Slow Down Aging with Interval Training

By Amy Ashmore, PhD

Ex Rx: The key to keeping strong and healthy as you age lies inside your fitness shoes.

As we age, our hearts beat more slowly and pump less blood. Our lung capacity also decreases. These changes result in decreased maximal oxygen consumption, which causes less oxygen to reach muscles. Oxygen is the life fuel for muscles; without it, they simply cannot work. The decrease in muscle oxygen consumption is one of the main reasons why we slow down, grow weak and lose stamina as we age. Without speed, strength and stamina, we cannot do the basic activities of daily living that allow us to enjoy life, maintain health and remain independent. Maximal oxygen consumption peaks at age 35 and begins to decrease between 50 and 60 years of age, with the greatest decrements occurring after 60 (Tanaka & Seals 2008).

All of us will age. However, recent research shows that ***regular aerobic exercise can decrease biological age by 10 years or more*** (Shephard 2008). One of the ways aerobic exercise decreases biological age is by improving mitochondria function (den Hoed et al. 2008). **Mitochondria** in cells are organelles that are responsible for energy production. They transform energy into a chemical form that the cells can use. Cells can produce more energy when mitochondria are efficient. To illustrate this principle, consider when a person gets cut and new skin grows to cover the wound. A wound that heals quickly is an indicator of good health, just as a wound that heals slowly or not at all is an indicator of poor health or disease. The same principle can be applied across all cells: where mitochondria function is enhanced, the corporeal cells turn over, regenerate (where applicable) and function at a higher level for a longer period of time. Furthermore, activity level correlates with improved mitochondria function. The harder a person exercises, the greater are the mitochondrial changes, leading to a bigger reduction in biological age over the life span.

Interval training is one of the most effective ways to exercise at a high enough intensity to significantly increase oxygen demands and ultimately slow aging (Wright & Perricelli 2008). (See this issue's Research column—"Yes, Resistance Training Can Reverse the Aging Process" by Len Kravitz, PhD—for more on this topic.) Intense exercise is defined as "going all out." Interval training consists of short bursts of going all out followed by brief periods of active recovery. In contrast to steady rate training, defined as exercising at a steady heart rate, interval training allows us to exercise briefly at a high intensity in order to force the body to adapt in ways that slow aging. Typically, high-intensity exercise is associated with high-impact exercise, like jogging, rope jumping or high-impact aerobics. But high-impact exercise is associated with musculoskeletal injury.

Incorporating Interval Training

The key to incorporating interval training into workouts is to manipulate a few simple variables that fitness professionals work with every day. Here are the variables:

Speed. Increasing speed, or the **velocity of movement,** is an obvious way to boost intensity. However, speed can cause injury and should be used to increase exercise intensity only with conditioned clients who are free from musculoskeletal injuries.

Incline. Adding incline, along with resistance, is an alternative way to increase intensity on most cardiovascular equipment. A change in incline changes the mechanics of movement by incorporating additional muscles or increasing output, both of which increase how hard the heart works and what the maximal oxygen consumption is.

Resistance. The greater the resistance, the harder the muscles work to move the bones. This variable can be manipulated by increasing resistance on cardiovascular machines or by incorporating **load,** which is added weight. For example, a squat without weight is unloaded; in a squat with dumbbells, the load is the weight that the dumbbells add. The greater the load, the harder the muscles work and the more demand there is for oxygen.

Relationship to Gravity. One of the most effective ways to train is to use body weight against gravity; for instance, by incorporating jump push-ups or squats into a workout.

Range of Motion (ROM). A muscle works harder with a full- versus a small- ROM movement. For example, given the same weight, a biceps curl is much more difficult when it is done through full ROM than when it stops halfway at 90 degrees of flexion. Another example is step climbing; it is much more difficult to climb three steps per stride than it is to climb one step, and much harder to step up 12 inches versus 6 inches. At the greater height, the leg ROM is fuller, requiring more muscle work and forcing the heart to work harder.

Impact. Impact is most commonly associated with sustained, high-impact activities like jogging, but **plyometrics** (explosive movements such as hopping and jumping) are effective for adding impact moves in a nonsustained manner. Including a plyometrics component can increase the intensity of almost any exercise. However, incorporating plyometric moves calls for the same care that is needed when speeding up an exercise.

Lower Alternating With Upper. A simple way to increase intensity and then recover is to alternate a lower-body exercise like a lunge with an upper-body exercise like a dumbbell shoulder press. This strategy is particularly effective for deconditioned clients. The lower-body exercise increases the heart rate, while the upper-body work allows a brief recovery.

The best way to interval train is to keep it simple by changing one variable at a time; for example, increasing resistance on the elliptical trainer and maintaining speed, or increasing incline on the treadmill and maintaining speed. The key to remember is that it makes no difference to the body which variable changes. All that matters is that the muscles work harder, oxygen demand increases, the heart rate goes up and thereby aging slows.

The big issue with interval training is how long to spend in the all-out phase versus the recovery phase. All-out efforts cannot be maintained for long; how long each all-out interval can be maintained depends on intensity and heart rate. The goal should be to sustain high-intensity exercise for 30 seconds to 1 minute. "High-intensity" is anything that makes the heart work at 85% of maximum or higher. However, 85% may not be feasible for all, and you may need to modify intensity levels. The recovery time is proportional to the intensity and the length of the all-out phase. For example, 1 minute at 85% should require 2–3 minutes of recovery. Sticking to the exact time increments is not nearly as important as simply incorporating short bursts of high-intensity exercise in training sessions.

Factors to Consider

Age and Weight

Aging is associated with many changes in the body. Age-related musculoskeletal changes include decreases in muscle mass, joint cartilage, bone mineral density (BMD), and elasticity of tendons and ligaments. All persons over 40 show some sign of degenerative joint disease (National Council for Physical Activity & Disability). This is due to cartilage deterioration with age and normal wear and tear. The severity of joint disease varies from person to person, based on lifestyle and genetic factors. Notably, being overweight contributes greatly to joint disease because there is greater total force and stress acting on joints during exercise.

Motor Coordination and Balance

Typically, to increase the intensity of an exercise, the movement will become more difficult, requiring total body coordination, greater core work and better balance. To illustrate this point, think about the difference between exercising on the step climber while leaning on the handles versus doing the same workout hands-free. The exercise is more difficult without support because maintaining the step pattern requires coordination, core strength and balance. Regular, high-intensity exercise can slow aging by more than a decade. Interval training is the easiest and most effective way to incorporate high-intensity exercise into any exercise program. The key is to choose exercises that use large muscles, are done in a way that is biomechanically correct and will get the heart pumping to increase maximal oxygen consumption.

SIDEBAR: Tips to Consider for Interval Workouts

Use **correct biomechanics** to increase exercise intensity. For example, jogging on the toes is biomechanically incorrect and displaces force from the largest muscles of the body (quadriceps, hamstrings) to the toes. The same is true if clients lean forward on the elliptical machine. By standing up straight they use the large gluteal muscles.

Use **basic, simple movements** to decrease learning time and reduce the likelihood of incorrect biomechanics.

Use **gross movements** like step climbing to work the largest muscles, which consume the most oxygen.

Use the **building blocks principle**. To illustrate this principle, start with a stationary lunge, then move to a walking lunge, and from there add dumbbells or even plyometric drills to escalate the level of difficulty.

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