Medical Xpress

Brain signals for good memory performance revealed

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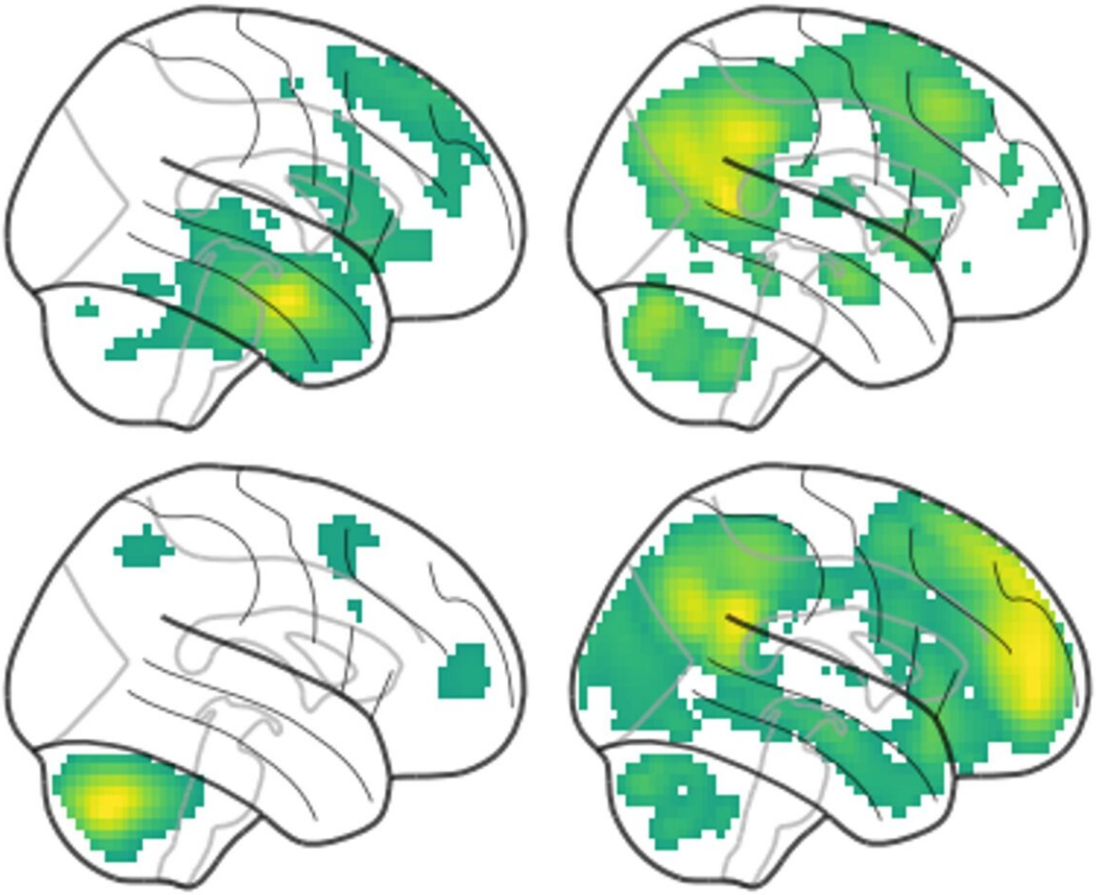

Functional networks associated with individual differences in memory performance. Credit: MCN, University of Basel

People differ significantly in their memory performance. Researchers at the University of Basel have now discovered that certain brain signals are related to these differences.

While it is well known that certain brain regions play a crucial role in memory processes, so far it has not been clear whether these regions exhibit different activities when it comes to storing information in people with better or worse memory performance.

Having investigated this matter, a research team led by Professor Dominique de Quervain and Professor Andreas Papassotiropoulos has now published its results in the journal *Nature Communications*.

In the world's largest functional imaging study on memory, they asked nearly 1,500 participants between the ages of 18 and 35 to look at and memorize a total of 72 images. During this process, the researchers recorded the subjects' brain activity using MRI. The participants were then asked to recall as many of the images as possible—and as in the general population, there were considerable differences in memory performance among them.

Signals in brain regions and networks

In certain brain regions including the hippocampus, the researchers found a direct association between brain activity during the memorization process and subsequent memory performance. Individuals with a better memory showed a stronger activation of these brain areas. No such association was found for other memory-relevant brain areas in the occipital cortex—they were equally active in individuals with all levels of memory performance.

The researchers were also able to identify functional networks in the brain that were linked to memory performance. These networks

comprise different brain regions that communicate with each other to enable complex processes such as the storage of information.

"The findings help us to better understand how differences in memory performance occur between one individual and another," said Dr. Léonie Geissmann, the study's first author, adding that the brain signals of a single individual do not allow for any conclusions to be drawn about their memory performance, however.

According to the researchers, the results are of great importance for future research aimed at linking biological characteristics such as genetic markers to brain signals.

The current study forms part of a large-scale research project conducted by the Research Cluster Molecular and Cognitive Neurosciences (MCN) at the University of Basel's Department of Biomedicine and the University Psychiatric Clinics (UPK) Basel. The aim of this project is to gain a better understanding of memory processes and to transfer the findings from basic research into clinical applications.

More information: Léonie Geissmann et al, Neurofunctional underpinnings of individual differences in visual episodic memory performance, *Nature Communications* (2023). DOI: 10.1038/s41467-023-41380-w

Provided by University of Basel