# Neuroscientists find a key to reducing forgetting—it's about the network

29 August 2013

A team of neuroscientists has found a key to the reduction of forgetting. Their findings, which appear in the journal *Neuron*, show that the better the coordination between two regions of the brain, the less likely we are to forget newly obtained information.

The study was conducted at New York University by Lila Davachi, an associate professor in NYU's Department of Psychology and Center for Neural Science, and Kaia Vilberg, now a postdoctoral researcher at the University of Texas' Center for Vital Longevity and School of Behavioral and Brain Sciences in Dallas.

"When memories are supported by greater coordination between different parts of the brain, it's a sign that they are going to last longer," explained Davachi.

It is commonly understood that the key to memory consolidation—the cementing of an experience or information in our brain—is signaling from the brain's hippocampus across different cortical areas . Moreover, it has been hypothesized, but never proven, that the greater the distribution of signaling, the stronger the memory takes hold in our brain.

In the *Neuron* study, Davachi and Vilberg sought to determine if there was scientific support for this theory.

To do so, they examined how memories are formed at their earliest stages through a series of experiments over a three-day period.

On day one of the study, the researchers aimed to encode, or create, new memories among the study's subjects. Here, they showed participants a series of images—objects and outdoor scenes, both of which were paired with words. Here, subjects were asked to form an association between the word and image presented on the screen.

On day two, the subjects returned to the lab and completed another round of encoding tasks using new sets of visuals and words. This allowed to the researchers to compare two types of memory: the more consolidated, long duration (LD) memories encoded on day one with the less consolidated, short duration (SD) memories encoded on day two.

After a short break, participants were placed in an MRI machine—in order to monitor neural activity—and viewed the same visual-word pairings they saw on days one and two as well as a new round of visuals paired with words. They then completed a memory test of approximately half of the visual-word pairings they'd seen thus far. On day three, they returned to the lab for a memory test on the remaining visuals.

By testing over multiple days, the researchers were able to isolate memories that declined or were preserved over time and, with it, better understand the neurological factors that contribute to memory preservation.

Their results showed that memories (i.e., the visual-word associations) that were not forgotten were associated with greater coordination between the hippocampus and left perirhinal cortex (LPRC)—two parts of the brain previously linked with memory formation. By contrast, there was notably less connectivity between these regions for visual-word associations that the study's subjects tended to forget.

Moreover, the researchers found that the coordinated brain activity between the hippocampus and the LPRC—but not overall activity in these regions—was related to memory strengthening, arguing for the network's contribution to memory longevity.

"These findings show the brain strengthens memories by distributing them across networks," explained Davachi. "However, this process takes time. Day-old memories show greater coordinated brain activity compared to recent ones. This suggests that coordinated brain activity increases with time after a memory is initially formed."

Provided by New York University