

# A Woman's Brain Looks 3 Years Younger Than a Man's of the Same Age

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## STORY AT-A-GLANCE

- Women's brains are about three years younger, metabolically speaking, than men's brains of the same chronological age. The finding offers a clue as to why women tend to maintain their mental acuity longer than men
- Glucose is one of the brain's fuels, but how your brain uses sugar changes with age. Women's brains appear to convert more glucose to energy than men's do during adulthood
- Diet and other lifestyle strategies, including stress management, can have a significant impact on your brain's rate of aging
- Ketones — water-soluble fats produced by your liver during the conversion of fats into energy — are a preferred fuel for your brain, which is in part why a ketogenic diet is so beneficial for your brain function
- Exercise has also been shown to play an important role in the aging of your brain, and together, diet and exercise is a winning combination that can help reverse your brain's age by up to nine years in just six months

Recent research<sup>1,2</sup> from Washington University School of Medicine in St. Louis reveals women's brains appear to be about three years younger, metabolically speaking, than men's brains of the same chronological age. The finding offers a clue as to why women tend to maintain their mental acuity longer than men. The original study<sup>3</sup> can be viewed for free online, but is summarized by Science Daily:<sup>3</sup>

*"Time wears differently on women's and men's brains. While the brain tends to shrink with age, men's diminish faster than women's. The brain's metabolism slows as people grow older, and this, too, may differ between men and women ...*

*The brain runs on sugar, but how the brain uses sugar changes as people grow and age. Babies and children use some of their brain fuel in a process called aerobic glycolysis that sustains brain development and maturation.*

*The rest of the sugar is burned to power the day-to-day tasks of thinking and doing. In adolescents and young adults, a considerable portion of brain sugar also is devoted to aerobic glycolysis, but the fraction drops steadily with age, leveling off at very low amounts by the time people are in their 60s."*

## Gender Differences in Human Brain Metabolism

While gender differences have been found, it's still unclear exactly how brain metabolism differs between men and women, and why. The team, led by Dr. Manu Goyal, assistant

professor of radiology at the university's Mallinckrodt Institute of Radiology, sought to determine how the brain uses sugar by studying 205 individuals (121 women and 84 men) ranging in age from 20 to 82.

Using PET scans, they measured oxygen flow, blood flow and glucose levels in the brain, and determined how much glucose was being used up in aerobic glycolysis in the various brain regions of each person. An algorithm was then used to identify the relationship between chronological age and brain metabolism.

Based on this algorithm, the women's brains were found to be, on average, 3.8 years younger, metabolically, than their actual chronological age, and this was true even for women in their 20s.

On the other hand, men's brains were found to be, on average, 2.4 years older than their chronological age. What these findings suggest is that women's brains somehow convert more glucose to energy than men do during adulthood. Goyal told Science Daily:

*"The average difference in calculated brain age between men and women is significant and reproducible, but it is only a fraction of the difference between any two individuals.*

*It is stronger than many sex differences that have been reported, but it's nowhere near as big a difference as some sex differences, such as height. It's not that men's brains age faster — they start adulthood about three years older than women, and that persists throughout life.*

*What we don't know is what it means. I think this could mean that the reason women don't experience as much cognitive decline in later years is because their brains are effectively younger, and we're currently working on a study to confirm that."*

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## High-Fat Diet Helps Keep Your Brain Youthful

While these findings are interesting, it is perplexing to speculate as to what the reason is. The primary metabolic difference between premenopausal women and men would be their iron levels. Because menstruating women lose blood every month, they keep their iron levels relatively low, unlike men.

Excess iron will lead to oxidative stress that could easily contribute to some of these differences. Even though they surveyed women well beyond their last menstrual cycle, their lowered iron levels in their younger years could easily have contributed to some of the observed differences.

However, there's no reason for men to fret as you can easily [optimize your iron level](#), as I have discussed previously. Additionally, research clearly shows diet and other lifestyle strategies, including [stress management](#),<sup>5</sup> can have a significant impact on your brain's

rate of aging. It's well worth noting that while your brain is known to use glucose for fuel, it's not the sole fuel for your brain.

Ketones — water-soluble fats produced by your liver during the conversion of fats into energy — are actually a preferred fuel for your brain, which is in part why a ketogenic diet is so beneficial for your brain function. In fact, a [ketogenic diet has been shown to protect against Alzheimer's disease](#) by keeping your brain healthy and youthful.

In one study,<sup>6</sup> the researchers concluded the ketogenic diet acted as a veritable "fountain of youth," significantly improving neurovascular and metabolic functions in lab rodents, compared to those eating an unrestricted diet, and neurovascular function and integrity plays a significant role in determining your cognitive capacity.

High-fat diets have also been shown to lower your risk of dementia by 44 percent, whereas high-carb diets increase your risk by 89 percent.<sup>7</sup> Indeed, glucose directly contributes to atrophy of the hippocampus,<sup>8</sup> which means that even if you're not [insulin resistant](#) or diabetic, excess sugar in your diet may still be negatively affecting your memory.

## **Ketones Are Particularly Beneficial for Those With Diabetes, Alzheimer's and other Neurological Diseases**

Ketones appear to be the preferred source of energy for the brain particularly in people affected by [diabetes](#), Alzheimer's and Parkinson's, because in these diseases, certain neurons have become insulin resistant or have lost the ability to efficiently utilize glucose. As a result, neurons slowly die off.

The introduction of ketones may rescue these neurons and they may still be able to survive and thrive. In multiple studies, ketones have been shown to be both neurotherapeutic and neuroprotective. They also appear to lower markers of systemic inflammation.

The most common circulating ketone, beta-hydroxybutyrate, is also an important epigenetic player, having significant effects on DNA expression, increasing detoxification pathways and your body's own antioxidant production. Beta-hydroxybutyrate also stimulates specific receptors on cells called G-proteins.

When these receptors are tagged by this beta-hydroxybutyrate during mild ketosis, it helps reduce the activation of pathways that lead to inflammation, and inflammation is a driver in most all chronic diseases, including dementia and Alzheimer's.

## **Diet Plus Exercise Can Turn Back the Clock on Your Brain's Age**

Exercise has also been shown to play an important role in the aging of your brain, and together, diet and exercise is a winning combination. Recent research<sup>9</sup> demonstrating this was published in the journal *Neurology* in December 2018.

According to James Blumenthal, clinical psychologist from Duke University who led the research, this was the first study to look at the separate and combined effects of diet and exercise on cognitive decline in those who are vulnerable to developing dementia later in life.

In all, 160 adults (average age 65) were recruited. All had a history of high blood pressure or other cardiovascular risks, never exercised, and had cognitive challenges in executive functioning. None had a diagnosis of dementia.

At the beginning of the study, the average cognitive skills in the participants were similar to those of individuals 93 years old — 28 years older on average than the actual age of the participants. The volunteers were divided into four groups:

1. The first participated in a structured [aerobic exercise](#) program for the first three months and were given exercises to do at home in the last three months
2. The second group were asked to eat a low sodium DASH diet (which reduces processed foods and increases intake of whole foods) but did no exercise
3. The third group were asked to exercise and change their diet at the same time
4. The fourth group served as a control and received a 30-minute educational session over the phone on how to improve their brain health, but were asked not to change their exercise or dietary habits

Here's what they found at the end of the six-month-long study:

- The first group, who exercised but did not change their diet, had greater improvements in executive functioning than the group who did not exercise
- Those who followed the DASH diet with no exercise experienced no significant improvement in thinking skills
- The group who changed their diet and exercised reversed their brain age by nine years, bringing their average mental age to 84
- The control group's executive function declined

## **Muscle Strength Indicative of Brain Health**

Importantly, research shows muscle strength, especially your leg muscles, impacts neurosignaling, thereby playing a role in brain deterioration.<sup>10</sup> This connection is why neurological functioning in patients tends to decline when their physical mobility is limited.

In her book "Sitting Kills, Moving Heals," Joan Vernikos, Ph.D., former director of NASA's life science division, describes how weight-bearing against gravity is crucial component

allowing human body and brain to function optimally. Another key factor is how exercise affects brain-derived neurotrophic factor (BDNF), found in both your brain and muscles.

Exercise stimulates production of a protein called FNDC5, which in turn triggers BDNF. In your brain, BDNF preserves existing brain cells, activating them to convert into new neurons and promoting actual brain growth.

You can find a list of studies demonstrating the links between your muscles and brain in my previous article, "[For Optimal Brain and Nervous System Health, You Need to Exercise Your Leg Muscles.](#)"

Grip strength is another strong indicator of the health of your brain.<sup>11</sup> An analysis<sup>12</sup> of data collected from over 475,000 British participants revealed the stronger an individual's hand grip, the better they performed across every brain function test the researchers used, including reaction speed, logical problem-solving and multiple tests analyzing memory.

The analysis also accounted for age, gender, [body weight](#) and education, confirming those who were stronger indeed had better functioning brains. What's more, the data was consistently strong both in individuals younger than 55 and those over 55.

## Nutrients for Better Brain Health

In addition to a ketogenic diet, certain [nutrients are also vital for brain health](#), while others can be helpful. Among the most important are vitamin D and [marine-based omega-3](#), which contains two long-chained fatty acids that are vital for brain health: docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). Other nutrients known to influence your brain health and cognition include:

**Choline** — Recent research<sup>13</sup> demonstrates the importance of choline for brain health and prevention of neurodegenerative diseases such as Alzheimer's. Choline is a precursor to acetylcholine, a neurotransmitter required for the proper function of your brain and nervous system, and helps protect against Alzheimer's by reducing your homocysteine level and inhibiting microglia activation.

**Phosphatidylserine** — This is another supplement that can help improve cognitive function<sup>14</sup> and protect against Alzheimer's disease.<sup>15</sup> Phosphatidylserine is an amino acid derivative that is highly prevalent in neural tissue and plays an important role in the cellular function in your brain.

In one study,<sup>16</sup> supplementing with 400 mg of phosphatidylserine increased the speed of calculations done in short-term memory by 20 percent in a group of healthy adults. In another, it improved cognitive function of geriatric patients at a dosage of 300 mg per day for six months.<sup>17</sup>

**Acetyl-L-carnitine** — This supplement has many beneficial effects on brain metabolism, protects against neurotoxic insults, and has been shown to benefit certain forms of [depression](#).<sup>18</sup>

**Vitamin B12** — Research<sup>19</sup> shows people with high levels of markers for vitamin B12 deficiency are more likely to score lower on cognitive tests and have a smaller total brain volume, which suggests a lack of B12 may contribute to brain shrinkage. Research<sup>20</sup> has found that supplementing with B vitamins, including B12, helps to slow brain atrophy in elderly people with mild cognitive impairment.

**MCT oil** — As mentioned, ketones are what your body produces when it converts fat (as opposed to glucose) into energy, and a primary source of ketone bodies are medium chain triglycerides (MCT). While [coconut oil](#) is one healthy option, MCT oil is a more concentrated source of ketones, so it tends to be more appropriate for clinical uses. noted by Mental Health Daily:<sup>21</sup>

*"In small scale human trials,<sup>22</sup> MCT supplementation boosted cognition in individuals with cognitive impairment and mild forms of Alzheimer's disease after just a single dose."*

You can learn more about MCTs and the differences between them in my previous article, "[The Many Health Benefits of MCT Oil](#)."

**Ashwagandha** — Memory enhancement is one traditional use, particularly of the root. A 2017 study published in the Journal of Dietary Supplements<sup>23</sup> showed positive results using ashwagandha root extract to improve memory and cognitive functions in 50 people with mild cognitive impairment.

**Bacopa** — [Bacopa](#) (Bacopa monnieri), or moneywort, is a popular herb in Ayurvedic medicine used in India for over three centuries. The bacopa herb is commonly known as a nootropic herb, which means it can help repair damaged neurons and improve brain function. Nootropics are usually said to have the ability to "unlock" the brain when it comes to creativity and cognitive drive.<sup>24</sup>

**Curcumin** — A double-blind, placebo-controlled study<sup>25</sup> included 40 adults between the ages of 50 and 90 with reported mild memory lapses but no dementia. Those who received curcumin supplementation saw significant improvements in memory and concentration, while the control group experienced no improvement.