# The Aging Athlete

Taylor Jobe MD†
†UNM Department of Orthopaedics and Rehabilitation

## Introduction

As the general population ages, it is the duty of the orthopaedic surgeon to meet the challenges of an older, athletic patient. Throughout the aging process the physiology of the body changes. This occurs at different rates in different people.

Organ functions gradually become impaired and decrease in efficiency. Our bodies become more vulnerable to environmental stresses, metabolic disturbances and disease.[1] Recent evidence suggests that effects of aging may be more of a result of unhealthy living and a sedentary lifestyle. As we see an increase in life-expectancy, we also see a portion of the population that desires higher activities at older ages than has ever been seen before. Ever.

Between 1900-1988, the life expectancy in western countries increased from 47 years to 75 years. The number of people living over the age of 85 increased 232% between 1960 and 1990, compared to just a 35% growth of the general population. Now, 25% of Americans are over the age of 55. Looking at really old people (age over 65), today there are 38.6 million Americans, and that number will skyrocket to 54.8 million by 2020.[2]

These numbers are somewhat astounding. Now more than ever it is the role of the orthopedic surgeon to understand the anatomy and physiology of aging, as well as be able to outline expectations for these older athletes. Because, let's face it, sometimes we don't know what's best for ourselves as athletes.

Dr. Nicholas DiNubile coined the term "Boomeritis" in 1999. It refers to injuries in older amateur athletes. These can be acute injuries (i.e. ACL tears) or overuse injuries (i.e. tendonitis). He notes a significant increase in these injuries presenting to his clinic in the last 2 decades. His general recommendation for prevention is to schedule balanced routines, change the muscle groups being used, and perform sport-specific preparation.

A simple step for the orthopedic surgeon in treating the aging athlete is to identify the aging athlete. This tends to make up a significant portion of our patient base. It can include "Weekend Warriors", who are people who participate in usually physically strenuous activity only on weekends or part-time. A more competitive group of aging athletes are known as "The Masters Athlete". Think of these as washed-up Olympians. Another category is older professionals who still are involved in sports but no longer as athletic participants. This includes coaches and trainers, who often push themselves to their physical limits as a means of motivation for their players. Military personel should also be considered aging athletes, given their requirements to remain active duty.[3]

## The Effects of Aging the Body

The human body changes at the molecular level during the aging process, thus affecting every organ system in the body. These changes have been well-documented. For example, the oxygen utilization in a 60-year-old is 80% of that of a 20-year-old. Peripheral vascular resistance increases due to atherosclerosis. There is also a decrease in pulmonary efficiency because lung compliance decreases, thoracic cage elasticity decreases, and gas exchange becomes limited. The result of these cardio and pulmonary effects is an increased risk of myocardial events. This risks are exacerbated in the person who suddenly begins intense training from a previously sedentary lifestyle.

Changes affect the kidneys as well. The number of glomeruli decrease by half from age 40 to age 70. There is also insensible water loss in the aging population. Intravascular depletion affects cardiac output and athletic performance. This depletion usually precedes thirst. Sensorimotor coordination is also affected. Peripheral nerves can be affected even more by common diseases such as diabetes.

On a subject that is far more comfortable to the orthopedic surgeon, the musculoskeletal system undergoes sufficient changes as well. Bone density decreases as we age. Men lose .75% per year of their density after the age of 40, compared to women who lose 3% per year after menopause. These changes can be slowed with regular exercise, Calcium

and Vitamin D supplementation, hormone replacement therapy and medical therapy such as bisphosphonates.

Ligaments and tendons undergo a loss of compliance and become more stiff, thus also making them more susceptible to catastrophic failure. They also are affected by the decreased vascularity that happens to them as they age. Regular exercise and activity-specific warm-ups can help prevent these injuries.

The meniscus, the most common indication of orthopaedic elective procedures also ages. There is appreciable intrasubstance degeneration. It loses the ability to dissipate stress and eventually undergoes degenerative tears. There is no good prevention for this known to us, but is it treatable with arthroscopic debridement.

Articular cartilage certainly is no stranger to the aging process. Theses affects are seen daily in orthopaedic clinics. The concentration of chondroitin sulfate relative to keratin sulfate increases in articular cartilage. We also diminished amounts of synovial fluid. Nutrition and metabolic waste occur via diffusion, thus resulting in hypertrophy of the surrounding tissues. Treatment and prevention for cartilaginous wear is multifactorial and numerous options exist. Glucosamine chondroiton and hyaluronic acid injections have not had resounding results, but there is some favorable literature out there. Kanzaki et al reported on the effect of a dietary supplement containing glucosamine chondroitin compared to a placebo. Their 16 week follow up showed that patients that took 1200mg glucosamine and 60mg chondroitin had improved symptoms and functional knee scores. They also had improvement of their Type II collagen synthesis/degradation balance.

Skeletal muscle undergoes sarcopenia as we age, a .5% to 1% loss of muscle mass per year starting at age 25. There is a volumetric loss of individual fiber size as well as some unfortunate muscle denervation. There is also a decreased mitochondrial volume in the muscles themselves, and we all know what that means. Muscle also becomes less flexible as we age, so think twice about that gymnast girlfriend of yours. The great news, is that Regular exercise and muscle training can actually REVERSE the loss of muscle volume seen with aging. Warming up also helps prevent tears, and nutritional supplementation is good stuff.

## The Negative Consequences of Sports and Fitness

The orthopedic surgeon does see numerous complaints as a result of sports participation. These include overuse injuries such as patellar tendinits, impingement and stress fractures. It's also noted that patients that are more active as teenagers have higher hip and knee osteoarthritis rates when older. We are seeing more injuries in sports especially since female participation has increased over the last few decades. However, we do not have a lot of long-term effects on sports injuries, as trainers and doctors often lose track of their athletes. We do know that modest to intense running regiments do not correlate with increased osteoarthritis later on in life. And most studies have shown a positive effect of sports. They help control weight, contribute to cardiovascular health and slow osteoporosis.

## Sports Participation in the Elderly

One question that we face is whether or not participating in sports at an older age is beneficial to one's health. Kallinen et al did a review of 11,581 patients, all over the age of 65, looking at their level of sports participation. None of these patients were disabled. The divided these people into four groups, including active particpants in sports, people that only exercise, passive participant in sports, and sedentary. They found that incidental functional disability is better prevented when a person actively participates in sports.[4]

## Care of the Aging Athlete

Since a high proportion of the population demands to be active at older ages now, orthopedic surgeons must be able to offer advice for all aspects of the patients training. This include from the preinjury level to the severe disease level. Sixty-three percent of triathletes are over the age of thirty-five.[5] Advice that physicians provided to these patients in the past used to be "quit" or "slow down". But we have to understand that this is no longer the culture in our country. We must meet the demands of these people.

As the athlete ages, we are more likely to see more chronic/overuse injuries. 70% of all sports injuries in patients older than 60 are of a chronic nature. That is compared to 40% for the 21 - 25 year olds. By the seventh decade of life the 5 most common sports injuries are degenerative, and 20% of these injuries last more than 2 years and alter the athletes training and competition levels.

Tendinosis is caused by cumulative microtrauma to the tendons. Tendons have less elasticity as we age, and are slower to heal. This is seen in nearly every type of athlete, including golfers, who at risk for rotator cuff pain, medial epicondylitis and wrist tendonitis. In joggers we often see iliotibial band syndrome and Achilles tendinitis.

The acronym FACE is a simple reminder for the orthopedic surgeon to remember simple goals to set forward for patients that want to remain active. Flexibility. Aerobic intensity. Carry a load. Equilibrium and Balance.[6] Remind patients to perform sport specific warm-ups and stretch in the end. Dynamic stretching is better for preworkout; this is where the muscle is lengthened and then contracted. Traditional stretching is reserved for the end of a workout. Cardio workouts and weight-lifting or resistance exercise

should be worked into their routine, taking care to not focus too much on one and ignore the other. Exercises that work on balance will also be preventative to future injuries. When patients do sustain an injury, RICE is a well known acronym to treat sprains Remind them to go with Active RICE, not just RICE. They still have 3 good extremities that need attentions.

Dynamic, or sport-specific, warmup has become more popular and more and more literature is supporting it's use. In a study in which half of 943 professional soccer players underwent dynamic warmups for their hamstrings over a soccer season, there was over a 50% reduction risk of injury compared to the traditional warmup group.[7]

The aging athlete cannot be symptom free forever. Once they do develop symptoms, steroid injections have long been a clinical procedure that can provide good results. Cole et al looked at the use of steroid injections in modern practice. The most common extraarticlur sites that are injected in modern practice are the lateral epicondyle of the elbow (93% of surgeons), subacromial space (91%) and the greater trochanteric burse (91%). He saw no proven benefit of extraarticular injections lasting over six weeks. The results for the lateral epicondyle were inconclusive. The most successful sites were for trigger finger (60% resolution), DeQuervain's (90% symptomatic relief) and the greater trochanteric bursa in which 61% had ongoing relief for at least 26 weeks. The most common complications are post-injection flare, facial flushing and skin or fat atrophy. A septic joint occurs 1:3000 to 50,000 injections. Only 12.6% of rheumatologists and orthopedic surgeons have seen a septic joint in their career that they relate to an injection.[8]

## Osteoarthritis

Potentially the most feared diagnosis for our aging athletes is osteoarthritis. Eventually the joints wear down, cartilage is degraded, pain is severe and motion becomes limited. We are often asked about the causes and potential preventions of arthritis in our clinic. To some degree there is thought to be a genetic predisposition.

Chakravarty et al compared 45 long distance runners to a control group of 53, with a mean age of 58. These patients were followed for 18 years and studied with serial radiographs. They were controlled for age, gender, BMI, education, initial radiographs and disability scores. They saw less osteoarthritis develop in the long-distance runners (20% vs 32%), as well as a lower incidence of sever osteoarthritis (2.2% vs 9.4%). They concluded that long-distance running does not result in accelerated osteoarthritis or more severe osteoarthritis.[7]

Cole et al also looked at intraarticular steroid injection in the treatment of osteoarthritis. Pain was provided from 1 to 13 weeks in his study sample. These injections also helped with rehab and decreased the need for rescue analgesia after knee scopes. They appreciated that it did not cause progression of osteoarthritis if given every 3 months for two years. These patients also had better motion compared to a placebo group. Results still vary for viscosupplementation. It is more costly that steroids, and it seems to be less effective for severe DJD.[8]

Eventually patients who have failed nonoperative treatment of osteoarthritis will undergo a joint replacement. It is generally recommended that they pursue lower-intensity and lighter impact activities after the surgery. They have a better chance of returning to an old sport than starting a new one. Table 1 guides the physician in answering questions on what they think patients can do after a certain type of joint replacement.

## Conclusion

The aging athlete walks into an orthopedic surgeon's office every day. It is imperative that we have a broad knowledge set for these patients. It includes advice to prevent injury, treatments for small acute and chronic injuries and, of course, surgical options that can help them maintain their maximal level of competitiveness.

Table 1: Athletic Activity after Joint Arthroplasty: Summary of the 1999 Surveys of the Hip Society, the Knee Society, and the American Shoulder and Elbow Society

| Activity | Hip | Knee | Shoulder |
|---|---|---|---|
| Aerobics—High Impact | — | 0 | 0 |
| Aerobics—Low Impact | — | ++ | ++ |
| Baseball/softball | — | 0 | 0 |
| Basketball | — | — | 0 |
| Bicycling—road | + | + | ++ |
| Bicycling—stationary | ++ | ++ | ++ |
| Bowling | + | ++ | ++ |
| Canoeing | + | + | ++ |
| Croquet | ++ | ++ | ++ |
| Dancing—ballroom | ++ | ++ | ++ |
| Dancing—jazz | 0 | ++ | ++ |
| Dancing—square | 0 | ++ | ++ |
| Fencing | 0 | 0 | 0 |
| Football | — | — | — |
| Golf | ++ | ++ | + |
| Gymnastics | — | — | — |
| Handball | — | — | 0 |
| Hiking | + | + | + |
| Hockey | — | — | — |
| Horesback riding | + | ++ | 0 |
| Horseshoes | ++ | ++ | ++ |
| Ice skating | 0 | + | + |
| Jogging | — | — | ++ |
| Lacrosse | — | — | 0 |
| Racquetball | — | — | 0 |
| Rock climbing | — | — | — |
| Roller/in-line skating | 0 | 0 | 0 |
| Rowing | 0 | + | 0 |
| Shooting | ++ | ++ | + |
| Shuffleboard | ++ | ++ | ++ |
| Skiing—cross-country | + | + | ++ |
| Skiing—downhill | 0 | 0 | + |
| Skiing—stationary (machine) | 0 | + | ++ |
| Soccer | — | — | 0 |
| Speed walking | 0 | + | ++ |
| Squash | — | — | 0 |
| Swimming | ++ | ++ | ++ |
| Tennis—doubles | ++ | + | ++ |
| Tennis—singles | — | — | 0 |
| Volleyball | — | — | 0 |
| Walking | ++ | ++ | ++ |
| Weightlifting—free-weights | 0 | 0 | 0 |
| Weightlifting—machines | 0 | + | 0 |

++ = allowed
+ = allowed with experience
— = not recommended
0 = no conclusion

## References


1. Kober S. Committee on aging brings awareness to needs of the elderly. *Orthopedics Today*. 2002;11:32-33.

2. US Department of Commerce: Bureau of the Census. *Current populations reports. Statistical abstract of the United States, 2000*. Washington, DC: US Government Printing Office; 2001. 42.

3. Chen AL, Mears SC, Hawkin RJ. Orthopedic Care of the Aging Athlete. *J Am Acad Orthop Surg*. 2005;13(6):407-416.

4. Kallinen M, Markku A: Aging, physical activity, and sports injuries. *Sports Med*. 1995;20:41-52.

5. Wright VJ. Masterful care of the aging triathlete. *Sports Med Arthrosc*. 2012;20(4):231-6.

6. Garrick JG, Requa RK. Sports and Fitness Activities: The Negative Consequences. *J Am Acad Orthop Surg*. 2003;11(6):439-443.

7. Chakravarty EF, Hubert HB, et al. Long distance running and knee osteoarthritis. A Prospective study. *Am J Prev Med*. 2008;35(2):133-8

8. Cole BJ, Schumacher HR. Injectable Corticosteroids in Modern Practice. *J Am Acad Orthop Surg*. 2005;13:37-46.