

BY DIANE BOUDREAU

IT'S BEEN NEARLY 500 YEARS SINCE JUAN PONCE DE LEON SCoured THE FLORIDA PENINSULA IN SEARCH OF THE MYTHICAL FOUNTAIN OF YOUTH. MUCH TO THE CHAGRIN OF TODAY'S RETIREES, THE SUNSHINE STATE'S MANY SPRINGS SPOUT NOTHING BUT PLAIN OLD WATER, SOME OF IT SALTY. BUT HOPE, UNLIKE YOUTH, SPRINGS ETERNAL, AND THE QUEST TO DEFEAT THE CLOCK PERSISTS. TODAY'S YOUTH-SEEKERS HAVE SIMPLY TRADED MAGIC FOR TECHNOLOGY, SHIFTING THEIR ATTENTION TO VITAMIN-ENHANCED WRINKLE CREAMS AND PLASTIC SURGERY. THESE PRODUCTS MAY WORK WONDERS AGAINST THE PHYSICAL RAVAGES OF TIME. BUT WHAT ABOUT THE MENTAL ONES?

STOP THE CLOCK

MOTOR SKILL TRIAL
RESULT PRODUCED
BY PRACTICED
GRADUATE STUDENT

Jennifer Etnier conducts a motor skill test. The volunteer is allowed eight seconds to trace the star figure while watching her hand in a mirror.

AFTER AGE 60, certain mental abilities—such as memory, performance speed, and problem solving—begin to decline. Despite the claims of some dietary supplements, no products have been proven to reverse this process in otherwise healthy adults.

Help is here. Researchers at Arizona State University have found a way to slow some of the decline, and it doesn't cost a dime. Their magic elixir is something Ponce de Leon probably had in abundance—it is called exercise.

Jennifer Etnier is an ASU professor of exercise science. She studies how aerobic fitness affects learning and memory. In two separate studies, she has shown that physically fit older people learn new skills faster—and retain them better—than their out-of-shape counterparts. “People haven't looked at the acquisition of novel skills much,” says Etnier.

People today are retiring later in life, Etnier notes. At the same time, workplace technology is becoming more and more complex. Older employees must learn to use computers, beepers, voice mail, and other technologies that didn't exist when they first entered the workforce.

Retired seniors need to learn new skills if they hope to successfully get cash from an ATM or program their VCR. “Eventually, cars may become so programmable that older people who experience cognitive declines may not be able to use them,” says Etnier.

In her first study, Etnier compared four groups of people: young fit people (aged 20-30), young unfit people, older fit people (over 60), and older unfit people. Fitness levels were determined using a VO₂ submax test (see sidebar).

Subjects learned to trace a star shape while looking in a mirror. They repeated the eight-second trials a total of 175 times.

Twenty-four hours later, Etnier brought her subjects back to the lab to find out how well they retained their new skill. Everyone lost some ability, but the older subjects lost more than the younger ones. Interestingly, the fit older subjects retained their ability better than those with lower fitness levels.

Etnier was cautious about drawing too many conclusions from this study, however. “The older people never got to the same ability level as the younger people to begin with,” she explains. “Maybe the drop-off in retention has to do with how good you are rather than your age or fitness level.”

TO THE MAX

How do researchers measure aerobic fitness? Exercise scientist Jennifer Etnier says there are two favored methods—VO₂ max and VO₂ submax tests.

In a VO₂ max test, subjects activate large muscle groups through an activity like walking or running on a treadmill. During this activity, they breathe into a device that measures the oxygen and carbon dioxide they exhale. They also wear heart-rate monitors or EKG electrodes.

Researchers gradually increase the incline and/or speed of the treadmill until the subjects reach a plateau in the amount of oxygen they consume. They also use other criteria such as an oxygen/CO₂ ratio of 1.1 or the subject's age-predicted maximum heart rate.

The amount of oxygen consumed tells scientists how efficient the muscles are at using oxygen. Physically fit people use oxygen more efficiently than unfit people, and have a lower VO₂ max.

For safety purposes, a physician must be present for all VO₂ max tests on male subjects over age 40 and females over age 50. The physician monitors the subjects' blood pressure and EKG readings and makes sure they don't experience any health problems.

Etnier knows the importance of this precaution firsthand. In one of her studies, the physician stopped the test because the subject's EKG was producing some strange results. The physician told the man to visit his own doctor. Within a month, the subject ended up

Etnier corrected for this problem in her second study. She required that all subjects reach a specified ability level before she tested their retention. Subjects were allowed to repeat the trials as many times as needed to reach this level.

Etnier also measured fitness levels using a VO₂ max test, which is more reliable than the VO₂ submax.

Her results supported the first study. Older people took longer than the younger people to reach the required ability level. The unfit older people took longest of all.

Again, retention also depended upon age and fitness level. The physically fit subjects retained their skills better than their unfit counterparts.

No one really knows why the health of the heart affects the performance of the brain. One possible explanation is that exercise increases cerebral blood flow, nourishing the brain with extra oxygen and nutrients. Etnier plans to test this possibility in the future.

She wants to know: Do older fit people have higher cerebral blood flow than older unfit people? And can we manipulate it by increasing people's fitness levels?

Etnier also intends to continue her research using real-world tasks. People don't trace stars in a mirror on a regular basis, she says. She wants to know if aerobic fitness affects learning of skills like using an ATM, programming a VCR, or using a computer.

“Some seniors are really computer literate and others aren't. I think part of that is their fitness level,” she says, adding that fitness may also have an indirect effect on learning.

“Maybe fit people are also interacting with their environment, perhaps in social ways. This interaction may stimulate the brain in a way that influences learning. It may also be self-efficacy—maybe their confidence increases as a result of their fitness and this impacts their ability to learn new skills,” she adds.

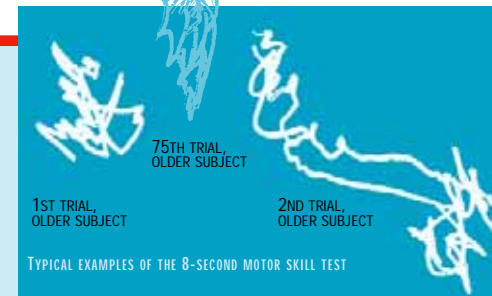
“I don't know the precise mechanism, but I think the physiological changes associated with fitness are part of it.”

Etnier's research was funded by a Faculty Grant-in-Aid. For more information, contact Jennifer Etnier, Ph.D., Department of Exercise Science and Physical Education, 480.965.7042. Send e-mail to jennifer.etnier@asu.edu

having a successful quadruple bypass surgery.

VO₂ submax tests are slightly less reliable than VO₂ max, but they are much less expensive because the researchers are not required to hire a physician. VO₂ submax tests don't pose the same health risks as the VO₂ max because subjects are not required to reach their maximum heart rate.

There are several ways to conduct a VO₂ submax test. One way is to measure how quickly a person can walk a half-mile. Another method measures how far a subject can walk in a predetermined amount of time. The latter test is correlated with the VO₂ max test, meaning that it is a good indicator of VO₂ max values when a VO₂ max test is not possible.



Etnier has gotten extra mileage out of her study of aging, fitness, and memory. In addition to conducting VO₂ max tests on her subjects, she asked them to do a timed half-mile walk.

She found that this submax test also correlates directly with the VO₂ max test. Although this connection seems like common sense, Etnier is the first researcher to demonstrate the link statistically.

—DIANE BOUDREAU