

Alzheimer's gene may show effects on brain starting in childhood

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A gene associated with Alzheimer's disease and recovery after brain injury may show its effects on the brain and thinking skills as early as childhood, according to a study published in the July 13, 2016, online issue of *Neurology*, the medical journal of the American Academy of Neurology.

Prior studies showed that people with the epsilon(ϵ)4 variant of the apolipoprotein-E gene are more likely to develop Alzheimer's disease than people with the other two variants of the gene, ϵ 2 and ϵ 3.

"Studying these [genes](#) in young [children](#) may ultimately give us early indications of who may be at risk for dementia in the future and possibly even help us develop ways to prevent the disease from occurring or to delay the start of the disease," said study author Linda Chang, MD, of the University of Hawaii in Honolulu and a Fellow of the American Academy of Neurology.

For the study, 1,187 children ages three to 20 years had genetic tests and [brain](#) scans and took tests of thinking and memory skills. The children had no brain disorders or other problems that would affect their [brain development](#), such as prenatal drug exposure.

Each person receives one copy of the gene (ϵ 2, ϵ 3 or ϵ 4) from each parent, so there are six possible gene variants: ϵ 2 ϵ 2, ϵ 3 ϵ 3, ϵ 4 ϵ 4, ϵ 2 ϵ 3, ϵ 2 ϵ 4 and ϵ 3 ϵ 4.

The study found that children with any form of the $\epsilon 4$ gene had differences in their brain development compared to children with $\epsilon 2$ and $\epsilon 3$ forms of the gene. The differences were seen in areas of the brain that are often affected by Alzheimer's disease.

In children with the $\epsilon 2\epsilon 4$ genotype, the size of the hippocampus, a brain region that plays a role in memory, was approximately 5 percent smaller than the hippocampi in the children with the most common genotype ($\epsilon 3\epsilon 3$). Children younger than 8 and with the $\epsilon 4\epsilon 4$ genotype typically had lower measures on a brain scan that shows the structural integrity of the hippocampus.

"These findings mirror the smaller volumes and steeper decline of the hippocampus volume in the elderly who have the $\epsilon 4$ gene," Chang said.

In addition, some of the children with $\epsilon 4\epsilon 4$ or $\epsilon 4\epsilon 2$ genotype also had lower scores on some of the tests of memory and [thinking skills](#). Specifically, the youngest $\epsilon 4\epsilon 4$ children had up to 50 percent lower scores on tests of executive function and working memory, while some of the youngest $\epsilon 2\epsilon 4$ children had up to 50 percent lower scores on tests of attention. However, children older than 8 with these two genotypes had similar and normal test scores compared to the other children.

Limitations of the study include that it was cross-sectional, meaning that the information is from one point in time for each child, and that some of the rarer gene variants, such as $\epsilon 4\epsilon 4$ and $\epsilon 2\epsilon 4$, and age groups did not include many children.

Provided by American Academy of Neurology

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