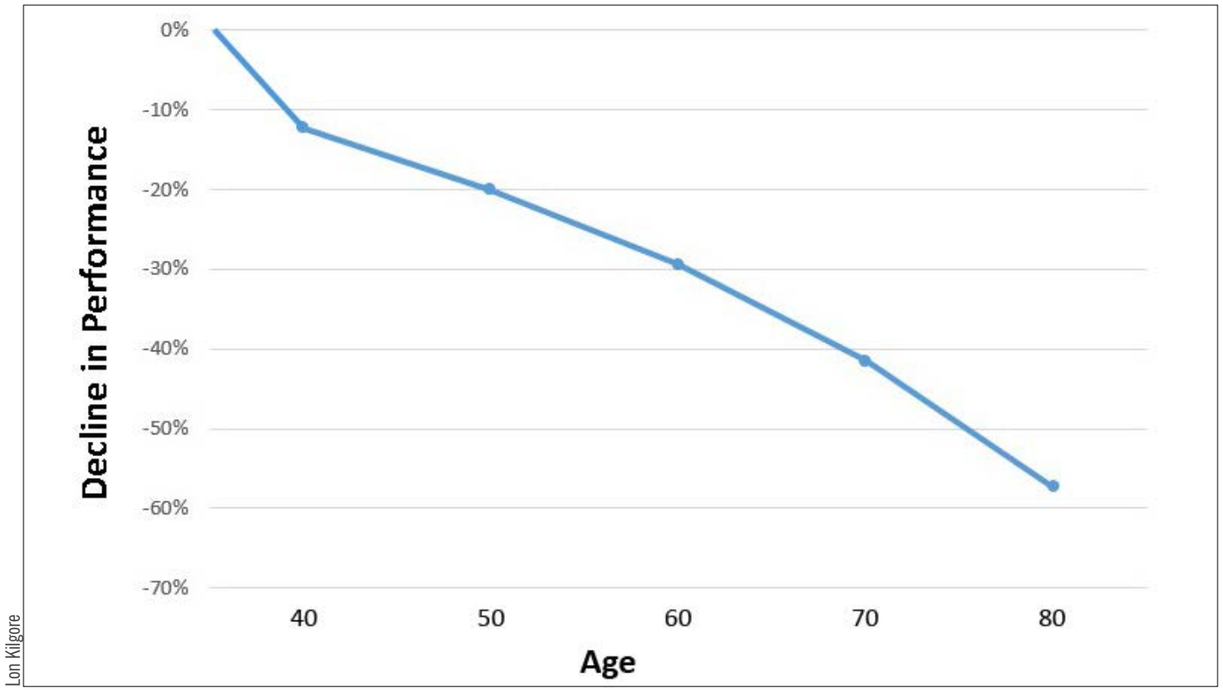
THE CrossFit JOURNAL

AGING, PERFORMANCE AND HEALTH

BY LON KILGORE

While physical capacity inevitably declines as athletes age, fitness has dramatic effects on health and quality of life.

Mike Warkentin/CrossFit Journal



Lon Kilgore

Figure 1: Decline in record performance (representing loss of fitness capacity) over time. Competitive records for 16 different sport disciplines for each age group—open division through over 80 years of age—are plotted, and the reduction is expressed as a percentage of the open world record.

Category	Age 40	50	60	70	80
Heavy Power	-25%	-35%	-44%	-54%	-69%
Endurance	-7%	-18%	-29%	-45%	-64%
Strength	-13%	-16%	-29%	-44%	-57%
Speed	-9%	-16%	-25%	-37%	-58%
Power Speed	-13%	-23%	-31%	-41%	-50%
Light Power	-5%	-14%	-20%	-29%	-46%
Mean Loss	-12%	-20%	-29%	-42%	-57%

Table 1: Comparative loss of performance capacity over time from highest cumulative loss to lowest. World records for each age group—over-40 division through over 80 years of age—are expressed as a percentage of the world open record lost with age.

"How much should I be lifting?"

It's probable every coach or trainer has been asked this question, and the query is usually qualified with variables including age, body weight and so on.

We as trainees, and humans in general, really like to compare what we can do with what other people can do, so we create standards for many common exercises. A standard is what we can realistically expect of someone with specific characteristics—sex, age, training experience—in a particular exercise. Sadly, few authoritative sources exist, and we can only strive to provide a relatively close approximation to help the trainee evaluate his or her performance and set goals.

When asked to provide performance standards, coaches must rely on a very limited data set in the literature, their own experience in training, observations of the people they train and pseudo-mathematical estimation. In many instances there is no referential data for an exercise in the literature, so that leaves only experience, observation and estimation.

The largest set of paying customers in the fitness industry is made up of people over 30, and this group is most often interested in how their newfound fitness levels stack up with people their own age. We see this in the 2015 industry report "The Wellness Deficit: Millennials and Health in America," in which almost two-thirds of the surveyed population said it is important to track and monitor their fitness progress. CrossFit, of course, is driven by data, and few trainees ignore whiteboards and logbooks.

So what can we expect for ourselves and our clients in terms of performance as we age?

Estimating Performance Loss

When we age, we lose fitness capacity. That loss is compounded if we do not train. But if we do train hard and intelligently, we can abate that loss even if we can't eliminate it completely.

These facts simply mean a standard for a 30-year-old trainee cannot fairly be applied to someone who is 40, 53, 67, 88 or any other older age, so we need to figure out how much fitness will be lost over time and adjust our expectations accordingly.

We can begin to get a handle on things if we take a cumulative look at how human performance in a variety of athletic events decays over the lifespan. By combining the open world records for a spectrum of events and comparing them to the master's world records for the same spectrum of athletic events—proposed here as a representation of comprehensive fitness—we should be able to get a feel for how overall fitness behaves over time.

Figure 1 tracks the loss of fitness capacity by plotting world records across all ages from open competition to octogenarians. As we would expect, performances tend to decline as we get older. Compared to open competitive records, performances decay by a little more or less than 10 percent per decade until the 70s, when fitness capacity drops 13 percent, and the 80s, when it drops 15 percent. Overall, by the time an athlete reaches his or her 80s, he or she will have lost approximately 57 percent of overall performance capacity.

We can take various records that represent various aspects of fitness and try to discriminate which elements of fitness are more persistent and which are lost faster or to a larger degree. We put maximal strength on one end and endurance on the other end. All other categories are arranged by similarity to those at the two ends of the spectrum.

Maximal strength—squat, bench press, deadlift.
Heavy power—snatch, clean and jerk.
Light power—shot put, discus, hammer.
Power speed—high jump, long jump.
Speed—100-, 200- and 400-m sprint.
Endurance—1,500-, 5,000- and 10,000-m run.

If we arrange the performances in the events above into a table that stratifies by the amount of performance capacity lost by category, you arrive at Table 1.

Heavy power activities—the Olympic lifts—behave differently in the first decade after the open-division records when compared to other events. The first thing you'll note in the table is that Olympic-lift performance takes a huge hit immediately, dropping 25 percent by the age of 40. That's twice the average decay and up to five times the rate of decay for other categories. This is curious, as maximal strength, speed, power speed and light power are thought to be closely related to heavy power, and these other categories had much better performance-capacity retention. Could the advanced mobility demands of the Olympic lifts contribute to the rapid decay or is there another factor in play?

It is interesting that power speed (high jump, long jump) and light power (shot, discus, hammer) are the best-preserved physical capacities. Jumping and throwing are fundamental human movements, but are they biologically more important than lifting or running?

We can't answer that with available information.

Physical Activity, Health and Quality of Life

We strive to make informed decisions about loading and expectations for our trainees, so we need to understand that a trainee is quite capable of improving fitness levels to a significant degree regardless of age. There are reports of octogenarians improving their strength by up to 200 percent, and virtually all resistance-training studies produce results that show positive effects on fitness and quality of life (1).

But if the data above are an indication, there are limits to how much fitness can be gained as athletes advance in age. Therefore, we need to exercise caution and not lead our trainees to expect elite performances in any age group. When we look at the normal distribution for physical activity and exercise habits, only 1 percent reach the level of performance that could be considered elite—but remember that you don't have to set a world record or even win a big event to be elite. Similarly, you don't have to be elite to reap the death-repelling benefits of training.

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If we consider the epidemiology of inactivity, we come up with the following estimations of training progression:

- Physically inactive—25 percent of the population (no movement above minimal).
- Physically active—40 percent of the population (a person with some level of movement above normal workday levels for a cumulate 30 minutes per day three to five days per week).
- Novice trainee—20 percent of the population (actual beginner who trains regularly to improve fitness).
- Intermediate trainee—10 percent of the population.
- Advanced trainee—4 percent of the population.
- Elite trainee—1 percent of the population.

Due to their physical training, many older athletes have fitness levels well above those of much younger people.

Matthew Townsend

Colleen Baz

Good news: When sedentary individuals become active, fitness levels increase regardless of age.

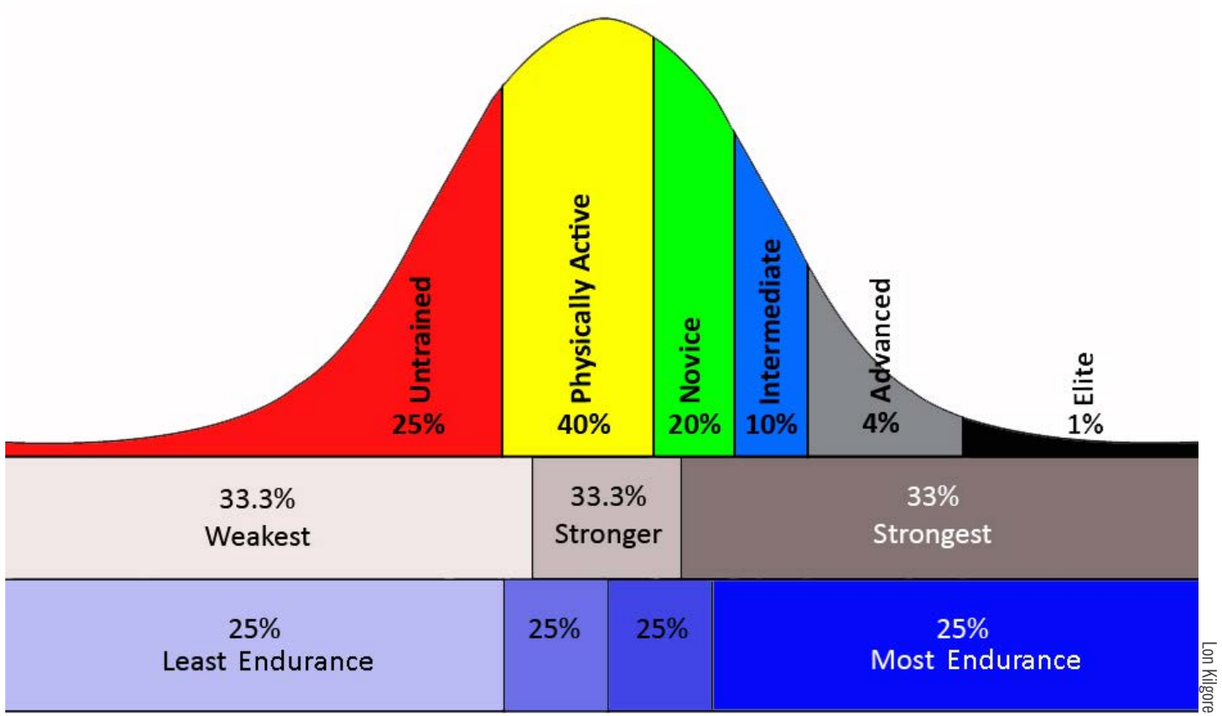

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Figure 2: Estimated distribution of the population by fitness progression. With respect to mortality, individuals who are in the upper two-thirds of the population in strength die from all causes at a lower frequency than those in the weakest third. Similarly, those in the lowest quarter of endurance have a significantly increased risk of death from all causes.

Note that these are the author's approximations based on experience, published papers on prevalence of exercise participation and inference.

If we overlay this distribution across the epidemiological data about strength and mortality and endurance and mortality, we can roughly determine the level of fitness needed to maximize the risk-abatement effects of exercise (Figure 2).

Those individuals who are untrained and perform neither physical activity nor exercise have the highest risk of death from all causes because they are the weakest and least enduring of the species. Once a person becomes physically active—meaning he or she just moves regularly by doing things like taking the stairs, walking around a mall or doing anything that elevates metabolism above baseline for an accumulated 30 minutes per day—he or she will experience a significant reduction in risk of death. While this is an improvement in general health, the person will not reap a significant fitness benefit from these relatively low levels of activity.

The best results for reducing premature death are found in the upper third of the population in strength and the upper quarter in endurance. That level of capacity begins at the upper end of the novice performance standard and extends through elite.

Even though risk of death does not significantly change between intermediate and elite, the higher the category reached, the higher the physical function in the real world—meaning the potential for higher quality of life grows with fitness improvement. That's why we strive to make our trainees more fit; we seek not only to improve health and prevent death but also to improve quality of life.

If we seek only the biggest bang for the buck, being physically active is likely enough in terms of health benefits. But it's really not enough, and this is where definitions are important. If you consider the absence of disease as the primary criteria for "health"—health is avoidance of disease and death—then being physically active might suffice. That is precisely the tack of the American College of Sports Medicine and other medical interests.

Alicia Anthony/CrossFit Journal

At any age, very few athletes will reach the elite level. Nevertheless, those at higher levels of fitness will be healthier while enjoying a very high quality of life characterized by vitality and independence.

But being healthy—no disease—while functionally impaired in strength, endurance and mobility is just as problematic as ill health. Health without function is simply not especially rewarding. As trainers, we want our trainees to grow in function inside the gym and out. By pushing for higher levels of fitness, we improve their abilities not only in the gym but also at work, home and play, which improves quality of life.

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Range of motion, agility, balance and coordination can all affect quality of life, but their relationship to mortality across the lifespan is not well known, and thus they are not included in Figure 2. While we do have informative data that can help guide us with respect to strength and endurance, there is virtually no data suggesting an across-lifespan relationship between mortality rates and mobility. Numerous studies suggest lower levels of mobility—such as shortened walking gait and inferior balance—are associated with early death, but the relationship is unknown at younger ages as research is generally focused on people 70 or older.

So how do we put Figure 2 into the context of aging? Well, the distribution pattern stays the same; all that changes is the performance level that dictates the classification of athletes.

If you peruse Figure 3, you will note that the slope of performance loss is shallower when a person is at a lower level of training progression. For example, elites will lose more fitness as they age, while untrained people will lose less, but it's important to remember untrained people don't have much fitness to lose in the first place. Any loss of fitness in the lowest stratifications—the

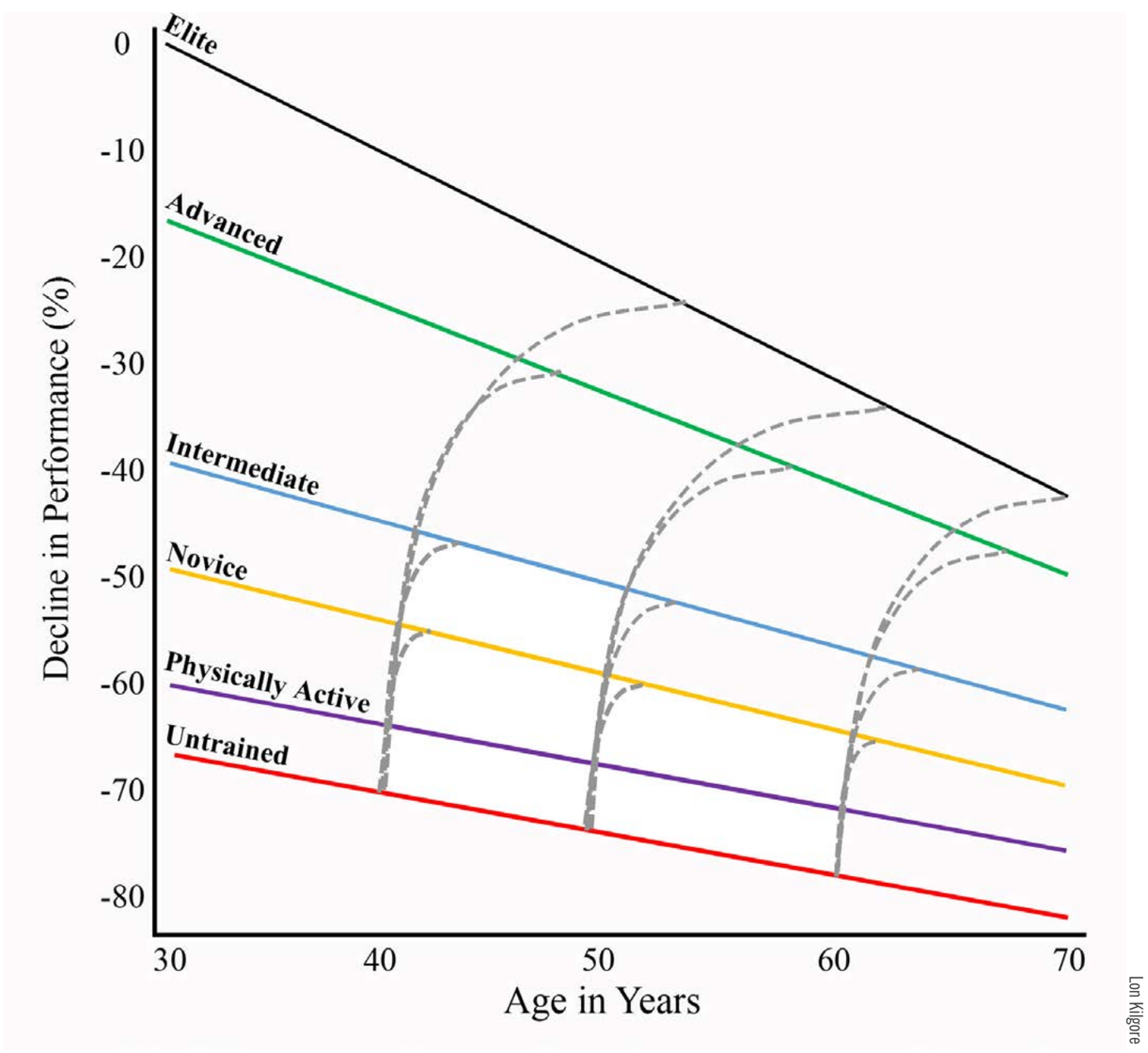

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Figure 3: A proposed relationship of the varied levels of training progression (untrained through elite) and the slope of performance decay (from mean loss in Table 1) over a lifespan. Note that one can begin training or alter training to move up in level of fitness at any time. This concept is illustrated with the grey dashed lines. It is thought that movement from untrained to novice levels can occur in a matter of a few months. Moving from untrained to intermediate levels of performance can take about two years of consistent training. Reaching the advanced level may take about four to five years, and it is often proposed that reaching the elite level is generally the result of approximately a decade's worth of systematic training.

untrained and physically active—can be catastrophic because small losses still eat away at their extant meager performance and significantly reduce their quality and quantity of life. The higher the fitness level achieved through training, the more functionality will be retained as we age—and it's never too late to start.

While inevitable performance declines might seem somewhat depressing at first glance to the aging trainee and especially to hard-charging masters athletes, they needn't be. Our perspective can be on performance or it can simply be on maintaining health and quality of life, to include pain-free activity, vitality and preserved functionality. Higher levels of fitness provide a buffer from decrepitude, and older trainees, regardless of goal, will be rewarded with a higher quality of life—even if world records and previous lifetime-best performances are no longer attainable.

For any older trainee who is not as fit as he or she would like to be or could be, you will note that potential for gain exists throughout each decade of life. An untrained individual can begin training and within a couple of years reach the intermediate level, reaping the lower mortality risk and improved quality of life associated with improved function through fitness. Moving to the elite level, if possible for the individual, may take a decade or more of regular training. The longer you wait to start training, the less likely it is you will reach your genetic potential, but fitness can be improved at any age. All you need to do is to commit to getting off the couch and to the gym—frequently and regularly.

Finally, and perhaps most importantly, while we see more dramatic performance declines in elite and advanced fitness with aging (Figure 3) than we see in lower categories, those declines still leave fitness levels above those seen in younger populations. If you reach elite fitness at 70, you are doing about as well in terms of function as a 30-year-old intermediate. If you are an intermediate 70-year-old, you are doing about as well as a physically active 30-year-old. So age is not a reason to give up on fitness or sports performance. Although the data point out the inevitability of fitness decay, older trainees and masters athletes remain capable of very impressive things. You need only watch the masters competition at the CrossFit Games or poke your head into a CrossFit affiliate for proof.

As it turns out, getting fit is as close to a fountain of youth as we can get. ■

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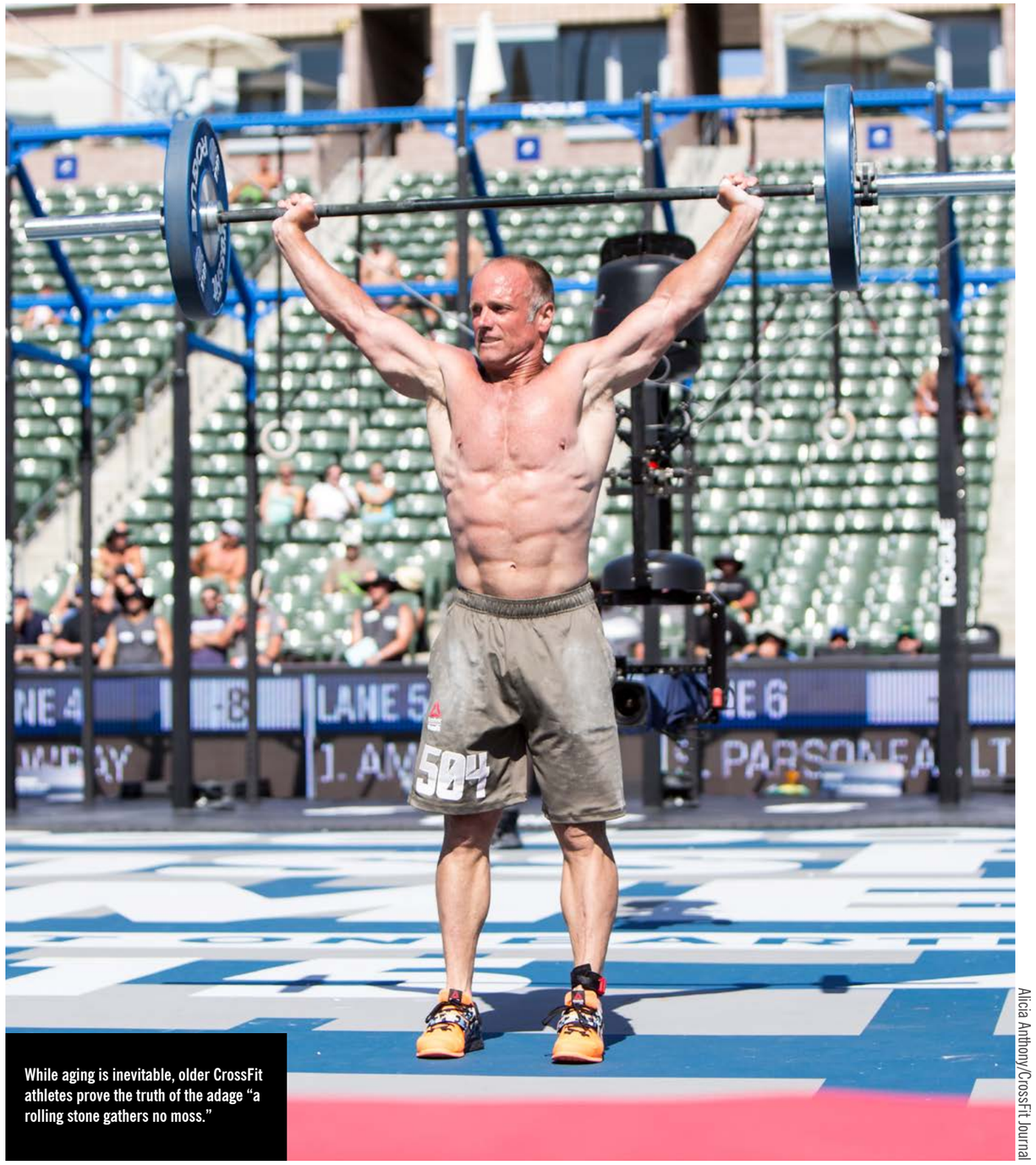
About the Author

Lon Kilgore earned a Ph.D. from the Department of Anatomy and Physiology at Kansas State University's College of Veterinary Medicine. He has competed in weightlifting to the national level since 1972 and coached his first athletes from a garage gym to national-championship event medals in 1974. He has also competed in powerlifting, the first CrossFit Total event, wrestling and rowing. He has worked in the trenches, as a qualified national-level coach or scientific consultant, with athletes from rank novices to the Olympic elite, and as a consultant to fitness businesses. He was co-developer of the Basic Barbell Training and Exercise Science specialty seminars for CrossFit (mid-2000s) and was an all-level certifying instructor for USA Weightlifting for more than a decade. He is a decorated military veteran (sergeant, U.S. Army). His illustration, authorship and co-authorship efforts include several bestselling books and works in numerous research journals. After a 20-year professorial career in higher academia, he currently delivers vocational-education courses through the Kilgore Academy, provides online commentary and analysis of exercise-science papers, and works as a writer and illustrator. His fitness standards have been included in textbooks and numerous websites. You can download free PDFs of his standards here.



While aging is inevitable, older CrossFit athletes prove the truth of the adage "a rolling stone gathers no moss."

Alicia Anthony/CrossFit Journal