New test may detect who is most at risk for Alzheimer's

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Dr. John Hart Jr. (left) and Dr. Hsueh-Sheng Chiang (right), with researchers Drs. Jeremy Strain and Neena Rao, led the study on a new non-invasive test for Alzheimer's disease.

Researchers at Center for BrainHealth at UT Dallas have developed a test that may help detect who is at risk for Alzheimer's disease.

In a study published in the *Journal of Alzheimer's Disease*, scientists found that individuals with amnestic mild cognitive impairment (aMCI) have twice the risk of others in their age group of progressing to Alzheimer's after identifying a specific variation in their brain waves.

The test uses electroencephalogram (EEG) technology, a more affordable and non-invasive alternative compared to other methods, to measure neural responses, while participants access their semantic memory—long-term memory that represents general knowledge and concepts. The findings reveal a pattern of delayed neural activity that is directly related to the severity of cognitive impairment during a word task and may indicate an early progression to Alzheimer's.

"This is a promising start at looking at a group of MCI patients. The long-term goal is whether this can be applied to individual patients one day," said study principal investigator Dr. John Hart Jr., Medical Science Director at the Center for BrainHealth and Distinguished Chair in Neuroscience and the Jane and Bud Smith Distinguished Chair.

Impaired episodic memory, the ability to retain new memories such as recent conversations, events or upcoming appointments, is a hallmark symptom of Alzheimer's. While mild cognitive impairment (MCI) is the state between healthy aging and Alzheimer's, aMCI is a specific type characterized by deficits in episodic memory.

In the study, individuals with aMCI were less accurate and slower on the semantic memory task than other participants. EEG results showed delayed brain activity during the task. In the episodic memory evaluation, researchers found that the worse the performance, the greater the delayed brain activity.

For the study, 16 individuals with aMCI and 17 age-matched healthy controls were monitored by EEG and presented with pairs of words that either described features of an object or were randomly paired. For example, "humps" and "desert" would evoke the memory of the word "camel," but "humps" and "monitor" would be considered a random pair. Participants were then asked to indicate whether the pair conjured any particular object memory.

"The majority of EEG research in aMCI has focused on looking at the mind 'at rest,' but we are looking at the brain while it is engaged in the object memory retrieval process. We think this might be more sensitive and more specific in pointing out certain cognitive deficits, in this case semantic memory, than other non-EEG methods available, because EEG reflects direct neural activity," said study lead author Dr. Hsueh-Sheng Chiang, a

postdoctoral fellow at UT Southwestern Medical Center who was a research doctoral student at the Center for BrainHealth at the time of the study.

"This protocol could potentially provide complementary information for diagnosis of pre-dementia stages including MCI and identify neural changes that can occur in cases of Alzheimer's disease," he said.

Chiang and Hart will continue to develop this prospective diagnostic tool.

More information: "Altered Neural Activity during Semantic Object Memory Retrieval in Amnestic Mild Cognitive Impairment as Measured by Event-Related Potentials." *Journal of Alzheimer's Disease*, vol. 46, no. 3, pp. 703-717, 2015 DOI: 10.3233/JAD-142781

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