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Not like riding a bike: New motor memories need stabilizing

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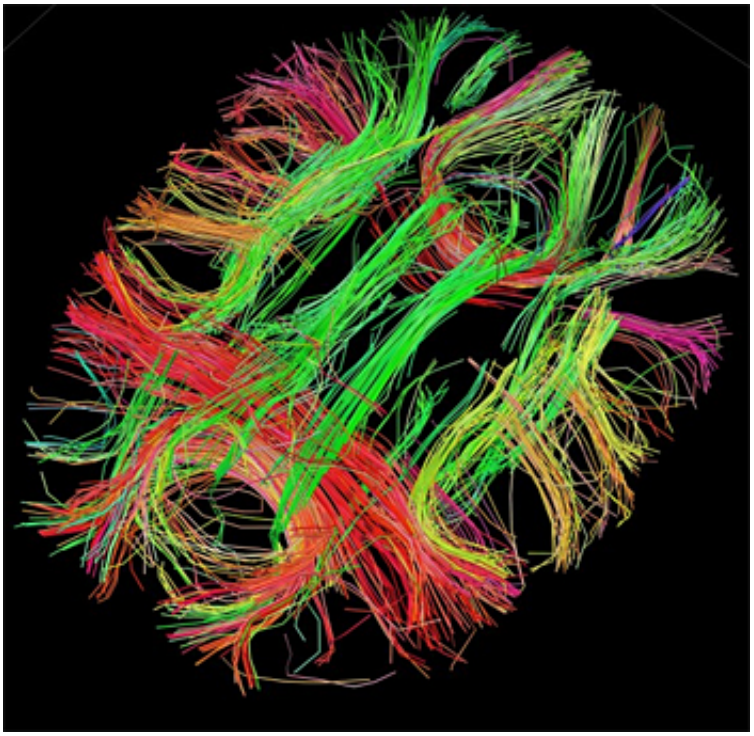

White matter fiber architecture of the brain. Credit: Human Connectome Project.

Well-practiced motor skills like riding a bike are extremely stable memories that can be effortlessly recalled after years or decades. In contrast, a new study publishing in *PLOS Computational Biology* shows that changes to motor skill memories occurring over the course of a single practice session are not immediately stable, according to

researchers Andrew Brennan and Maurice Smith of Harvard University School of Engineering and Applied Science and Center for Brain Science.

We're all familiar with the old saying that you never forget how to ride a bike and perhaps personally familiar with riding off on a bike years after last putting pedals under your feet. This experience highlights the incredible stability possible for motor skill memories, especially those for well-practiced skills. However, the stability of the new motor memories formed on the shorter timescale of a single practice session has been under debate.

One theory maintains there is a bank of intrinsically stable memories that can be laid down in just a few minutes of practice and that are highly specific to the context surrounding the training. An alternative theory maintains that new motor memories are intrinsically somewhat unstable and tend to be applied over a range of different contexts. Such instability could be beneficial in changing environments, such as maintaining one's running stride while muscles fatigue or donning eyeglasses that will soon be removed, especially if the persistence of the memory tends to match the persistence of environmental changes.

This week's study, designed to rigorously examine this question, found strong evidence that recent changes to motor memories are in fact intrinsically unstable and not strongly context dependent, suggesting each memory is applied in a range of contexts and the motor system would thus require fewer distinct memories.

The instability observed in new motor memories stands in stark contrast to the long-term stability of well-practiced skills like riding a bike. This contrast raises the critical question: how can new motor memories eventually become so stable?

More information: Brennan AE, Smith MA (2015) The Decay of Motor Memories Is Independent of Context Change Detection. *PLoS Comput Biol* 11(6):e1004278.DOI: 10.1371/journal.pcbi.1004278