Dementia is a devastating condition for which there is currently no cure. But catching it early can improve prognoses.

EYE-TRACKING APP MAY SPEED UP DEMENTIA DIAGNOSIS

A promising new technology makes it easier to **DIAGNOSE DEMENTIA EARLIER**, when a diagnosis can really make a difference.

One of the greatest challenges of this century is dementia, a condition with a range of causes, which irretrievably ravages the brain and lacks a cure. It currently afflicts up to 50 million people globally — a number that may triple by 2050.

Dementia is currently the seventh leading cause of death in the world (the second in high-income countries), and its death rates are projected to continue to climb. The costs to individuals, families and society are already immense, with dementia care estimated to account for more than 1% of global GDP.

In response to this global crisis, a team from Ai-BrainScience, a company supported by Osaka University, Japan, has developed an innovative technology that promises to help streamline the difficult and costly process of diagnosis. It may also enable patients and doctors to alter the progression of the disease early on.

The precise course of dementia can be hard to predict for any individual. It may take a few months or many years to change a life, but when it does the impact is usually stark. Dementia typically degrades a person's ability to manage their life, and even recognize their loved ones.

More than half of people with dementia worldwide are never diagnosed. And for those who are, it often comes too late to improve their prognosis. According to one study, one in three patients died within a year of their first hospitalization or clinic visit for dementia. Despite these grim statistics, recent research has shown that early diagnosis and intervention can significantly impact the progression of the disease.

A new diagnostic tool developed by Ai-BrainScience, based on research conducted at Osaka University, promises to markedly change the landscape of early dementia detection. The novel eye-tracking technology can screen patients for dementia in a low-cost, low-stress process, in a matter of minutes.

CURRENT DIAGNOSIS

Dementia is currently diagnosed via a series of question-and-answer tests. Known as the Mini-Mental State Examination (MMSE), the screening test evaluates a patient's short-term memory, language ability, attention, and orientation to time and location. It does this by asking the patient to memorize objects, compose short sentences, identify the c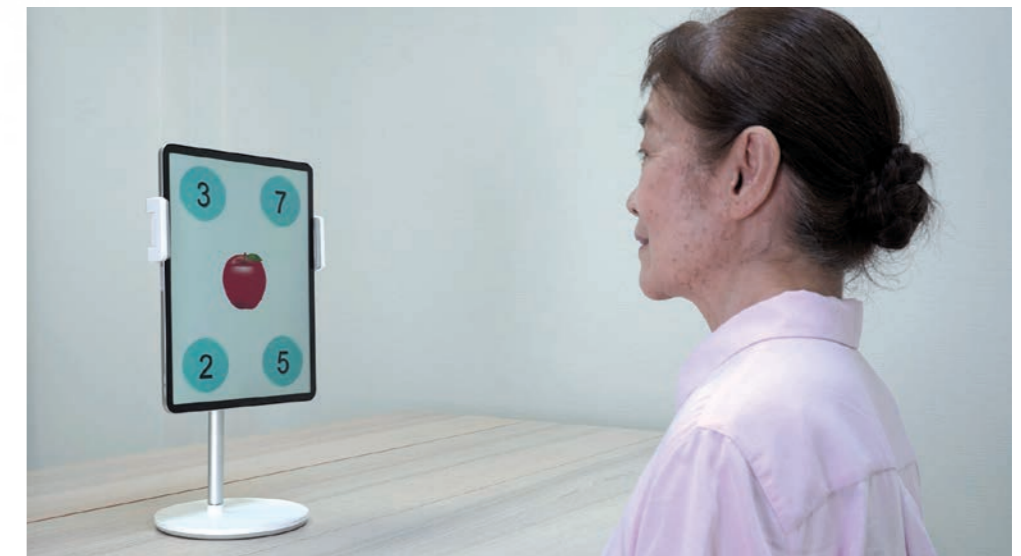urrent date and other markers of the present moment. Alzheimer's Disease Assessment Scale-cognitive subscale (ADAS-Cog) and the Frontal Assessment Battery need to be administered to evaluate the severity of dementia. In ADAS-Cog, patients are asked to recognize and recall words, name objects, follow commands and perform other tasks.

In worldwide use for more than two decades, tests like MMSE have demonstrated reliable sensitivity to cognitive impairment. But they have significant drawbacks too. They should be administered by a doctor and other medical professional who has been specifically trained. MMSE can take 15–20 minutes, and potentially much longer, to complete. ADAS-Cog takes 45 minutes or more.

With dementia, the challenges of testing are compounded by the nature of the population being tested. People suffering from cognitive impairment can struggle to understand questions and may hesitate to answer, and the person administering the test may be required to repeat questions over and over, all of which extends the time taken.

Assessment can be impacted by qualitative factors, such as determining whether the struggle to understand a question is affected by cognitive impairment or by some other challenge, such as hearing difficulties. The proficiency of the tester may vary across settings, leading to inaccurate diagnoses and missed opportunities to provide treatment.

Compounding the situation is the fact that ageing patients often enter cognitive tests with trepidation, conscious that their results may bring dire news. Being placed in a situation where they must repeatedly admit that they're not sure what a question means can compound distress and negatively affect performance. There are many anecdotal reports of patients becoming too upset to finish a test.

THE EYE-TRACKING TEST ONLY TAKES THREE MINUTES TO ADMINISTER, AND IT PROVIDES AN OBJECTIVE ASSESSMENT

A SIMPLER WAY

The simple app for assisting the diagnosis of dementia from Ai-BrainScience eliminates these issues[1]. Patients are shown a set of images on a screen (the app can be installed on a tablet). Questions are displayed on the screen, and instead of having to speak, patients are merely asked to focus their gaze on the correct image.

The questions measure core symptoms, including impairment of short-term memory, language ability, attention and orientation to time and place. But with this method, the patient's eye movements are tracked — and the duration of their fixation on either the correct image or the distractor is measured. If subjects do not focus on a particular image, the app measures their gaze as hesitation.

Critically, the eye-tracking test only takes three minutes to administer, and it provides an objective assessment, unaffected by the skill of the person administering the test. Also, the technology is designed to place less stress on patients than a conventional test. Practitioners don't need training or medical degrees to deliver the eye-tracking test, so testing for dementia is much cheaper and easier to provide. Crucially, it will be scalable with increasing demand, allowing health systems to better serve undiagnosed but dementia-affected people.

Accurate and early detection of dementia using the eye-tracking tool will allow more patients to make lifestyle changes that support dementia management and access pharmaceutical treatments, such as cholinesterase inhibitors, where appropriate.

Dementia may result from different diseases, including Alzheimer's disease or dementia with Lewy bodies, with varying treatments. The app is at an early stage of development and the company is currently applying for medical device approval in Japan. Ai-BrainScience researchers are now developing their testing app using machine learning so that it can provide reliable information about dementia and about its specific cause. This will enable patients to access the most suitable treatment sooner. ■

REFERENCE
1. Oyama, A. *et al. Sci. Rep.* **9,** 12932 (2019).

Ai-BrainScience

www.ai-brainscience.co.jp/en/

Naeblys/iStock/Getty

▲ To use a new app for diagnosing dementia, a patient simply needs to move their gaze to select an answer, making it quicker, easier and less stressful than existing tests.