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Study shows importance of exercise for those at special risk for Alzheimer's

Participants included individuals who carry a high-risk gene

Physical activity promotes changes in the brain that may protect high-risk individuals against cognitive decline, including development of Alzheimer's disease, according to a new study done at the University of Wisconsin-Milwaukee (UWM).

J. Carson Smith, an assistant professor of health sciences, included in the study both people who carry a high-risk gene for Alzheimer's disease, and other healthy older adults without the gene.

"Our study suggests that if you are at genetic risk for Alzheimer's disease, the benefits of exercise to your brain function might be even greater than for those who do not have that genetic risk," says Smith.

While evidence already shows that physical activity is associated with maintenance of cognitive function across a life span, most of this research has been done with healthy people, without any consideration of their level of risk for Alzheimer's, says Smith.

A team of researchers compared brain activation during memory processing in four separate groups of healthy 65- to 85-years-olds. The level of risk was defined by whether an individual carried the apolipoprotein E-epsilon4 (APOE-ε4) allele. Physical activity status was defined by how much and how often the participants reported physical activity (PA). The study divided subjects into Low Risk/Low PA, Low Risk/High PA, High Risk/Low PA and High Risk/High PA.

Functional magnetic resonance imaging (fMRI) was used to measure brain activation of participants while they performed a mental task involving discriminating among famous people. This test is very useful, says Smith, because it engages a wide network called the semantic memory system, with activation occurring in 15 different functional regions of the brain.

"When a person thinks about people – for example, Frank Sinatra or Lady Gaga – that involves several lobes of the brain," explains Smith.

In the study groups of those carrying the gene, individuals who exercised showed greater brain activity in memory-related regions than those who were sedentary.

Perhaps even more intriguing, physically active people with the gene had greater brain activity than those who were physically active but not gene carriers.

There are many physiological reasons why this could be happening, Smith says. "For example, people with this increased activation might be compensating for some underlying neurological event that is involved in cognitive decline." "Using more areas of their brain may serve as a protective function, even in the face of disease processes."

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The study's collaborating institutions include the Cleveland Clinic, Marquette University, Wayne State University and Rosalind Franklin University of Medicine and Science. It was funded by the National Institutes of Health and the National Institute on Aging.

The study will be published in Vol. 54 (January 2011) of the journal *NeuroImage*, but is now available online.

Smith's current research builds on this study. He and his team are conducting a new study testing the before-and-after effects of a structured exercise program on brain function. The study includes patients diagnosed with mild cognitive impairment or early Alzheimer's disease, as well as a healthy control group.

For more information on this ongoing study, visit <http://www.exerciseforbrainhealth.com/>.