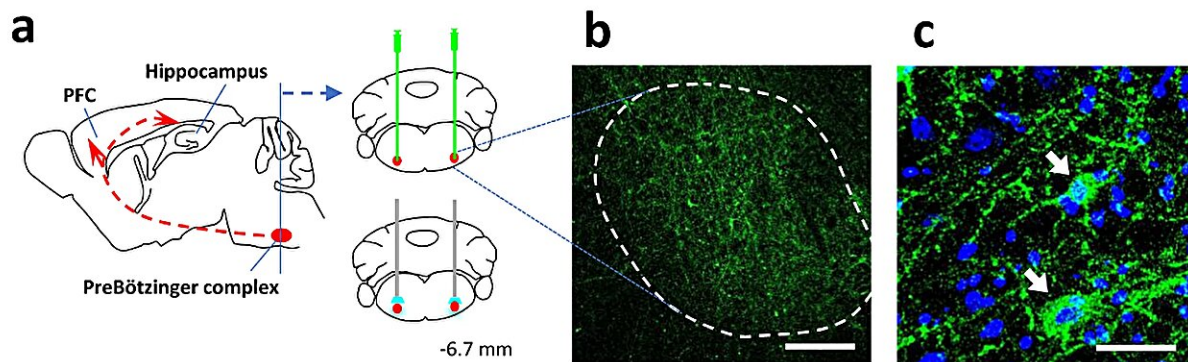


Breathing patterns found to influence memory retention in mice

August 14 2023, by Bob Yirka



Regulation of breathing and optogenetic manipulations. a) PreBötzing complex (PreBötC), prefrontal cortex, and hippocampus. AAV-Ef1 α -DIO-hChR2(H134R)-EYFP was injected bilaterally into the PreBötC (6.70 mm caudal to bregma, red) in Vgat-Cre⁺ mice and fiber-optic cannulas were placed bilaterally in the dorsal region. b, c) Images showing EYFP positive inhibitory Vgat neurons (green, arrows) and DAPI-stained nuclei (blue) in the PreBötC. Similar patterns of expression were confirmed independently at least five times. Credit: *Nature Communications* (2023). DOI: 10.1038/s41467-023-40139-7

A team of Japanese neurologists and physiologists has found that momentarily suspending breathing in mice during a learning exercise can inhibit memory retention. In their study, reported in the journal *Nature Communications*, the group genetically altered test mice to control their breathing.

In a prior effort, the same research team had found that if they asked human volunteers to breathe in during a memory test, rather than breathe out, it reduced their memory recall abilities. This, they suggested, was due to inhalation causing an interruption in information processing.

In this new effort, the team genetically modified test mice in a way that allowed them to control their breathing by manipulating neurons in the pre-Bötzinger complex—a part of the medulla oblongata that regulates breathing.

They ran the test mice through several kinds of memory tests, ranging from [object recognition](#) to fear conditioning. In so doing, they found that when they temporarily disabled breathing, the mice were less able to form [new memories](#). They also found that such pauses also impacted the hippocampus, which prior research has also shown plays a role in storing both long- and [short-term memory](#).

The research team also ran several memory experiments while simultaneously forcing the [mice](#) to breathe in different patterns. They found that some of the breathing patterns led to improved memory processing. They also found that slowing breathing during such exercises resulted in reduced memory processing.

The researchers suggest their findings hint at possible therapies for treating some brain injuries or disorders or even [mental health issues](#) in general. They further suggest that certain breathing exercises could help people when faced with the need to remember something for referencing later.

The research team concludes that their work is likely just the beginning of a new area of research looking into the role that respiration plays in [molecular mechanisms](#) in the brain and memory processing in general.

More information: Nozomu H. Nakamura et al, Hippocampal ensemble dynamics and memory performance are modulated by respiration during encoding, *Nature Communications* (2023). [DOI: 10.1038/s41467-023-40139-7](https://doi.org/10.1038/s41467-023-40139-7)

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