The aging brain

Much of the science remains a mystery, but staying active and socially engaged is key

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Catherine Morsink, 76, works out in the gym at Oak Hammock at the University of Florida in Gainesville. Morsink is a participant in the UF Institute on Aging's Active Brain Study. She credits her good brain health in part to her regular exercise.

Erica Brough/Staff Photographer
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When Catherine Morsink was a teenager, she remembers her father, who was in his 70s, struggling with an undiagnosed disease. He was forgetful and had trouble with logical reasoning.

**Facts**

**HOW THE BRAIN AGES**

**20s:** The brain finishes developing — namely the frontal lobe regions responsible for planning and judgement. By your late-20s, the first signs of brain aging may appear, when you begin to lose neurons, but the changes will be so slight that you likely won't notice.

**30s:** The brain continues to gradually lose neurons and, because of this, shrinks slightly. Some cognitive and memory slippage may begin to occur.

**40s:** The brain begins to lose volume. Lapses in short-term memory may increase, but interpreting social situations and emotions and moral decision-making improve. Increased memory of positive over negative associations is said to set in.

**50s:** More accelerated loss of brain volume. Loss of memory and other cognitive skills also increases.

**60s:** Loss of brain volume continues, notably in the hippocampus, the brain's memory center. Cognition also slows, making it harder to learn new skills and tune out distractions. Early onset of Alzheimer's in some people.

**70s:** Mental sharpness decreases as wisdom increases. The risk of Alzheimer's increases.

**80s-90s:** Cognitive abilities continue to decline, with physical conditions such as diabetes and high blood pressure also taking their toll on memory and cognition.

His condition, which is now recognized as Alzheimer's disease, led Morsink to study psychology, and then teach children with learning disabilities. She became a professor of special education at the University of Florida.

Watching her father suffer also inspired Morsink to stay on top of her own brain health. A resident of Oak Hammock Retirement Center, the 76-year-old is a regular participant in studies at UF's Institute on Aging that are designed to monitor and promote healthy brains as they age.

**The control center**

Since many of us connect aging with the gradual deterioration of the body, it can be easy to forget that the brain is the body's third largest organ, and also its control center. The brain basically controls what happens throughout the rest of the body.

Although certain brain functions begin to slow as early as the fourth decade of life as you lose neurons, by your 60s your brain has started to shrink.
The signs of that shrinkage are tell-tale: fuzzy memory, slow reaction time, worsened hearing.

But other changes are more pathological, said Dr. Ron Cohen, the director of the Clinical Aging and Memory Clinical Translational Program at UF.

“Slowing is ubiquitous; we're trying to understand who has abnormalities,” Cohen added. “What is considered normal and abnormal for aging is still a bit of a mystery.”

However, certain trends — atrophying, or shrinking, of the frontal lobe, which controls motor skills, flexibility and the ability to multi-task — normally occur when people are in their 80s, Cohen said.

Inhibitory control also starts to decline.

“If someone is 90 years old and driving, it could be dangerous” if that person sees a red light and keeps going, Cohen said.

Planning and judgement also may decline. “Older people who sit in front of a slot machine and gamble for hours,” even as they lose money, Cohen continued.

Other changes are less natural and are considered “pathological brain disturbances.”

People with Alzheimer's disease, for example, have a damaged hippocampus.

“It's like a sieve,” Cohen said. “People can't hold onto information for more than 30 seconds.”

**Defining the healthy brain**

While much research has focused on the pathological side of brain aging — the diseases that impair normal brain functioning — Cohen is working on a study that establishes baseline parameters for healthy brains.

Since late November, the study has enrolled 200 participants, most older than 65, with the goal of reaching 300. There are certain exclusion criteria: you can't have a neurological or psychiatric disorder, or an implant that would prohibit undergoing an MRI.

Participants first perform a series of cognitive and memory exams that include tasks such as pronouncing words that most people have never heard of, putting pictures in the order in which they first appeared on the computer screen and vocabulary tests.

Weeks later, participants undergo an MRI to hone in on the parts of the brain that are used for thinking and memory. The idea is to establish a database of healthy brain measures in the elderly.

“They're our most precious resource,” said Kim Foli, coordinator of the cognitive aging and memory program.
She added that participants don't get the test results back — unless a serious problem emerges — since the tests aren't done for diagnostic purposes.

Still, people often have test-taking anxiety.

“Older people worry about, ‘What if I’m not as good as someone else?’ ” Foli said. “I tell them it doesn't mean anything, that [results show] the way their wiring is. [Brain functioning] is like their fingerprints.”

And although the tests can be very specific, “in functional, day-to-day life [the results] often have no effect,” Foli continued.

And, in fact, it's the changes in what Cohen calls “activities of daily living” that can be a warning. These activities include a person's ability to drive, cook and take care of his or her own finances, he explained.

“Any change in functional capacity should be a red flag,” Cohen said. “An abrupt change in personality,” he said — either an exaggeration of prior tendencies, or a reversal of them — also can signal the onset of diseases such as Alzheimer's.

Unless the disease is genetic, sporadic onset comes usually between ages 75 and 80, Cohen said, adding that conditions such as diabetes and trauma to the brain can trigger it.

**Brain health: staying active**

Morsink is participating in the ACTIVE study. She's already done the series of brain-game tests.

“It was interesting to do and never boring,” she said of the tests, adding that the pronunciation test was particularly challenging, featuring words like “synechdochism.”

Next month, Morsink will go in for an MRI. Neuroimaging is the latest way that researchers are measuring the aging of the brain, along with behavioral and cognitive changes.

“What happens with advanced age at the neural level is still not very well understood,” Cohen said. The MRI can measure cerebral blood flow, along with neuronal activity.

“The brain can be tricky to study,” Cohen said. “Unlike other organs, you can't stick a needle through it to obtain a biopsy.”

A previous UF study called VITAL tested the effects of physical activity on aging.

The intensive study involved three hours of exercise for four days a week. Morsink participated and said that, using a Wii board, she did activities such as aerobic bowling, basketball and bicycling.
“You have a controller in your hand and simulate these activities,” Morsink said. “You're active as well as thinking during the process.”

Brain games followed the physical activity. Morsink said the physical activity improved her mental performance long after the study.

“I have never been good at finding my way. I always get lost,” Morsink said. “I know there were times that I couldn't find my car in the parking lot. After having done some of the brain activities, I was able to come out of the store and find it.”

In general, though, Morsink credits her stimulating living environment with her brain health.

As a resident of Oak Hammock, Morsink is always busy. She likes attending the Institute for Learning in Retirement (ILR) classes — “on anything you want to know, from astronomy to new civilizations of the world ... it's like going to college without having tests,” Morsink said.

“We all have our computers and iPads and everything in between, and learn from each other. There's so much to do here, you can hardly find time to sleep,” she continued.

“I think that active learning is really the secret to maintaining an active brain and an active body. You just keep doing things — as many things as you can for as long as you can.”

While we often hear about the downside of aging, there are some mental benefits to getting older: Negative personality traits may soften as creativity blossoms, Cohen said.

“People may excel at writing or art as they get older,” Cohen said, adding: “It's rare to find chess players or mathematicians peak in their 70s.”

People also become wiser.

“The accumulation of knowledge based on past experiences — we make use of those in problem-solving. Thinking involves the integration of past information.”

Caregivers' health

At the other end of the spectrum are people with dementia and Alzheimer's disease who need constant care. Terrie Hardison, the founder of Alzheimer's & Dementia Alliance for Education and Support in Ocala, provides training and support for patients and caregivers, who include spouses and children, siblings and neighbors. She also trains law enforcement officials and adult protective services personnel in dealing with patients.

She said that 64 percent of caregivers die before the people they are taking care of, so improving caregivers' health is crucial.
“If you can imagine taking care of a 1-year-old at age 80 24/7,” Hardison said. “[The patient] could start a fire, or go out and wander and get lost. Sometimes if we don't know how to handle them, we are the trigger for combative behaviors.”

Hardison often is called into homes to provide care plans at the onset of an Alzheimer's diagnosis. She also consults with caregivers in need of wellness plans.

“Ironically, these folks need a lot of education on how to stay healthy,” she said. Positive thinking is key and can actually boost the immune system, while things like watching dramatic movies can constrict blood vessels, which cause the body to age.

“Laughter is truly good medicine. Having pets really helps,” Hardison continued, adding that eating “clean,” unprocessed foods also is important.

These holistic approaches also can help empower patients, Hardison said.

“It's not going to change the progression of the disease, but it does help the patient,” she said. Her husband, she added, runs the adult day care and has patients with advanced dementia “who are having a ball.”

“Happiness makes a huge difference for everybody, no matter what you're living with,” Hardison continued.

“The mind is like the computer for everything that happens to us.”

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