

The effects of drinking on the aging brain

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Credit: Human Brain Project

Wisdom and grace come with age, but so do mental slowing and increased risk for dementia. As the elderly population continues to grow, preserving brain health to maintain independence and quality of life into older age is a pressing concern. Researchers have identified some unsurprising factors that reduce one's risk for cognitive decline, including [education, exercise or a healthy diet](#). But a more controversial question that continues to perplex scientists is whether alcohol consumption might also stave off cognitive impairment with age.

The aging brain on alcohol

Anyone who's experienced the fatigue and [brain fog](#) that follow a night of heavy drinking doesn't need science to explain the dangers of excessive [alcohol](#) intake. These health risks may be especially impactful to the older brain, which is already particularly vulnerable to environmental stressors. However, in moderation, a glass of wine or beer may not only be harmless, but may in fact also confer resilience to the aging brain against cognitive decline. Numerous studies have reported

that moderate drinking is associated with [lower rates of dementia](#), better cognitive performance, and slower decline in memory and [executive functions](#). Yet, not all studies support the notion that a nightcap can help keep the brain sharp into late life. These discrepant findings raise two obvious questions. First, why are some patterns of drinking neurobiologically healthy, while others are toxic? And second, how can we better identify drinking behaviors that promote the healthiest trajectories of cognitive aging?

Neuroprotective in moderation, neurotoxic in excess

In excess, alcohol works as a neurotoxin on many levels. Studies in animals have shown that bingeing on ethanol [kills neurons](#) and [impairs neurogenesis](#)—the birth of new neurons—in the hippocampus, a region critical to creating new memories. Furthermore, alcohol-induced dementia results from brain damage that occurs with prolonged alcohol abuse. The reasons for the observed benefits of alcohol are less clear. In contrast to binge drinking, moderate alcohol intake [increases neurogenesis](#) and may help combat oxidative stress to neurons. It's well documented that what's good for the heart is good for the brain, and indeed, vascular dysfunction often co-exists with or precipitates many forms of dementia. A prevailing theory is that the neuroprotective properties of drinking stem largely from their positive effects on cerebrovascular health. Alcohol can reduce risk for stroke and heart disease, lower blood pressure and increase HDL ("good") cholesterol. However, some evidence that wine is more strongly neuroprotective than other forms of alcohol suggests that resveratrol, a potent antioxidant found in red wine, may also play a role. Although resveratrol minimizes dementia pathology in animals, the extremely high doses required make it unlikely to be the primary source of neuroprotection from alcohol.

Unraveling healthy drinking patterns for the aging brain

For our aging population to reap the greatest benefit from alcohol, it will be essential to determine patterns of healthy drinking that are optimized for the individual. This will require, foremost, a comprehensive understanding of how alcohol distinctly affects you versus me based on our genetics, sex or lifestyle. For example, alcohol has been found to differentially influence brain structure and risk for dementia or [cognitive impairment](#) for those with and without the apolipoprotein E4 gene, a strong risk factor for Alzheimer's disease. Furthermore, studies have inconsistently reported [sex differences](#) in how drinking influences [cognitive decline](#), which may be explained by differences in how men and women metabolize alcohol.

Despite overwhelming evidence that moderate alcohol intake can be healthy for the aging brain, there are striking incongruences across findings—which may be due to differences in study design or confounding factors—that muddle our understanding of alcohol's benefits. 'Survival bias,' in which healthier individuals participate in studies for longer, is an unavoidable complication in longitudinal studies of aging. This could significantly skew results if unhealthy drinkers drop out early, leaving only "healthy" drinkers to be studied in very old age. Furthermore, most human studies on alcohol and brain aging rely on observed associations, which can be replete with confounding factors. For instance, it's known that drinkers tend to live more healthy lifestyles (e.g., they may exercise more or follow a Mediterranean diet), or may drink more often simply because they're more socially active, which alone is known [to be brain-healthy](#). What's more, effects of alcohol on cognitive aging may depend on the [type of alcohol](#) consumed, how alcohol intake is measured, or the definition of "non-drinkers." Many studies group life-long abstainers together with quitters, who may avoid alcohol due to poor health or may have developed health problems from alcohol abuse. However, my postdoctoral adviser Linda McEvoy, who studies effects of alcohol on brain aging at UC San Diego, explains that "Randomized controlled trials offer a better alternative to more definitely answer the question of how [moderate alcohol intake](#) affects cognitive function. Such trials have demonstrated beneficial cardiometabolic effects in those randomized to drink moderate

amounts of alcohol."

A prescription for alcohol?

Despite some uncertainties in the research so far, it appears that regular [moderate drinking](#) is unlikely to be hazardous to cognitive function and may even support healthy brain aging. Until we have further clarification, McEvoy offers some advice to those hoping to preserve brain health into late life: "If a person consumes alcohol, I would advise drinking moderate amounts of alcohol (one or two drinks) with dinner. If the person does not drink, I would not advise starting. Some individuals have a hard time controlling the amount they drink, and heavy drinking has detrimental effects on [brain health](#) and cognitive function."

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