Cognitive training helps regain a younger-working brain

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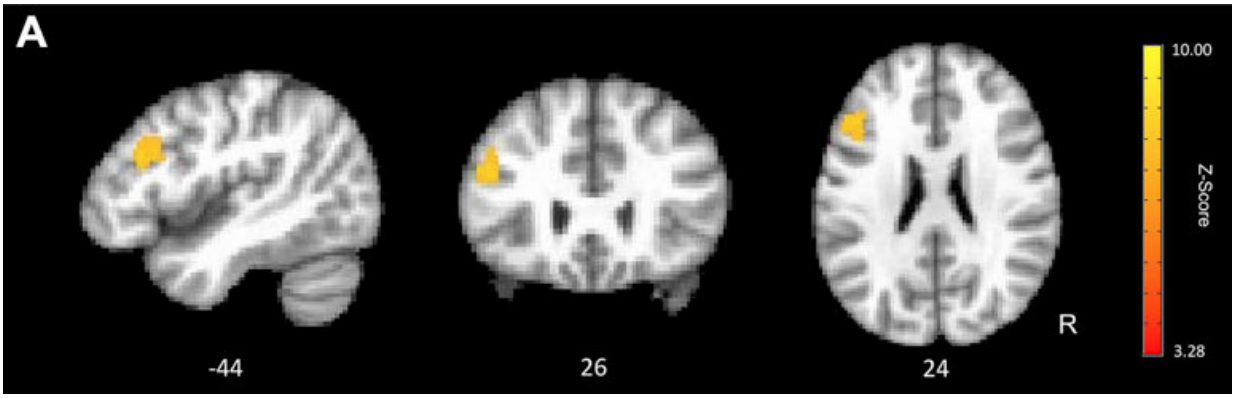

Brain imaging revealed more energy efficient brains in the cognitive training group compared to the exercise and waitlist control groups. Credit: Michael A. Motes, et. al., *Neurobiology of Aging*, 2018

Relentless cognitive decline as we age is worrisome, and it is widely thought to be an unavoidable negative aspect of normal aging. Researchers at the Center for BrainHealth at The University of Texas at Dallas, however, say their research could provide new hope for extending our brain function as we age.

In a randomized clinical study involving adults age 56 to 71 that recently published in *Neurobiology of Aging*, researchers found that after cognitive training, participants' brains were more energy efficient, meaning their brain did not have to work as hard to perform a task.

Dr. Michael Motes, senior research scientist at the Center for BrainHealth and one of the lead authors of the study, said, "Finding a nonpharmacological intervention that can help the aging brain to perform like a younger brain is a welcome finding that potentially advances understanding of ways to enhance brain health and longevity. It is thrilling for me as a cognitive neuroscientist, who has previously studied age-related cognitive decline, to find that cognitive training has the potential to strengthen the aging brain to function more like a younger brain."

To investigate changes in brain efficiency, the research team studied neural activity while the participant performed a task. For the study, 57 cognitively normal older adults were randomly assigned to a cognitive training group, a wait-listed control group, or physical exercise control group. The cognitive training utilized the Strategic Memory Advanced Reasoning Training (SMART) program developed at the Center for BrainHealth.

Cognitive training strategies included how to focus on the most relevant information and filter out the less relevant; ways to continually synthesize information encountered in daily life to encourage deeper thinking; and how to inspire innovative thinking through generating diverse interpretations, solutions and perspectives. Because aerobic exercise has been shown to lead to improvements in processing speed and functional changes within the frontal and other brain regions, it was included as one of the study groups.

The cognitive training was conducted over the course of 12 weeks. Participants in the active control physical exercise program exceeded physical activity guidelines of 150 minutes per week for the 12 weeks.

Using functional magnetic resonance imaging (fMRI), an imaging technique that measures brain activity, researchers examined all three

groups at the beginning (baseline), middle, and end of the study while participants performed computer-based speed tasks in the scanner.

The fMRI results provided evidence that cognitive training improved speed-related neural activity. While all groups showed faster reaction times across sessions, the cognitive training group showed a significant increase in the association between reaction time and frontal lobe activity. After training, faster reaction times were associated with lower frontal lobe activity, which is consistent with the more energy-efficient neural activity found in younger adults.

In contrast to the cognitive training group, the wait-listed and physical exercise groups showed significant decreases across sessions in the association between reaction time and frontal lobe activation.

"This discovery of neural efficiency profiles found in the SMART-trained older adults is promising," said Dr. Sandra Bond Chapman, one of the lead authors, Center for BrainHealth founder and chief director. "If replicated, this work paves the way for larger clinical trials to test the ability to harness the potential of the aging mind and its ability to excel - by working like a younger brain with all the rich knowledge and expertise accrued over time. To counteract the pattern of age-related losses and even enhance the brain's inner workings by 'thinking' in smarter ways is an achievable and highly desirable goal."

More information: Michael A. Motes et al, Higher-order cognitive training effects on processing speed–related neural activity: a randomized trial, *Neurobiology of Aging* (2017). DOI: 10.1016/j.neurobiolaging.2017.10.003

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