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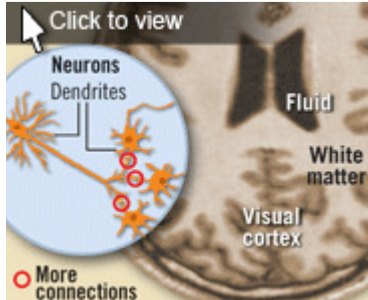
Keeping Your Brain Fit

There's plenty you can do to slow the effects of aging. Here's how to keep your thinking and memory sharp

By *Christine Larson*

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Marian Conte's brain weighs 1,100 grams, according to Nintendo. "That's up from 800 grams when I started playing," jokes Conte, 52, a real-estate agent from Hamilton, N.J., who recently added the video game Big Brain Academy to her fitness regimen. The better she scores on brainteasers, the larger her fictional brain. Since Conte's mother died of complications from Alzheimer's disease in 2003, she's trying to guard herself any way she can, embracing crossword puzzles, fruits and vegetables, and a new genre of high-tech workouts that aim to slow cognitive loss. This particular game makes no such claim. But regular play certainly can't hurt, Conte figures: "I want to do any little thing I can to protect my brain."



If her Nintendo score isn't solid evidence, science increasingly suggests Conte's efforts may pay off. Just within the past few months, several groups of researchers have added support for the growing consensus that plenty can be done to slow the age-related declines in memory, mental speed, and decision making that affect most people. In November, a team from the Mayo Clinic and the University of Southern California

announced that one computer-based mental training program appeared to improve older people's cognitive performance by as much as 10 years. That same month, a Harvard researcher found that long-term use of beta carotene supplements delayed cognitive decline by up to a year and a half.

And a new book out last month puts forth evidence that "exercise is the single best thing you can do for your brain," says author John Ratey, a clinical associate professor of psychiatry at Harvard Medical School. The book is *Spark: The Revolutionary New Science of Exercise and the Brain*.

"Some of the myths about the brain—that it was not changeable, that there was nothing

you could do about cognitive decline—have really been dispelled in the past 10 years," says Lynda Anderson, director of the Healthy Aging Program at the federal Centers for Disease Control and Prevention, whose bold goal is "to maintain or improve the cognitive performance of all adults." The potential payoff is enormous. Alzheimer's now afflicts 4.5 million people in the United States—double the number in 1980—and is expected to reach 16 million by 2050. "Statistics show if we could delay the onset of Alzheimer's by five years, the number of people with the disease would be cut in half," says Yaakov Stern, a cognitive neuroscientist at Columbia University.

What are you up against? The inevitable physical changes start in early adulthood but become especially marked after about age 60 or so. Gradually, the brain shrinks, losing around 0.5 percent to 1 percent of its volume each year after that age threshold; brains with Alzheimer's shrink about twice as fast. The effects are greatest in the prefrontal cortex, the seat of executive function (which includes working memory—responsible for remembering a telephone number while you're dialing, say—and planning, focus, and behavior choices), and sometimes in the hippocampus, involved in memory. Brain cells' dendrites and axons—the slender filaments that transmit electrical impulses—shrink. The brain's white matter, which contains nerve fibers that transmit signals from one brain region to another, starts to degrade around age 50. Result: It gets harder and harder to remember what you wanted to buy at the grocery store, to process and respond to information, and to reason your way through a problem. In your 70s and 80s, executive function starts to fail.

Not every mental skill suffers equally. Vocabulary, for instance, tends to remain, as do skills practiced for a long time, like playing the piano or using a spreadsheet. You might even improve at some things: In tests of experienced crossword puzzlers of all ages, the best were in their 60s and 70s.

Potential. The more scientists learn about the brain's decay, the more curious they've become about how well people function anyway. Even among people 85 and older, only 18.2 percent live in nursing homes. "In the past, much of the research has focused on disease and decline," says Gene Cohen, director of the Center on Aging, Health and Humanities at George Washington University. "Now we're looking at the concept of potential and how older people often continue to thrive and grow even in the face of the most serious illness." Recent studies of both animal and human subjects have found that several factors go hand in hand with better mental performance, including education, professional success, and intellectual, social, and physical activities. A 2003 study reported

in the *New England Journal of Medicine*, for example, found that people over 75 who danced, read, or played board games or musical instruments also had a lower rate of dementia.

Much of the work has focused on finding ways to bulletproof people against Alzheimer's. In mice, an Alzheimer's vaccine seemed to work, but it proved toxic in humans and trials were suspended (although research on vaccines continues). Beta carotene supplements may delay cognitive decline if taken for many years—but only by a year and a half. Education seems to lower your odds of Alzheimer's—but even some Nobel laureates develop it. Cholesterol-lowering drugs seemed to offer some promise in fending off Alzheimer's, but a 12-year-long study published in January showed they had no effect. For now, experts think the best approach is to take the sorts of steps that Conte is taking to delay normal cognitive decline.

Stretch the plastic. For decades, scientists assumed that humans were born with all the brain cells they'd ever have. Then, in the 1970s, researchers showed that new brain cells and neural pathways form through the end of life. "This was the beginning of the brain plasticity movement," says Cohen, "the understanding that when we challenge our brains, the brain cells sprout new dendrites, which results in increased synapses, or contact points." More recent research has shown that there isn't an age limit: Training older adults in certain memory tasks, like remembering faces and names, seems to boost those specific abilities—though it won't remind you to bring your shopping list to the store. And the newest evidence suggests that intensive practice in reasoning skills or in distinguishing sounds appears to lead to more generalized improvements in brain function.

In 2006, for example, a controlled clinical study of more than 2,000 older people by researchers at Pennsylvania State University, Indiana University, Johns Hopkins University, and elsewhere found that those who received 10 60-to-75-minute training sessions in reasoning—specifically, in recognizing word, number, and letter patterns and filling in the next item in a series—reported less difficulty with such activities of daily living as understanding instructions on a medication label. The effects still were apparent five years later. This past November, scientists from the University of Southern California and the Mayo Clinic announced that study subjects who spent an hour a day for eight to 10 weeks using a program that asked them to recognize subtle differences in sounds performed better than the control group on memory and speed tests, too. Designers of the Brain Fitness Program (made by Posit Science, which funded the study) claim that such ear

training causes the brain to convey information more precisely from one region to another—which, in turn, improves other types of thinking.

"The amount of memory improvement was equivalent to going back 10 years in your ability," says Elizabeth Zelinski, professor of gerontology and psychology at USC and a principal investigator on the study, which has not yet been published.

Experts caution that most [brain-training products](#) haven't been tested and that what data do exist are still shaky. If improvement of daily living tasks is the goal, "we don't yet have the data to suggest they accomplish that," says Arthur Kramer, a neuroscientist at the University of Illinois. "Yes, we have data that says you can get better at certain things with practice. But does it translate to the real world? We don't know yet." Still, many doctors who work with older people feel they don't have time to wait for the research, and nursing homes and senior centers across the country are adding "brain gyms" and other programs to help older people stay mentally active.

"I've learned more about China than you can imagine," says Hortense Gutmann, 100, who started using E-mail just over a year ago through a new computer-education program for residents of Sarah Neuman Center for Healthcare and Rehabilitation, a nursing home in Mamaroneck, N.Y. She now keeps in touch with relatives there, as well as in Minnesota and Israel, and takes great pleasure in having mastered a new skill.

Consumers aren't waiting for more research, either. The market for products like Brain Fitness Program, Nintendo's Brain Age, and MindFit soared to an estimated \$80 million in 2007, up from just \$2 million to \$4 million in 2005, according to SharpBrains.com, a San Francisco-based group that follows the industry. Meanwhile, the Alzheimer's Association recommends any activity that will keep you curious and learning: reading and writing, attending lectures, taking classes, even gardening.

Sound body, sound mind. Still, the best workout for your brain may be the old-fashioned kind.

As far back as 1999, researchers at the University of Illinois found that older people who started exercising showed faster reaction times and better ability to focus after just six months than did a control group. Now, it's becoming clearer why. In a second study reported in 2006, the same team found that the aerobic exercisers actually increased their

brain size by about 3 percent. Last year, researchers at Columbia University found that when people exercised regularly for three months, blood flow increased to a part of the hippocampus, which is important for memory. In studies of mice who exercised on treadmills, increased blood flow to the same part of the brain corresponded with an increase in the production of new brain cells.

The power of exercise seems far more impressive than that of brain-training software, says Sandra Aamodt, editor in chief of *Nature Neuroscience*, a scientific journal on brain research, and coauthor of the forthcoming book *Welcome to Your Brain*. A recent meta-analysis of numerous exercise studies found that, on average, faithful aerobic exercise might boost someone's cognitive performance from average—say, from 10th place out of 20 people tested—to notably above average—say, to No. 5. But cognitive training would boost the same person to eighth out of 20.

Why is exercise so good for the brain? Maybe for the same reason it's so good for the heart: its beneficial effect on blood vessels. "It may be that a pretty significant amount of deterioration in brain function relates to disruptions of the cardiovascular system by microstrokes," in the tiny vessels in the brain, says Aamodt. Exercise may help prevent them. It also stimulates the production of proteins called growth factors, which promote the formation and growth of brain cells and synapses.

Certain nutrients, too, are thought to be protective. The antioxidants in fruits and vegetables have been linked to improved cognitive function; berries, for instance, seem especially beneficial in keeping brains spry. "Old neurons, like a lot of old married couples, don't talk to each other anymore," says James Joseph, director of the neuroscience lab at the USDA Human Nutrition Research Center on Aging at Tufts University. "We have found that the berry fruits improve neuronal communication." In November, Harvard researchers announced that men who took a beta carotene supplement for 18 years had slightly better cognitive function than those who didn't—their memory scores matched those of people about one year younger. However, men who took supplements for only one year showed no improvement, and several other studies have found no link between antioxidants and mental performance. The [Alzheimer's Association](#) recommends a diet high in dark-colored veggies, like kale, spinach, beets, and eggplant; colorful fruits like berries, raisins, prunes, oranges, and red grapes; plus fish like salmon or trout high in heart-healthy omega-3 fatty acids.

Making connections. It has been more than two decades since Bill Harves, 90, quit singing in his church choir. Four years ago, he joined the professionally led chorale that rehearses once a week at his Bailey's Crossroads, Va., continuing care retirement community. The chorale gives several concerts a year, including one at Washington, D.C.'s Kennedy Center. He's gained in breathing technique, enunciation, and music reading skills. "There's no doubt I've improved as a singer," he says.

Besides having fun, Harves, who also serves as chairman of his community's computer club and is active on a residents' committee, is very likely protecting his cognitive function. In a study of more than 2,800 people ages 65 or older, Harvard researchers found that those with at least five social ties—church groups, social groups, regular visits, or phone calls with family and friends—were less likely to suffer cognitive decline than those with no social ties.

"The working hypothesis is that it has something to do with stress management," says Marilyn Albert, a neuroscientist at Johns Hopkins and codirector of the Alzheimer's research center there. In animal studies, a prolonged elevation in stress hormones damages the hippocampus. Social engagement appears to boost people's sense of control, which affects their stress level. Creative arts seem to be a highly promising way to increase social engagement. George Washington University's Cohen has found that elderly people who joined choirs also stepped up their other activities during a 12-month period, while a nonsinging control group dropped out of some activities. The singers also reported fewer health problems, while the control group reported an increase.

All the new research has senior programs rethinking their offerings. In Chicago, for example, Mather LifeWays, a not-for-profit that promotes healthful aging, has opened three neighborhood cafes that serve coffee and sandwiches to people of all ages and offer fitness classes, computer courses, lifelong-learning opportunities, and volunteer activities for older adults. "I've met lots of friends here," says Jill Wonsil, 66, who drops in at the cafe near her home several times a week to socialize, check E-mail, and take exercise and other classes. If living life to the fullest is the best way to stay sharp, it's not such a tough prescription to swallow.

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