

Flavanol Deficiency Contributes to Age-Related Memory Decline

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STORY AT-A-GLANCE

- › Over 15 years of research study culminated in a 2023 study demonstrating that poor flavanol intake is associated with age-related memory loss and signs of cognitive aging in the hippocampal area of the brain
- › Flavanols, the subject of the featured study, are also called flavan-3-ols in reference to a hydroxyl group in the compound or catechins. You may recognize two flavanols that are found in tea, chocolate and berries: epicatechin and gallic catechin
- › Kaempferol and quercetin are two important flavonoids that help support a sharp mind. Quercetin helps prevent and/or treat high blood pressure, obesity, metabolic syndrome, NAFLD, gout and mood disorders
- › Kaempferol also selectively inhibits cancer growth and has been used for thousands of years to improve memory and cognition. Other strategies to help protect brain health include staying hydrated, exercising, getting quality sleep and reducing or eliminating anticholinergic drugs

A 2023 study¹ published in the Proceedings of the National Academy of Sciences (PNAS) demonstrated that participants with poor diet quality and low intake of flavanols experienced improved memory when flavanols were added to their diets. Flavanols are readily available in certain foods, but for the purposes of this study participants took a pill-form supplement.²

The large-scale study was conducted over a three-year period with supplements containing 500 mg of flavanols and 80 mg of epicatechins, an amount normally recommended that adults consume through the foods they eat. While participants with a baseline flavanol deficiency benefited from the supplementation, researchers noted that it had "no effect on people who don't have a flavanol deficiency."

There is a range of normal memory and learning in the elderly. You likely know an older adult who is cognitively sharp and rarely forgets anything and others who may forget things occasionally. The National Institute on Aging³ calls mild forgetfulness a normal part of aging.

However, serious forgetfulness and memory problems are an indication there may be something wrong. Poor memory and learning skills make it difficult to live independently, pay your bills and do everyday things like driving a car or using a phone.

In the featured study, researchers were interested in how nutrient deficiencies may impact hippocampal function in memory. The hippocampus is a brain structure important for encoding and retrieving events in episodic, or long-term, memories. Animal models have demonstrated that lesions in this area make it difficult to remember the sequential ordering of scent despite the ability to recognize the odor.⁴

The nutrient the scientists evaluated was flavanol, which is a type of flavonoid with high antioxidant properties. Flavanols are commonly found in green tea, cinnamon, red wine, grapes, apples and cocoa products.⁵

Flavanol Deficiency Contributes to Memory Loss in the Elderly

The result of this study brings to mind the old expression that an apple a day may keep the doctor away. It's the flavanols in apples that were the focus of the study, the first to conclusively establish that a diet low in flavanols is one driver behind age-related memory loss.⁶

This was the most recent study from the same team that has been researching age-related memory loss for over 15 years. The studies began with animal models and the

most recent data was gathered from the COcoa Supplements and Multivitamin Outcomes Study (COSMOS), which involved 21,442 men and women from across America.⁷

The arm of the COSMOS study designed to evaluate the impact flavanols may have on cognitive aging in the hippocampus is called COSMOS-Web. Data was gathered from 3,562 older adults who were randomly assigned to receive either a daily supplement of flavanol in pill form or a placebo for three years.

At the start of the study, the researchers assessed the participants' diet and short-term memory using web-based activities at home. These same tests were repeated at the end of years one, two and three. Additionally, roughly one-third of the participants also sent urine samples so researchers could identify biomarkers indicating levels of dietary flavanols. This offered greater accuracy in measuring if flavanols were associated with the participants' cognitive performance.⁸

The researchers found what you may have expected – memory scores increased greatest when compared to baseline in the participants who had the lowest level of flavanol intake in their diet. The 16% improvement was measured in year one and was sustained for the following two years. Memory scores for the entire group improved only slightly.

These results suggest that a deficiency in flavanol is one driver of age-related memory loss, but additional flavanols over and above what the body requires does not provide added benefits. Adam M. Brickman, Ph.D., professor of neuropsychology and co-leader of the study commented in a press release:⁹

"The improvement among study participants with low-flavanol diets was substantial and raises the possibility of using flavanol-rich diets or supplements to improve cognitive function in older adults."

What Are Flavanols, Flavonols, Flavonoids and Flavones

Although the terms are very similar, the structures of flavanols, flavonols, flavonoids and flavones are different. Flavonoids are a family of polyphenolic compounds in plants. Within that family are six large subclasses of compounds. These include flavanols, flavonols, flavones, isoflavones and anthocyanidins.¹⁰

Flavones are a large subgroup of flavonoids and can be found in flowers and fruits such as parsley, red peppers, ginkgo biloba and celery.¹¹ Flavonols have a ketone group and are the building blocks of proanthocyanins. They can be found in abundance in fruits and vegetables. The most studied of these are kaempferol, quercetin and myricetin.

Flavanols, the subject of the featured study, are also called catechins or flavan-3-ols in reference to a hydroxyl group in the compound. You may recognize two flavanols that are found in tea, chocolate and berries – epicatechin and gallic catechin.¹²

Flavonoids Are Key to a Sharp Mind

The results of the featured study support the results of a 2021 study¹³ from the same team published in Scientific Reports. In this shorter 12-week study, researchers engaged 211 healthy adults and investigated the effects of daily administration of 260 mg, 510 mg and 770 mg of cocoa flavanols. The primary outcome was an object recognition task that engaged the hippocampus.

The findings suggested that flavanols "may be associated with memory function of the aging hippocampus and normal cognitive decline." Another 2023 study¹⁴ looked at the association between dietary intake of flavonols with changes in cognition.

The study engaged 961 people between 60 and 100 years in the Rush Memory and Aging Project. This is a prospective cohort of community-dwelling people living in Chicago. The participants were followed for an average of 6.9 years, during which cognitive performance and flavonol intake was assessed.

They found the participants who had higher levels of dietary intake had a slower rate of decline in global cognition and across other cognitive domains. The researchers wrote:

"Results suggest that dietary intakes of total flavonols and several flavonol constituents may be associated with slower decline in global cognition and multiple cognitive abilities with older age."

The key to this study was that the researchers did not use supplementation, but only looked at whole food intake. Nutritional researchers who spoke with CNN¹⁵ about the findings stressed that since whole food was used and contains many other bioactive compounds, we cannot be certain that it was flavanols that warded off dementia.

However, it's worth noting that the synergistic effect between compounds in whole food is what creates the best benefits. So, the take-home message here is that fruits and vegetables are good for you, especially for your brain.

Take Care to Include Kaempferol and Quercetin

Many people used quercetin supplements for [early treatment of COVID-19](#) once access to hydroxychloroquine was restricted. Both are zinc ionophores, which means they help shuttle zinc into the cell where it has potent antiviral activity. Initially, researchers thought this was the only reason why quercetin worked so well against the virus but later discovered several other beneficial mechanisms that impact COVID.

For those interested in general long-term health, you can get quercetin from a wide variety of fruits and vegetables, including onions and shallots, apples, broccoli, asparagus, tomatoes, strawberries, raspberries, blueberries, red leaf lettuce and green tea.¹⁶

The quercetin content in the food is dependent on light exposure, so depending on where the food was harvested, the foods that top the quercetin-rich list will differ. Aside from slowing cognitive decline, quercetin also is helpful in the prevention and/or treatment of:

High blood pressure and triglycerides¹⁷

Cardiovascular disease¹⁸

Obesity and metabolic syndrome¹⁹

Certain types of cancer²⁰

Nonalcoholic fatty liver disease
(NAFLD)²¹

Gout²²

Arthritis²³

Mood disorders²⁴

Aluminum-induced neurodegenerative changes,²⁵ such as those seen in Alzheimer's, Parkinson's and amyotrophic lateral sclerosis (ALS)

Like quercetin, kaempferol selectively inhibits the growth of cancer cells.²⁶ Good sources of this nutrient include kale, spinach and other green leafy vegetables, onions, chives, dill, tarragon, wild leeks, asparagus and berries.²⁷ Kaempferol is also found in ginkgo biloba and is one of the plant's most important constituents.

Ginkgo is a tree native to China that's been used in traditional Chinese medicine for thousands of years. Ginkgo's ability to improve memory and cognition and to prevent or treat dementia has also been studied for decades. In general, Ginkgo is believed to positively affect your body by increasing blood supply, reducing blood viscosity, boosting neurotransmitters and reducing harmful free radicals.²⁸

A word of caution though – the seeds of the Ginkgo tree contain ginkgotoxin (4'-O-methylpyridoxine), an "antivitamin" that may lead to neurological problems in certain people, particularly those who are deficient in certain B vitamins.²⁹

More Strategies to Help Protect Memory and Cognition

In addition to ensuring that you consume a nutrient-dense diet and adequate amounts of the appropriate vitamins and minerals, there are [more strategies](#) that you can use to help protect your cognitive health and memory, such as:

- **Staying hydrated** – In 2013,³⁰ CBS News reported that it was possible up to 75% of Americans were chronically dehydrated. While it may be the simplest way to support your overall health and your cognitive health, it is apparent that many people have difficulty staying hydrated.

The best way to determine if you have had enough to drink is the color of your urine. Aim to urinate every 2 to 3 hours and for urine that is a light straw color.

- **Keeping active** – Exercise encourages your brain to work, stimulating nerve cells to multiply and strengthening their interconnections. During exercise, nerve cells release neurotrophic factors such as brain derived neurotrophic factor (BDNF), which triggers other chemicals that promote neural health and directly benefit cognitive functioning.

Exercise improves brain structure and function, and research has shown it significantly increases hippocampal volume in older adults with probable mild cognitive impairment.³¹

- **Getting good sleep** – Sleep is vital to brain health. Research from Harvard suggests that people are 33% more likely to infer connections between distantly related ideas after sleeping, but few realize that their performance has improved.³² Data have also shown that a midday nap can dramatically boost and restore the brain's learning capacity.³³

You can improve the quality of your sleep by using a sleep mask to eliminate light during the night. In a two-part study, the results of the first part showed participants who wore light-blocking sleep masks had "Superior episodic encoding and an improvement on alertness."³⁴ Further testing showed the participants perform better on word pair association tests and tests to measure reaction times.

In the second part of the study, those wearing light-blocking sleep masks had an increased ability to learn new information and form memories and had more slow-wave sleep, which may be beneficial for memory.³⁵

- **Avoiding anticholinergics** – One risk factor that may impair memory development and increase the risk for dementia is a class of drugs known as **anticholinergics**. These compounds block acetylcholine, which is a neurotransmitter that performs important functions within your brain such as triggering muscle contractions and pain responses and the regulation of your endocrine system and REM sleep cycle.

In your brain, it's a key player in attention, concentration,³⁶ memory formation and consolidation,³⁷ which is precisely why these drugs can cause symptoms identical to dementia. Anticholinergic drugs are widely prescribed for depression, motion sickness, insomnia, allergies and dizziness.

You'll find a long list of these medications on TheSeniorList.com,³⁸ some of which you may recognize such as diphenhydramine (Benadryl), Tylenol PM, pseudoephedrine and Xanax.

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