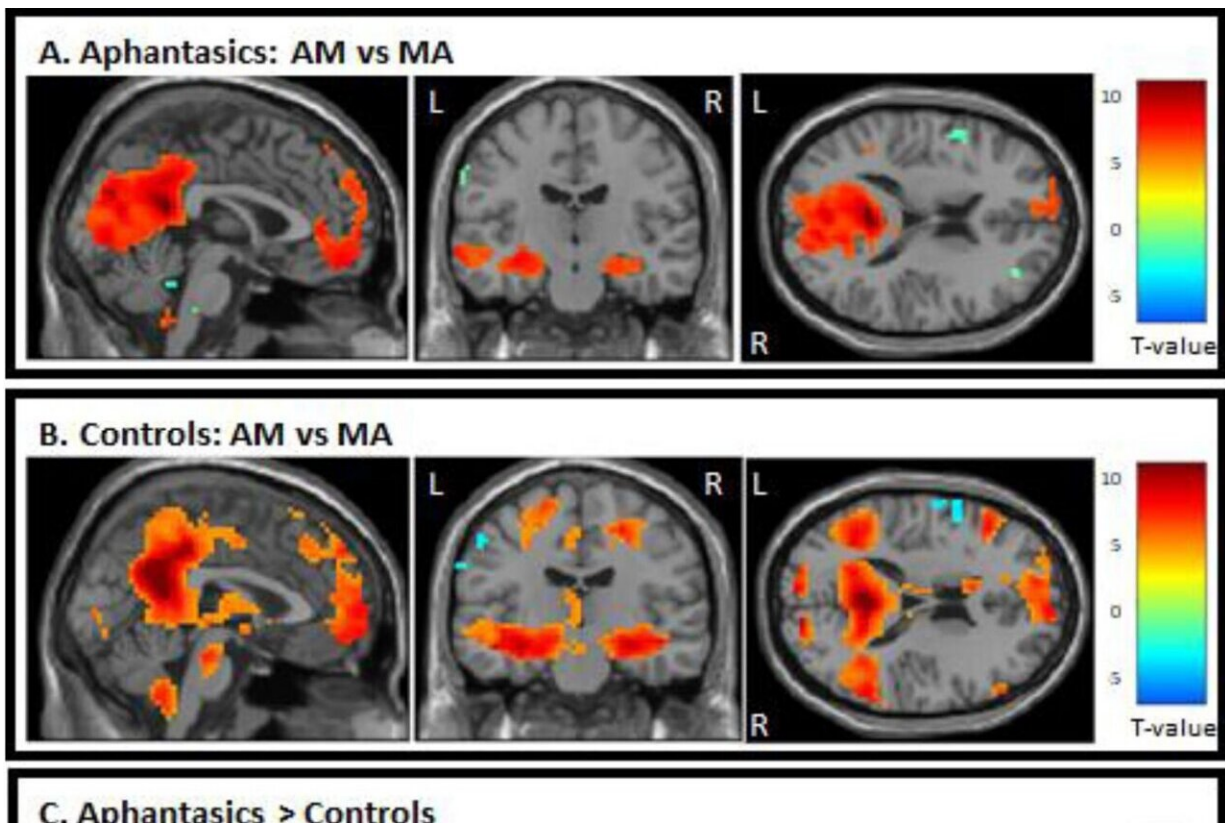


Researchers find connection between autobiographical memory and aphantasia

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Activation during AM retrieval task. (A) Stronger activated cortical regions during AM retrieval (in warm colors) in comparison to math problem solving (in cool colors) in aphantasics and (B) controls. (C) Aphantasics showed greater activation in visual-perceptual cortices than controls, and (D) controls showed stronger activation in the right posterior hippocampus than aphantasics. Credit: (2024). DOI: 10.7554/eLife.94916.1

People with aphantasia lack visual imagination. Researchers from the University Hospital Bonn (UKB), the University of Bonn and the German Center for Neurodegenerative Diseases (DZNE) investigated how the lack of mental imagery affects long-term memory.

They were able to show that changes in two important brain regions, the [hippocampus](#) and the occipital lobe, as well as their interaction, have an influence on the impaired recall of personal memories in aphantasia. The study results, which advance the understanding of autobiographical [memory](#), have now been [published](#) in *eLife*.

Most people find it easy to remember personal moments from our own lives. These memories are usually linked to vivid inner images. People who are unable to create mental images, or only very weak ones, are referred to as aphantasics.

Previous neuroscientific studies have shown that the hippocampus, in particular, which acts as the brain's buffer during memory formation, supports both autobiographical memory and visual [imagination](#). However, the relationship between the two cognitive functions has not yet been clarified.

"Can you remember specific events in your life without generating inner images? We investigated this question and, in collaboration with the Institute of Psychology at the University of Bonn, studied the autobiographical memory of people with and without visual imagination," says corresponding author Dr. Cornelia McCormick from the Department of Neurodegenerative Diseases and Geriatric Psychiatry, who also conducts research at the DZNE and the University of Bonn.



Long-term memory and lack of mental images: (from left) Research Group Leader Dr. Cornelia McCormick, Merlin Monzel und Pitshaporn Leelaarporn find connection between autobiographical memory and aphantasia. Credit: Rolf Müller

Recall of memories is dependent on the generation of mental images

The Bonn team led by McCormick investigated the question of whether the hippocampus—in particular its connection, or connectivity, to other brain regions—is altered in people with aphantasia and examined the brain activities and structures associated with deficits in autobiographical memory in aphantasia.

The study involved 14 people with aphantasia and 16 control subjects. The extent of aphantasia and the respective autobiographical memory were initially determined using questionnaires and interviews.

"We found that people with aphantasia have more difficulty recalling memories. Not only do they report fewer details, but their narratives are less vivid and their confidence in their own memory is diminished. This suggests that our ability to remember our personal biography is closely linked to our imagination," says co-author Merlin Monzel, a doctoral student at the Institute of Psychology at the University of Bonn.

The study participants then recalled autobiographical events while images of their brains were recorded using functional magnetic resonance imaging (fMRI). "This showed that the hippocampus, which plays an important role in recalling vivid, detailed autobiographical memories, is less activated in people with aphantasia," says co-author and Ph.D. student Pitshaporn Leelaarporn, who works at the UKB and the DZNE.

There were also differences in the interaction between the hippocampus and the [visual cortex](#), which is responsible for processing and integrating visual information in the brain and is located in the occipital lobe.

"The connectivity between the hippocampus and the visual cortex correlated with the imagination in people without aphantasia, whereas there was no correlation in those affected," explains Leelaarporn.

"Overall, we have been able to show that autobiographical memory does not work as well in people who have limited visual imagination as it does in people who can visualize something very easily. These results raise further questions that we are currently investigating," says McCormick.

On the one hand, it is important to find out whether people who are

blind from birth and have never been able to build up a repertoire of inner images can remember detailed autobiographical events. On the other hand, the Bonn researchers want to investigate whether this ability can be trained.

"It may even be possible to help people who suffer from memory disorders, such as Alzheimer's disease, by offering training in visual imagination instead of the usual memory training," says McCormick.

More information: Merlin Monzel et al, Hippocampal-occipital connectivity reflects autobiographical memory deficits in aphantasia, *eLife* (2024). [DOI: 10.7554/eLife.94916.1](https://doi.org/10.7554/eLife.94916.1)

Provided by University Hospital Bonn

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