

'Sticky synapses' can impair new memories by holding on to old ones

May 26 2014



(Medical Xpress)—A team of UBC neuroscientists has found that synapses that are too strong or 'sticky' can actually hinder our capacity to learn new things.

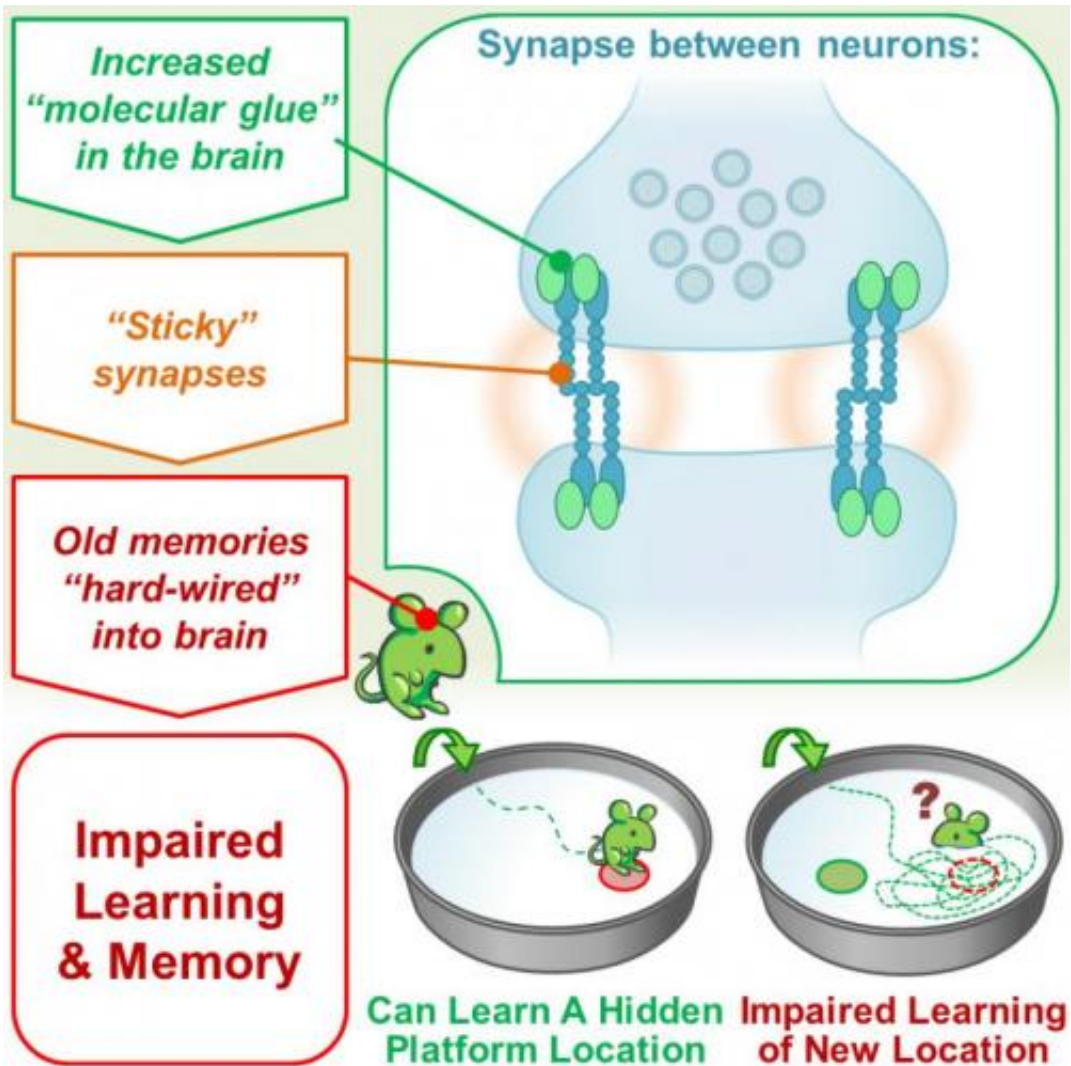
University of British Columbia researchers have discovered that so-called "sticky [synapses](#)" in the brain can impair new learning by excessively hard-wiring old memories and inhibiting our ability to adapt to our changing environment.

Memories are formed by strong synaptic connections between nerve

cells. Now a team of UBC neuroscientists has found that synapses that are too strong or "sticky" can actually hinder our capacity to learn new things by affecting [cognitive flexibility](#), the ability to modify our behaviours to adjust to circumstances that are similar, but not identical, to previous experiences.

"We tend to think that strong retention of memories is always a good thing," says Fergil Mills, UBC PhD candidate and the study's first author. "But our study shows that cognitive flexibility involves actively weakening old memory traces. In certain situations, you have to be able to 'forget' to learn."

The study, published today in the *Proceedings of the National Academy of Sciences*, shows that mice with excessive beta-catenin – a protein that is part of the "molecular glue" that holds synapses together – can learn a task just as well as normal mice, but lacked the mental dexterity to adapt if the task was altered.



Credit: University of British Columbia

"Increased levels of beta-catenin have previously been reported in disorders such as Alzheimer's disease and Huntington's disease, and, intriguingly, patients with these diseases have been shown to have deficits in cognitive flexibility similar to those we observed in this study," says Shernaz Bamji, an associate professor in UBC's Dept. of Cellular and Physiological Sciences.

"Now, we see that changes in beta-catenin levels can dramatically affect

learning and memory, and may indeed play a role in the cognitive deficits associated with these diseases," she adds. "This opens up many exciting new avenues for research into these diseases and potential therapeutic approaches."

Background

To test cognitive flexibility in mice, researchers conducted an experiment where the mice were placed in a pool of water and had to learn to find a submerged hidden platform. The mice with excessive beta-catenin could learn to find the platform just as well as normal mice. However, if the platform was moved to a different location in the pool, these [mice](#) kept swimming to the platform's previous location. Even after many days of training, the 'sticky synapses' in their brains made them unable to effectively learn to find the new platform.

More information: Cognitive flexibility and long-term depression (LTD) are impaired following β -catenin stabilization in vivo , *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1404670111

Provided by University of British Columbia

Citation: 'Sticky synapses' can impair new memories by holding on to old ones (2014, May 26) retrieved 24 April 2024 from <https://medicalxpress.com/news/2014-05-sticky-synapses-impair-memories.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--