

## Research Check: can even moderate drinking cause brain damage?

Written by Nicole Lee, Professor at the National Drug Research Institute, Curtin University

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Heavy alcohol consumption over ten years or more can cause significant brain function problems. But what about casual drinking? [Robert Mathews/Unsplash](#)

Research [reported last week](#) found “even moderate drinking” could “damage the brain”. Considering 78% of Australians over 14 years old [drink alcohol](#), this is understandably concerning information.

News reports were reasonably accurate in their interpretation of the study. With measured headlines using words such as “may damage the brain” and “linked with”, these reported that the observational study found an association between moderate drinking and brain damage, not a causation.

[The Financial Review](#) ran the headline:

The silent damage from drinking moderately down the decades

and [CBS News said](#) :

Even moderate drinking could harm the brain.

Others, such as the [Deccan Chronicle](#), were more hyperbolic, hinting at causation:

Moderate drinking leads to severe brain damage.

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We know about 17% of [Australians drink at levels](#) considered to put them at risk of long-term harm such as diabetes, liver disease and cognitive problems.

And it's well established heavy drinking over ten years or more can cause significant cognitive difficulties. These include disorders such as [Korsakoff's Syndrome](#) and [Wernicke's Encephalopathy](#), where memory and other essential thinking functions, as well as motor coordination, are severely and permanently damaged.

But what about those of us who have two to three drinks a night?

First, this is an observational study that followed people over time, showing an association between their alcohol intake and certain cognitive functions. Observational studies cannot prove that one (alcohol) caused the other (impaired brain function).

And while alcohol can potentially affect multiple parts of the brain, the researchers found significant impact in only one part of the brain. And that did not appear to correlate with poorer brain functioning overall.

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## Research Check

### Study

**Title:** "Moderate alcohol consumption as risk factor for adverse brain outcomes and cognitive decline: longitudinal cohort study"

**Authors:** A Topiwala, CL Allan, V Valkanova, E Zsoldos, N Filippini, C Sexton, A Mahmood, P Fooks, A Singh-Manoux, CE Mackay, M Kivimäki, KP Ebmeier

### Study type

Observational, longitudinal cohort study



### Sample size

550 men and women who were not alcohol dependent.

### Who, or what, is it testing/treating?

Association between moderate alcohol consumption and brain structure and function.

### Intervention or exposure

Participants undertook five neuropsychological tests over 30 years and had a brain scan at the end of the study.

### Outcome

Even moderate alcohol consumption is associated with adverse brain outcomes, including shrinking of an important area of the brain called the hippocampus.

## The Conversation, CC BY-ND How was the study conducted?

Researchers from the University of Oxford and University College London conducted the study, which was published in the well-regarded journal [The BMJ](#). It followed 550 men and women for 30 years who were not alcohol-dependent.

Participants were categorised into four groups based on how much alcohol they drank per week. The “abstinent” group drank less than one standard drink a week, and the “light” between one and seven drinks. “Moderate” drinkers had between seven and 14 drinks a week for women, and between seven and 21 drinks for men. Men who had 21 or more drinks per week, and women who drank 14 or more, were classified as “unsafe” drinkers.

The participants had brain scans once (at the 30-year point) and neuropsychological testing five times over the 30 years.

## What did it find?

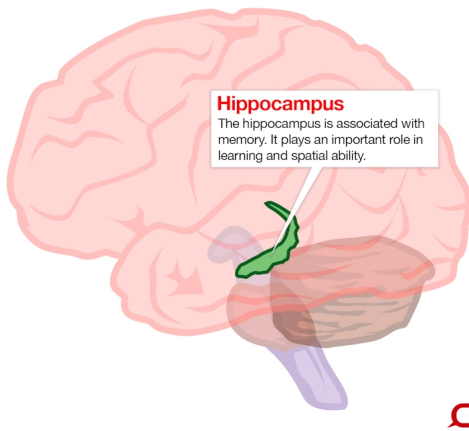
The main difference between the drinking groups was a smaller [hippocampus](#) – the area of the brain important for learning, memory and spatial awareness – in people who drank more.

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Compared to “abstainers”, people who drank an average 30 or more drinks a week over the 30 years were more likely to have a smaller hippocampus. But even those drinking between 14 and 21 drinks a week had, on average, a smaller hippocampus.



The Conversation, [CC BY-ND](#) **How should we interpret the results?**

There are a few reasons to be cautious about these results. The study looked at brain function (how well the brain works, measured by [neuropsychological tests](#) ) over time. But researchers measured brain structure (the physical make-up of the brain) with a [brain scan](#) only at the end of the study.

Although the hippocampus was smaller in the heavier drinking groups, alcohol consumption did not seem to affect the function of the brain. There was no alcohol-related decline in measures of memory and [executive functions](#) (such as planning, problem solving and impulse control). These are usually the cognitive domains most sensitive to effects of alcohol and most likely to show the negative impact of hippocampal shrinkage.

Not having scanned the brains of participants at the beginning of the study means researchers did not know the original size of their hippocampi. They visually assessed the size of brains from the scans and compared them to expected brain size, using an established scale for that purpose. Around 65% of people who drank 14 to 21 drinks a week showed a smaller hippocampus, but even 35% of the abstainers had “hippocampal atrophy”.

The study used many measures of brain functioning (visual and verbal memory, executive function and working memory), but it found alcohol-related decline in only one function – [verbal fluency](#)

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(the ease with which we can retrieve words). And none of the groups were particularly impaired overall compared to people in the general population of the same age and education level.



Researchers scanned participants' brains only once, at the end of the study. from shutterstock.com

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### What else should we take into account?

In a study with a moderate number of people like this, it can be harder to assess brain differences because it is difficult to properly take into account other important factors such as age, gender, mental health problems and other drug use.

It seems logical that something like alcohol, which has a strong short-term impact on the brain, might have longer-term effects, and this study adds to the growing evidence that alcohol can impact brain structure. But we are still some way off knowing how much moderate alcohol consumption affects the brain and whether that translates to a functional impairment.

Alcohol is implicated in a number of physical and mental health problems and should be used occasionally and within recommended limits. Studies that have reported [health benefits of moderate drinking](#) in the past have now been shown to be methodologically flawed.

The Australian National Health and Medical Research Council [guidelines on alcohol consumption](#) recommend that adults (both men and women) should drink a maximum of two standard drinks a day to maintain long-term health and no more than four drinks on one occasion to prevent short-term harm.

– Nicole Lee and Rob Hester

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### Peer Review

I agree with the observations made in this Research Check. There are several other factors to consider when interpreting this study.

Firstly, the researchers found a decline in verbal fluency, as well as atrophy of the hippocampus in participants. But (as Figure 7 in the study shows) there is no pathway between hippocampal volume and verbal fluency decline. Verbal fluency is [usually associated](#) with an area of the brain called the frontal lobe, while the [hippocampus is associated with memory](#)

And apart from differences in verbal fluency, the researchers found no other differences between groups on tests associated with the hippocampus, such as those for learning and memory. In the absence of changes to other executive and memory tests, it is uncertain what the clinical and functional significance of a reduction in verbal fluency means.

Further, it's unknown how the participants spaced out their alcohol intake. There is [new evidence](#) showing moderate drinking in a "binge" fashion could be dangerous to cognitive ability. The researchers did not distinguish between those who drank two standard drinks per day throughout the week and those who saved their 14 drinks for a single session on the weekend. This could also be mediating their results.

There is also [evidence that abstinence](#) from alcohol can [improve brain structure](#) and cognitive performance, even [after a few months](#)

. So don't be too alarmed when reading these results. –

**Travis Wearne**

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*This article has been amended to say that the NHMRC guidelines recommend adults drink no more than four drinks on one occasion.*

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[https://www.abc.net.au/news/2019-05-15/moderate-drinking-causes-brain-damage/5511114](#)