

You can believe your eyes: New insights into memory without conscious awareness

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(PhysOrg.com) -- Scientists may have discovered a way to glean information about stored memories by tracking patterns of eye movements, even when an individual is unable (or perhaps even unwilling) to report what they remember. The research, published by Cell Press in the September 10th issue of the journal *Neuron*, provides compelling insight into the relationship between activity in the hippocampus, eye movements, and both conscious and unconscious memory.

The hippocampus is a brain region that is critical for conscious recollection of past events but the precise role of this area in memory remains controversial. According to one theory, even if explicit retrieval fails, the hippocampus might still support expressions of relational memory (e.g., memory for the co-occurrence of items in the context of some scene or event) when sensitive, indirect testing methods are used.

To test this theory, Drs. Deborah Hannula and Charan Ranganath, both from the Center for [Neuroscience](#) at the University of California, Davis, used [functional magnetic resonance imaging](#) to examine participants' [brain activity](#) while they attempted to remember previously studied face-scene pairings. During scanning, participants were shown a previously studied scene along with three previously studied faces and were asked to identify the face that had been paired with that scene earlier. [Eye movements](#) were also monitored during the task and provided an indirect measure of memory.

During each test trial, participants frequently spent more time viewing the face that had been previously paired with the scene—an eye-movement-based memory effect. What is more surprising is that hippocampal activity was closely tied to participants' tendency to view the associated face, even when they failed to identify it. Activity in the prefrontal cortex, an area required for decision making, was sensitive to whether or not participants had responded correctly and communication between the prefrontal cortex and the hippocampus was increased during correct, but not incorrect, trials.

The findings may shed light on the role of the hippocampus in memory and awareness, as they suggest that even when people fail to recollect a past event, the hippocampus might still support an expression of memory through eye movements. Furthermore, the results suggest that even when the hippocampus is doing its job, conscious memory may depend on interactions between the hippocampus and the prefrontal cortex.

One implication of the results is that eye movements might be used to indirectly assess memory and hippocampal function in cognitively impaired patients, children, or others who might have difficulty with conventional memory tests. More intriguing is the possibility that these measures might also track [memory](#) in uncooperative individuals. "It is conceivable that eye-tracking could be used to obtain information about past events from participants who are unaware or attempting to withhold information," offers Dr. Hannula. "In other words, there may be circumstances in which eye movements provide a more robust account of past events or experiences than behavioral reports alone."

Source: Cell Press ([news](#) : [web](#))

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