Negative age related changes have been demonstrated in all organ systems, especially those of the musculoskeletal system as older adults strive to maintain physical activity. The population of the United States is aging, with 39.6 million Americans older than 65 years in 2009 and an expected increase to 72 million by 2030.[1] Despite the criticism of America being a sedentary country, this aging population continues to be active with recent health club memberships more than doubling in the 35 to 55 year old age group and more than quadrupling in the those over 55 years of age.[2] The term “boomeritis” refers to the musculoskeletal ailments that plague the aging athlete (typically >50 years of age) as he or she tries to maintain the same level of physical fitness experienced during youth.[3] Common lower extremity injuries incurred with boomeritis include muscle injury, Achilles tendinopathy, posterior tibial tendinitis, stress fractures, and plantar heel pain. While these injuries are also well known to younger athletes, the physiologic changes that occur with age, make active older adults more vulnerable to these injuries with less reserve for recovery.

Muscle is the most common acutely injured tissue in active older adults.[4] Aging causes decreased muscle mass and function. Specifically, the physiologic changes that occur with age are multitude and include decreased total muscle fiber number, decreased individual fiber cross-sectional area, disproportionate decrease in type 2 (fast twitch) fibers, denervation, increased collagen, and decreased mitochondrial activity. These result in decreased ability of muscle to adapt to high levels of loading, resulting in tearing. Kubo et al.[5] examined age related changes in the properties of the Achilles in sedentary men in their 20s, 30s, 50s, and 70s and found significantly decreased muscle mass, maximum isometric strength, and maximum strain in the 70 year old group compared to all other groups. However, skeletal muscle has been shown to retain its capacity to adapt into old age with enlargement of muscle size (hypertrophy of the remaining muscle fibers) with resistive training exercises.[6]

Age related changes to tendon are the most extensively studied in the musculoskeletal system. Age is typically associated with increased prevalence of tendinosis and injury, however the etiology is not exactly known.[7] In fact, Longo et al.[8] in a group of Masters track and field athletes with a mean age of 54 years (range 35-94) demonstrated no influence of age, gender, weight, height or impact on Achilles tendinopathy. Yet, age related changes to tendons are widely documented and include decreased tendon blood flow leading to calcific tendinopathy and lipoid degeneration, decreased extra-cellular matrix production, and decreased collagen production amongst others. Many of these changes are seen in Achilles tendinopathy and posterior tibial tendinitis. Moreover, it seems that with
increasing age, tendons participate in self-degeneration. Achilles tendons from aged rats demonstrated significantly increased matrix metalloproteinases (MMPs) 2 and 9 which are known to degrade type I collagen.[9] Supporting the previous animal work, we have demonstrated that human pathologic posterior tibial tendons secrete significantly elevated MMPs 1, 2, and 3 when compared to patient-matched flexor digitorum longus (FDL) tendons (Figure 1). Soluble pain and inflammatory mediators are also important in tendinopathies as they can contribute to pain not only within the tendon but in the surrounding tissues with increased activity. We have also demonstrated, glutamate, an excitatory neurotransmitter, and several inflammatory cytokines were secreted at significantly higher levels from posterior tibial tendons compared to patient-matched FDL tendons.

Complicating matters, more so with tendons of the foot and ankle (Achilles, posterior tibialis) than any other musculoskeletal tissue, with advancing age comes many comorbidities that make tendons more susceptible to degeneration such as variation in insulin, testosterone, or estrogen levels, thyroidectomy, corticosteroid treatment, amongst others.

Metatarsalgia, plantar fasciitis, and heel pain have been associated with physical activity in older adults.[10] However, the exact etiology is not yet understood. Regardless, there are no human or animal histological studies comparing changes in the plantar fat pad, plantar plate or plantar fascitis with age.

In summary, the active lifestyle of the baby boomer generation is revealing injuries not previously seen in active older adults. Age-related physiologic changes to multiple tissues of the musculoskeletal system can decrease the ability of these tissues to withstand high-impact physical activities.

References