How does aging affect athletic performance?

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Credit: AI-generated image (disclaimer)

I remember the moment a few years ago while watching TV when I realized that if I were riding in the Tour de France, at age 42 I'd be the oldest person in the race. It hit me that my dream of racing in cycling's biggest event was over…it was not going to happen.

Not that I'd been competing, let alone training seriously, on the bike for a number of years.

Or that not even in my "prime" years for competitive cycling would I have been good enough. It's just that now I had an excuse…. I was too old, too far past my prime years.

So what happened? Is there a physiological reason people in their mid-40's are no longer able to compete at the professional level in most sports, or is it a constellation of challenges, such as the time devoted to training, motivation, managing kids' schedules or busy work demands?

"I'm old" is the common refrain for why we get worse at athletics as we age. But here's what's really happening in the body through the years to make world-class performance less possible. And, interestingly, there are a few physiological elements that contribute to athleticism that don't seem as affected by aging.

The 'sweet-spot' age

In most sports, there is an age "sweet spot," at which the combination of physical, technical and strategic abilities comes together.

In most sports, this age sweet spot falls in the mid-20's to early 30's. Although there have been numerous examples of Olympians competing, and sometimes winning medals, over the age of 50, the vast majority of these come from sports requiring exceptional skill and less aerobic or anaerobic power, such as the shooting events, sailing, equestrian and fencing.

For endurance events, the upper cap for competing at the sport's highest levels appears to be around the age of 40.

Chris Horner won the 2013 edition of the Vuelta a Espana, Spain's version of the Tour de France, just shy of his 42nd birthday, making him the oldest winner of a Grand Tour in cycling.

The oldest Olympic marathon winner was the 38-year-old Romanian athlete Constantina Dita Tomescu, competing at the Beijing Olympic Games.

Dara Torres, at the age of 41 in 2008, is the oldest swimmer to compete in the history of the Olympics, missing the gold medal in the 50-meter freestyle by hundredths of a second. But these examples are the exceptions, not the rule.

Age changes how our bodies use oxygen

One big reason we see declines in aerobic (or endurance) athletic performance with age is that our bodies can't use oxygen as effectively.

The maximal ability to utilize oxygen (VO2max) is a predictor of endurance performance across ages. VO2max is a numerical value that describes how much oxygen your body can use per kilogram of body weight.

VO2max is affected by how well your body can bring oxygen into the lungs, how well this is carried in our blood to the working muscles, and how much oxygen the muscles can use to fuel contraction.

Exercise can improve all of these, and the higher the VO2max, the more "aerobically fit" a person is. That is, they can do more endurance work for their body weight.

In the general population, VO2max tends to decline by about 10% per decade after the age of 30. Athletes who continue to compete and train hard can reduce the drop by about half, to 5% per decade after the age of 30.

The reason VO2max declines with age is that our maximal heart rates go

down as well.

Maximal heart rate is the highest heart rate in beats per minute one can achieve during increasing intensity of endurance exercise. It is often roughly predicted as "220 – age = maximal heart rate." Although the actual maximal heart rate for a given person is highly variable, as you age, your maximal heart rate decreases, whether you are a highly fit athlete or a couch potato.

And this decrease reduces both cardiac output and oxygen delivery to the muscles, which translates to a lower VO2max and thus to lower performance in endurance events as we age.

Even if oxygen delivery to muscles goes down, the ability of your muscles to efficiently utilize the oxygen they do get relative to a given workload (this is called exercise economy) is well maintained into our 60's and 70's, though total muscle mass tends to decline as we age, and can contribute to declines in performance as well.

In terms of competitive endurance exercise, rowers have shown the least decline in VO2max with age, but the difference to other sports isn't huge. And it might be because rowing is a lower-impact sport than cycling (with crashes) and running (constant pounding).

Let's not forget the muscles

Some evidence suggest that for sports that require high levels of strength or power, like weightlifting, age-related limitations may reside in our skeletal muscles, those muscles that move our bones and joints.

For competitive weightlifters over the age of 40 (masters level), performance drops more precipitously than it does for endurance athletes such as runners, swimmers and cyclists. That's likely because

weightlifting draws on type II muscle fibers (called "fast-twitch" muscles) to produce strength and power. Research indicates that these cells decline in number and function with age.

Not only do these cells decline with age, but so do the cells that support the repair and growth of skeletal muscles in response to exercise decline.

These age-related declines are not as obvious in type I muscles, those muscle fibers most associated with endurance-type exercise.

Recovery can take longer

As they age, many athletes complain that the ability to recover from hard bouts of exercise diminishes.

This can affect the intensity and volume of training of all athletes. But in many contact sports, such as professional American football or rugby, recovering from injuries and the cumulative effects of hard hits becomes the limiting factor in continuing to play at the highest level.

For instance, last season there were only two people in the NFL, Sav Rocca of the Washington Redskins and Adam Vinatieri of the Indianapolis Colts, playing in their 40's.

Injuries take their toll on people playing non-contact sports as well. For masters athletes, experiencing more training-associated injuries leads to reduced training intensity and volume, and thus poorer performance come race day.

Better training can help you stay at your peak longer

Although all athletes will eventually lose the age versus performance

race, with better training and recovery practices, in the coming years we likely will begin to see more athletes in their 40's remaining competitive at the highest levels of sport. By "training smarter, not harder," athletes can reduce the chances of injuries, maximize gains from training and minimize the effects of aging.

Older athletes need longer to recover and adapt to a training stimulus, so workout planning needs to change with age.

High-intensity interval training, for instance, focuses on the quality of a workout, rather than the sheer volume of training, and can be used effectively by older athletes to improve aerobic capacity.

Cross-training, such as weightlifting and yoga, can help to maintain muscle mass and flexibility, and reduce overuse injuries in endurance athletes.

An emphasis on "active recovery" strategies (an easy run or swim on your rest days) and improved sleeping habits are important for athletes of all ages, but become essential for older athletes.

Performance decline isn't just about physical changes, however. As we age, our intrinsic motivation to train diminishes. Even in athletes, the motivation to train may shift somewhat from setting personal records to remaining active and healthy. And that's a great motivation for any athlete at any age.

Source: The Conversation