

Probing the secrets of sharp memory in old age

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Credit: AI-generated image ([disclaimer](#))

A study of the brains of people who stayed mentally sharp into their 80s and beyond challenges the notion that brain changes linked to mental decline and Alzheimer's disease are a normal, inevitable part of aging.

In a presentation here today at the 239th National Meeting of the

American Chemical Society (ACS), Changiz Geula, Ph.D. and colleagues described their discovery of elderly people with super-sharp memory — so-called "super-aged" individuals — who somehow escaped formation of [brain "tangles."](#) The tangles consist of an abnormal form of a protein called "tau" that damages and eventually kills [nerve cells](#). Named for their snarled, knotted appearance under a microscope, tangles increase with advancing age and peak in people with Alzheimer's disease.

"This discovery is very exciting," said Geula, principal investigator of the Northwestern University Super Aging Project and a professor of [neuroscience](#) at the Cognitive Neurology and Alzheimer's Disease Center. "It is the first study of its kind and its implications are vast. We always assumed that the accumulation of tangles is a progressive phenomenon throughout the normal [aging process](#). Healthy people develop moderate numbers of tangles, with the most severe cases linked to Alzheimer's disease. But now we have evidence that some individuals are immune to tangle formation. The evidence also supports the notion that the presence of tangles may influence [cognitive performance](#). Individuals with the fewest tangles perform at superior levels. Those with more appear to be normal for their age."

The findings are based on examination of the nine brains from super-aged individuals. Subjects who volunteer for this study get a battery of memory and other tests and agree to donate their brains for examination after death. They are considered 'super-aged' because of their high performance on the tests. The tests include memory exercises to evaluate their ability to recall facts after being told a story or their ability to remember a list of more than a dozen words and recall those words sometime later. The super-aged individuals recruited for study so far are all more than 80 years old, but they performed the memory tasks at the level of 50-year-olds. The scientists are recruiting more volunteers for the study, with the goal of eventually including about 50 people.

Geula pointed out that previous studies tended to focus on what goes wrong with the brain as people age. It established that tangles and other deposits termed plaques accumulate at higher levels in the brains of people with Alzheimer's Disease. Geula said the new study is unique in its focus on what's right with the brains of older people. It seeks insights into what lifestyle, genetic[s?], or other factors may protect super-aged individuals from the age-related memory loss that affects most other people.

The scientists found that super-aged people appear to fall into two subgroups: Those who are almost immune to tangle formation and those that have few tangles.

"One group of super-aged seems to dodge tangle formation," Geula explained. "Their brains are virtually clean, which doesn't happen in normal-aged individuals. The other group seems to get tangles but it's less than or equal to the amount in the normal elderly. But for some reason, they seem to be protected against its effects."

The next step, Geula said, involves determining why one subgroup is immune to tangle formation and the other seems to be immune to its effects. Environment, lifestyle, and genetics may be key factors. For example, some super-aged individuals might have a genetic predisposition to being super-aged, while others may help preserve high brain function by maintaining a healthy diet or staying physically active. Others may keep [mental decline](#) at bay by keeping the brain itself active: By reading books, playing crossword puzzles, or engaging in other mentally demanding activities.

"Ultimately, chemistry is one of the keys to understanding what makes these tangles form," Geula said. "By understanding the specific anatomic, pathological, genetic, and molecular characteristics of high-performing brains, we may eventually be able to protect normal brains

from age-related memory loss."

Provided by American Chemical Society

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