This New Technology Is an Early Warning System for Disease

Your path through life is largely set by a small number of facts and choices, which control virtually every aspect of our lives. These change with age. Our ultimate looks, intelligence and physiology are largely established before primary school. As young adults, we have a choice of partner, home and career. But as we enter old age, our health is typically the most important issue.

Because we're all living longer, mental capacity is becoming an ever-more important consideration. Neurodegenerative diseases are a huge global problem – and they're likely to grow in importance, as we all tend to live longer. A cure may elude us – but at least early diagnosis would give people the freedom to plan.

At present, by the time most people are diagnosed with a neurodegenerative illness, they're already suffering significant cognitive problems. This means that they may not have much healthy time left – and any opportunity for early treatment may have been lost. Furthermore, by the time of diagnosis, cognitive problems may already be so advanced that people can no longer make plans for their final years. This denies them opportunities like taking early retirement, saving for care, or completing their "bucket list".

For me, this is a very personal issue. My DNA test shows that I'm at increased risk from Alzheimer's disease. However, a risk isn't a diagnosis – and if I want to find if I'm personally affected, then I'll have to get tested. Common tests rely on either expensive brain scans, or on time-consuming cognitive tests. Accordingly, the early stages of mental decline are often missed.

Last week, we looked in depth at a range of digital technologies that can help diagnose neurodegenerative diseases. Today, we'll take a deep dive – and I'll meet a man who is attempting to revolutionise the process of early diagnosis. I'll hand you over to Mikhail Yanchikov, founder and CEO of EyeMove.

AL: Just for a bit of context: how big a problem are neurodegenerative diseases?

MY: Dementia is one of the main causes of disability and dependency among elderly people in the world. There are 28m people living with diagnosed Alzheimer's, and 6m with Parkinson's disease. For dementia, the total is 47.5m people. This problem is global now, and will worsen in future, as life expectancies increase.

AL: Your fundamental idea will surprise most people. Can you give a quick summary?

MY: EyeMove reveals the signs of neurological diseases by analysing eye movement. It is a qualitatively new product, based on machine learning and artificial intelligence (AI). We measure variables such as micro-motion and speed of reaction, to identify the first signs of disease. It is important that our project solves the problem of diagnosing diseases of the central nervous system at the early stage, when a person can still be helped.

AL: What got you interested in doing this?

MY: My grandmother was ill with Alzheimer's. At first, everyone began to notice that she forgets little things – such as where she put her glasses. It seemed that this was just normal ageing. But over time the condition worsened. She eventually stopped recognising me, and her emotional state changed a lot. The diagnosis was made at a late stage, when it was already impossible to help her by halting the development of the disease. It's painful to see when this happens to a person close to you.

AL: That must have been traumatic; I can certainly see the motivation. Can you please step me through how your tests are carried out?

MY: We use an ordinary mobile phone app, and the on-board camera. EyeMove uses AI to identify and measure the , eye and pupil. During operation, the person begins to follow the stimuli-points that appear on the screen. At this time, the camera records the trajectory of eye motion. It determines micro-motion (saccades), the response time of each eye – and so on. It takes just a few minutes to collect enough information for diagnosis.

AL: That's a very radical idea. How far have you got, at present?

MY: We have a prototype, and we are looking for investors for product development. We need to make improvements to our

algorithms, and then launch our website and app publicly.

AL: Can you explain how you do this diagnosis, with just a mobile phone?

MY: We are developing a mobile application for iPhone 6, and newer. The main hardware requirement is a camera capable of 240 frames-per-second video. This means we have access to very precise timing – around 4 thousandths of a second. It's this which enables people to do the diagnostics at home.

AL: How do you know the results are reliable?

MY: More than 30 years of scientific research has gone into the analysis of eye movement. For the standard procedure, the patient wears a helmet with mounted cameras. They then react to specific visual stimuli. All the necessary clinical trials for this approach have already been carried out. Our idea is simply to make this existing technique available far more widely, by using mobile phone hardware.

AL: Is it dangerous to diagnose these diseases, without giving people the support that's normally available?

MY: If negative symptoms are detected, we directly connect the user with a doctor, for a detailed examination and further consultations. In Russia we have an agreement with the scientific research Institute of Psychology of the Russian Academy of Sciences.

AL: What other companies are working in this area? What are their approaches, and how successful are they?

MY: At the moment there is no direct analogue to diagnosis by eye movement. Other, similar projects appear not to be proceeding commercially. However, there are contrasting approaches. Nerotra?k analyses short-term memory, not eye movements. This test is specific to Alzheimer's disease, whereas our solution allows us to diagnose more than ten diseases.

There are also several methods for early diagnosis of Alzheimer's and Parkinson's, which are based on a comprehensive examination in the hospital. Unfortunately, they are inaccessible to most people, and are very expensive. As a result, many people don't get the help they need. Our product offers diagnosis that's discrete, convenient and at an affordable price – as it requires only a mobile phone.

Some conventional hospital diagnostics are not only relatively expensive, but they also confer significant risks. Patients may be exposed to a strong magnetic field (for MRI) – and this makes the tests unsuitable for people with certain surgical implants. Other approaches may be invasive – such as requiring injections (for PET) or tissue samples (CSF analysis for beta amyloid and tau protein).

AL: What are your future plans?

MY: The near-term goals of the project are to start a website and a mobile application. In future, we plan to make our technology work in virtual reality (VR) helmets with cameras (such as those made by Fove). In addition, in 2018 we will start working on a smart mirror, this will enable us to conduct daily monitoring – giving the earliest possible diagnosis.

Would you like to know whether you have a neurodegenerative disease – or would you rather be blissfully ignorant? andrew@southbankresearch.com.

Best,

Andrew Lockley
Exponential Investor