

Exercise benefits the brain, but improving its blood vessels may take longer

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People with less consistent brain blood flow patterns may be at greater risk of dementia and cerebrovascular disease. To explore whether regular aerobic exercise can help, researchers at Iowa State University

have conducted a pilot study, the results of which were recently [published](#) in the *Journal of Applied Physiology*.

"The big take-away is that exercise is good for the arteries and brain, but its effects are complex and takes time to accumulate benefits," said Wes Lefferts, lead author and an assistant professor of kinesiology.

Lefferts studies large artery stiffness and [brain blood flow](#) in middle-aged adults and how these affect heart and brain health later in life.

He said participants in the pilot study's exercise group showed improvements in cognitive function and VO_2 peak—a measure of aerobic fitness and how much oxygen the body can use during exercise. But to the researchers' surprise, inconsistent brain blood flow increased among participants in the exercise group. Although not statistically significant, Lefferts said this finding was in line with other recent studies.

"The brain's vasculature may take longer to adapt to exercise training than the heart and central vasculature, like the aorta," said Lefferts, adding that other studies with year-long exercise training have found improvements in continuous blood flow to the brain.

More information about the pilot study

The Iowa State pilot study included 28 participants between 40 and 64 years of age. All were considered inactive and had elevated [blood pressure](#) or stage 1 hypertension.

Nineteen were randomly assigned to supervised aerobic exercise training three times per week for 12 weeks. Participants wore a heart rate monitor that synced with their exercise machine and automatically adjusted the speed, grade or resistance to keep their heart rate within the

range prescribed for that session.

Participants, including those in the no-exercise control group, were expected to maintain their physical and dietary lifestyle.

The researchers measured blood flow pulsatility with noninvasive Doppler ultrasound and tonometry, which measures pressure inside the eyes, at the start, mid-point and end of the pilot study. Cardiorespiratory fitness and cognitive performance on three tests were collected at the start and end of the trial.

Lefferts said the tasks pertained to "memory and executive function, which are most impacted by aging and cognitive disease."

Specific findings

- VO_2 peak increased 6% in the aerobic exercise training group and decreased 4% in the control group.
- Cerebral pulsatility tended to increase in the aerobic exercise training group.
- Working memory reaction time improved with [aerobic exercise](#) training but not in the control.

Marian Kohut, the Barbara E. Forker Professor in kinesiology; Angelique Brellenthin, assistant professor of kinesiology; graduate students Krista Reed and Quinn Keleher and undergraduate student Abby Frescoln co-authored the paper.

Lefferts said the research team is interested in replicating and expanding the [pilot study](#), but with a focus on women experiencing menopause.

"There's data to suggest that the vascular benefits of exercise are reduced after women go through menopause, but we have no idea what happens

with the cerebral vasculature and the [potential benefits](#) for the brain," said Lefferts.

By understanding the effects and limits of exercise and the underlying vascular mechanisms of dementia and [cerebrovascular disease](#), the researchers hope to shed light on behavioral interventions that could improve health outcomes and quality of life.

More information: Krista S. Reed et al, Effects of Aerobic Exercise Training on Cerebral Pulsatile Hemodynamics in Middle-aged Adults with Elevated Blood Pressure/Stage-1 Hypertension, *Journal of Applied Physiology* (2024). [DOI: 10.1152/jappphysiol.00689.2023](https://doi.org/10.1152/jappphysiol.00689.2023)

Provided by Iowa State University

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