot and ankle pain. Foot and ankle specific exercises and basic foot care will reduce your overuse injury risk. The average human travels 100,000 miles on their feet in a lifetime. Runners can multiply this number by a factor of two! Running places 2.5 to 5.0 times the weight of the body through each foot strike, depending on gait efficiency. Impact alone can break down the structural integrity of the foot, including the joints, connective tissue, and muscular integrity. The greatest enemy of the foot, however, is torsion. Bones, joints, and connective tissue are happy when movement is through designated movement planes. Torsion through a joint, or musculotendinous structure, however, greatly increases its chance of fatigue, overuse, and injury. Stress fractures are often the result of excessive torsion through a bone secondary to inadequate stability (muscle weakness or lack of connective tissue tensile strength).

To prevent structural failure and subsequent injury in the foot, attention must be regularly placed on addressing foot-related strength, proper joint mobility, and tissue recovery. Yes, TLC is the best medicine for happy, healthy feet to allow you to run. Below are two examples of foot exercises designed to combine mobility and stability for foot injury prevention and treatment. Call or email Sapphire Physical Therapy to find out how our staff can help prevent and treat foot-related injuries to enable you to achieve your 2016 running goals!