

Reminiscing can help, not hinder, some mind-bending tasks

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To solve a mental puzzle, the brain's executive control network for externally focused, goal-oriented thinking must activate, while the network for internally directed thinking like daydreaming must be turned down to avoid interference – or so we thought.

New research led by Cornell neuroscientist Nathan Spreng shows for the first time that engaging brain areas linked to so-called "off-task" mental activities (such as mind-wandering and reminiscing) can actually boost performance on some challenging mental tasks. The results advance our understanding of how externally and internally focused neural networks interact to facilitate complex thought, the authors say.

"The prevailing view is that activating brain regions referred to as the default network impairs performance on attention-demanding tasks because this network is associated with behaviors such as mind-wandering," said Spreng, assistant professor of human development and the Rebecca Q. and James C. Morgan Sesquicentennial Faculty Fellow in Cornell's College of Human Ecology. "Our study is the first to demonstrate the opposite – that engaging the default network can also improve performance."

The study is the first published research conducted in the new Cornell MRI Facility (CMRIF), Spreng said.

There are plenty of neuroimaging studies showing that default network activation interferes with complex mental tasks – but in most, Spreng

explained, the mental processes associated with default network conflict with task goals. If you start thinking about what you did last weekend while taking notes during a lecture, for example, your note-taking and ability to keep up will suffer.

Spreng and his team developed a new approach in which off-task processes such as reminiscing can support rather than conflict with the aims of the experimental task. Their novel task, "famous faces n-back," tests whether accessing long-term memory about famous people, which typically engages default network brain regions, can support short-term memory performance, which typically engages executive control regions.

While undergoing brain scanning, 36 young adults viewed sets of famous and anonymous faces in sequence and were asked to identify whether the current face matched the one presented two faces back. The team found participants were faster and more accurate when matching famous faces than when matching anonymous faces and that this better short-term memory performance was associated with greater activity in the default network. The results show that activity in the default [brain regions](#) can support performance on goal-directed tasks when task demands align with processes supported by the default network, the authors say.

"Outside the laboratory, pursuing goals involves processing information filled with personal meaning – knowledge about past experiences, motivations, future plans and social context," Spreng said. "Our study suggests that the [default network](#) and executive control networks dynamically interact to facilitate an ongoing dialogue between the pursuit of external goals and internal meaning."

More information: "Goal-Congruent Default Network Activity Facilitates Cognitive Control." *Journal of Neuroscience*, 15 October 2014, 34(42):14108-14114; www.jneurosci.org/content/34/42/14108.full

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