

## Cognitive Aging

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### **Cognitive aging is not the same as dementia**

Aging takes a toll. No one runs as fast at age 80 years as they did at age 40; very few are as fast at 40 years of age as at age 18. The same is true for most physical abilities and most physiological processes related to the heart (for example, maximal heart rate), lungs (for example, forced vital capacity), and other organs.

The same is also true for at least some cognitive (mental) abilities.

Cognitive aging represents usual, or typical, changes in mental abilities that occur with age. This is different from dementia, where the decline is larger and interferes with daily function and independent living.

Dementia is rare in middle age. In old age, it is common but not inevitable. Dementia occurs when pathological processes (disease processes) are added to the milder changes of cognitive aging. Cognitive aging by itself does not lead to dementia within a normal lifespan. Nonetheless, cognitive aging creates limitations, even if these are more often annoying (like trouble remembering names) than functionally disabling. Cognitive aging might also contribute indirectly to dementia by lowering the threshold at which dementia pathology begins to impair daily function.

The most common cause of dementia is Alzheimer's disease. Here, the defining pathological changes are the neuritic plaques and neurofibrillary tangles. For people who have died with Alzheimer's disease, these changes in the brain can be seen with a microscope. The biochemical processes that lead to these microscopic changes involve two proteins, amyloid-beta (associated primarily with plaques) and tau (associated primarily with tangles).

Vascular dementia is the second most common cause of dementia, and here the pathological changes are due to stroke and to related changes that impair blood circulation in the brain. The third most common cause is dementia with Lewy bodies, a disorder that is related to Parkinson's disease. Here the microscopic abnormality is the Lewy body. Lewy bodies can be seen within nerve cells of the brain, and the key biochemical process involves a protein called alpha-synuclein.

There are other causes of dementia, and each of these has a characteristic pathological or biochemical signature.

Cognitive aging does not include neuritic plaques, neurofibrillary tangles, strokes, Lewy bodies, or other changes that can lead to dementia. It includes nearly everything else. In general, however, scientists have only an imperfect understanding of what constitutes "everything else." It is clear that some people age better than others, and researchers have

much to learn about how best to maintain cognitive abilities with age.

### Cognitive aging is not the same as mild cognitive impairment

In a sense, mild cognitive impairment (MCI) is an intermediate point between cognitive aging and dementia (Table). As with cognitive aging, people with MCI are able to live independently and to carry out usual daily activities on their own. Memory or other aspects of mental ability may be less sharp compared to cognitive aging, but the clinical distinction between cognitive aging and MCI can be blurry.

**Table. Key characteristics of cognitive aging, MCI and dementia**

Cognitive category	Symptoms impair independence?	Symptoms due to dementia pathology?
Cognitive aging	No	No
MCI	No	Yes
Dementia	Yes	Yes

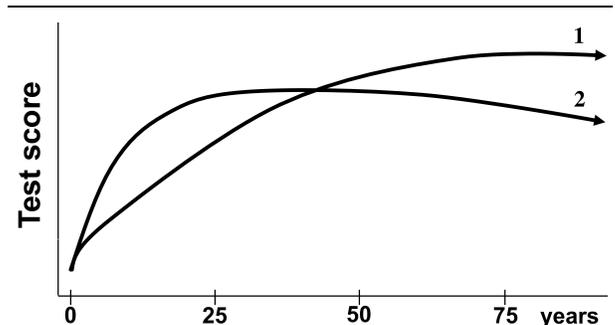
MCI = mild cognitive impairment  
after: Henderson, V.W. (2014), *Climacteric* 17 (suppl. 2), 38-46.)

There is also a sense in which MCI and cognitive aging are quite different (Table). The cognitive decline of MCI is due to pathologies that cause dementia. Some of the biochemical changes of Alzheimer's disease, for example, begin to appear a decade or more before someone has obvious dementia. MCI represents the point when these Alzheimer changes impair cognition in a noticeable way but have not (yet) caused dementia.

### Gains and losses with cognitive aging

Cognitive aging leads to improvement in some mental abilities. With time and experience, we gain new knowledge and skills. We become wiser (Figure, curve 1).

Cognitive aging leads to reductions in other mental abilities. These changes can include slower mental processing, reduced mental flexibility, increased susceptibility to distraction, and less efficient learning (Figure, curve 2) As an example, the amount of detail recalled from a short story or the number of words recalled from a long list of words drops with age. Subtle decline begins as early as age 20 and continues thereafter.



**Figure. Cognitive aging.** Cognitive abilities based on acquired skills, knowledge, and experience may improve throughout the lifespan (curve 1). In adulthood, cognitive abilities dependent on learning, abstract reasoning, and problem solving may decline (curve 2).

### Evaluation and management

Some older adults worry that their mental abilities are not quite as good as when they were young. In this circumstance, it may be useful to discuss the issue with a health care provider, especially if a family member or close friend has also expressed concern. More often than not, there will be no need for further examination. Assessment becomes

important, however, if there is a question of MCI or dementia.

Assessment might also reveal medical or psychological issues that are unrelated to aging or dementia but have the potential to influence cognitive performance. These problems can include medication side-effects, anxiety and depression, stress at work or home, poor sleep hygiene and sleep disorders like obstructive sleep apnea, excess alcohol or recreational drug use, and common medical conditions like thyroid disease.

Although some of the scientific evidence is circumstantial, daily physical exercise, mental activity, social engagement, and healthy nutrition can contribute to successful physical aging. The same factors might also contribute to successful cognitive aging. If health permits, one target goal for physical exercise is brisk walking, about 150 minutes each week, divided into periods of about 30 minutes each, five days a week.

## Resources

*Alzheimer's Association*  
[www.alz.org](http://www.alz.org)

*National Institute on Aging, Alzheimer's Disease Centers*  
<https://www.nia.nih.gov/research/dn/alzheimers-disease-centers>

*National Institute on Aging, Alzheimer's disease information resources*  
[www.nia.nih.gov/health/alzheimers](https://www.nia.nih.gov/health/alzheimers)

*National Institute on Aging, Alzheimer's disease fact sheet*  
[www.nia.nih.gov/alzheimers/publication/alzheimers-disease-fact-sheet](https://www.nia.nih.gov/alzheimers/publication/alzheimers-disease-fact-sheet)

*Stanford Alzheimer's Disease Research Center*  
<https://med.stanford.edu/adrc.html>

*Stanford Health Care Aging Adult Services*  
<https://stanfordhealthcare.org/medical-clinics/aging-adult-services.html>

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