

Heavy alcohol use alters brain functioning differently in young men and women

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Scientists have found that brain functions in young men and women are changed by long-term alcohol use, but that these changes are significantly different in men and women. This indicates not only that

young people might be at increased risk of long-term harm from alcohol use, but also that the risks are probably different in men and in women, with men possibly more at risk. This work is presented today at the ECNP meeting in Paris.

A Finnish research group worked with 11 [young men](#) and 16 [young women](#) who had a heavy 10-year [alcohol](#) use, and compared them with 12 young men and 13 young women who had little or no alcohol use. All were between 23 to 28 years old at the time the measurements were taken. The researchers examined the responses of the [brain](#) to being stimulated by magnetic pulses - known as Transcranial Magnetic Stimulation (TMS), which activates brain neurons. The brain activity was measured using EEG (electroencephalogram).

Previously, the researchers had found that heavy alcohol users showed a greater electrical response in the cortex of the brain than non-alcohol users, which indicates that there had been long-term changes to how the brain responds. This time, they found that young men and young women responded differently, with males showing a greater increase in electrical activity in the brain in response to a TMS pulse. As researcher Dr Outi Kaarre (University of Eastern Finland and Kuopio University Hospital, Finland) said:

"We found more changes in brain electrical activity in male subjects, than in females, which was a surprise, as we expected it would be the other way around. This means that male brain electrical functioning is changed more than female brains by long-term alcohol use"

The EEGs also allowed the researchers to show that male brains have greater [electrical activity](#) associated with the GABA (gamma-amino butyric acid) neurotransmission than do female brains.

Dr Kaarre continued, "Generally, our work showed that alcohol causes

more pronounced changes in both electrical and chemical neurotransmission in men than women. There are two types of GABA receptors, A and B. Long-term alcohol use affects neurotransmission through both types in males, but only one type, GABA-A, is affected in females.

We're still trying to figure out what this means, but GABA is a pretty fundamental neurotransmitter in the inhibition of many brain and central nervous systems functions. It's involved in many neurological systems, and is important in anxiety and depression. Generally it seems to calm down [brain activity](#).

We know from animal studies that GABA-A receptor activity seems to affect drinking patterns, whereas GABA-B receptors seem to be involved in overall desire for alcohol. It has been suggested that women and men may respond differently to alcohol. Our work offers a possible mechanism to these differences."

We know that long-term alcohol use can be risky for [young people](#). What this work means is that long-term alcohol use affects young men and women very differently, and we need to find out how these differences manifest themselves. It may be that we need to look at tightening regulations on youth drinking, since none of our study participants met the diagnostic criteria for [alcohol use disorders](#) and still these significant changes in brain functioning were found. It may also mean that gender differences should be taken into account when planning pharmacological treatment for alcoholism".

Commenting, Professor Wim van den Brink (Professor of Psychiatry and Addiction at the Academic Medical Centre, University of Amsterdam, and ex Chair of the ECNP Scientific Programme Committee):

"These are very interesting findings, especially since young women are catching up with young men when it comes to drinking and heavy drinking in Europe. This may also mean that a different group of women is getting involved in early heavy alcohol use than used to be the case; in other words, when heavy drinking occurs more frequently and tends to become the norm, [women](#) do not need to have some aberrant personal characteristic to become an early heavy user of alcohol.

The finding of a different EEG-pattern in male and female early heavy drinkers may indeed have important consequences for the treatment of male and female patients with an alcohol use disorder. One of the most recent new medications for the treatment of [alcohol dependence](#) is the GABA-B agonist Baclofen, which has shown mixed results which may be explained by this work.

A limitation of the study is that it says nothing about possible pre-existing neurobiological differences between the groups, an explanation for the observed differences that is equally valid".

Provided by European College of Neuropsychopharmacology

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