Photo by Lawrence Lerner

Rutgers-Newark Neuroscientist Devises Test to Catch Alzheimer's Symptoms Early

By Lawrence Lerner

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A Rutgers University–Newark neuroscientist may be onto a fast, inexpensive and noninvasive way to identify whether people are likely to contract Alzheimer's long before significant symptoms emerge, adding to medical science's ability to intervene early in the disease.

Professor Mark Gluck, who has been studying Alzheimer's disease (AD) and other memory disorders for decades, has seen how standard memory tests confirm deficits in patients already diagnosed with the condition by measuring their explicit recall of previously memorized facts and events.

But for those who show early symptoms—or are asymptomatic but genetically predisposed because Alzheimer's runs in the family—Gluck has been developing test methods based on something more nuanced: generalization, or people's ability to apply previously learned rules to novel tasks and new combinations of stimuli.

"Years before people exhibit the more obvious memory deficits associated with Alzheimer's diagnoses, the ability to learn new rules and associations becomes 'rigid' as people lose the ability to 'flexibly' apply what they have learned to novel situations, even though they can still explicitly recall previously learned facts and events," says Gluck.

So, he and a colleague at RU-N's Center for Molecular Biology and Neuroscience (CMBN) devised what they call the Rutgers Generalization Tasks, two innovative cognitive assessments sensitive enough to identify generalization deficits with patients showing Mild Cognitive Impairment (MCI) or the earliest signs of Alzheimer's-related symptoms, known as prodromal AD. Not surprisingly, these assessments reveal deficits before they're apparent on standard memory tests.

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Recently, Gluck and John Ringman, of the USC Alzheimer's Disease Research Center in Los Angeles, took it a step further, demonstrating the Rutgers Generalization Tasks' effectiveness with a different population: preclinical Familial, or Autosomal Dominant, AD (ADAD) mutation carriers, which are people who have a family history of the disease and carry the Alzheimer's gene but are asymptomatic.

"These individuals are essentially certain to develop the disease, providing a unique opportunity to examine biomarkers during preclinical AD," says Gluck. "We compared preclinical individuals carrying ADAD genetic mutations to non-carrying kin. And as we predicted, preclinical ADAD mutation carriers made significantly more errors during generalization [tests] than non-carrying kin, despite no differences between groups during learning or retention."

Gluck and Ringman recently published a paper outlining their findings in the journal *Neurobiology of Aging*, and the results are promising. Gluck says the earlier clinicians can detect deficits, the better they can measure patients' changes over time. And this can directly benefit the evaluation of new drugs that can halt or delay the onset of Alzheimer's long before it causes widespread and irreversible brain damage.

Statistics also explain the urgency.

According to the National Institute on Aging, Alzheimer's is currently ranked as the sixth leading cause of death in the United States, and may rank third, just behind heart disease and cancer, as a cause of death for older people. More than 5 million Americans may suffer from the disorder, while approximately 200,000 Americans under the age of 65 have early-onset Alzheimer's. Alzheimer's is the most common form of dementia, accounting for 60 to 80 percent of dementia cases.

"This is significant to say the least, since it offers an inexpensive and easily implementable way to identify and track cognitive changes in early prodromal AD, which could be useful for Alzheimer's drug discovery," says Gluck.