'Brain training' app may improve memory and daily functioning of people with schizophrenia

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These are screenshots of the Cambridge Advanced Training Programme, based on the Wizard game. Credit: Peak

A 'brain training' iPad game developed and tested by researchers at the University of Cambridge may improve the memory of patients with

schizophrenia, helping them in their daily lives at work and living independently, according to research published today.

Schizophrenia is a long-term mental health condition that causes a range of psychological symptoms, ranging from changes in behaviour through to hallucinations and delusions. Psychotic symptoms are reasonably well treated by current medications; however, patients are still left with debilitating cognitive impairments, including in their memory, and so are frequently unable to return to university or work.

There are as yet no licensed pharmaceutical treatments to improve cognitive functions for people with schizophrenia. However, there is increasing evidence that computer-assisted training and rehabilitation can help people with schizophrenia overcome some of their symptoms, with better outcomes in daily functioning and their lives.

Schizophrenia is estimated to cost £13.1 billion per year in total in the UK, so even small improvements in cognitive functions could help patients make the transition to independent living and working and could therefore substantially reduce direct and indirect costs, besides improving the wellbeing and health of patients.

In a study published today in the *Philosophical Transactions of the Royal Society B*, a team of researchers led by Professor Barbara Sahakian from the Department of Psychiatry at Cambridge describe how they developed and tested Wizard, an iPad game aimed at improving an individual's episodic memory. Episodic memory is the type of memory required when you have to remember where you parked your car in a multi-storey car park after going shopping for several hours or where you left your keys in home several hours ago, for example. It is one of the facets of cognitive functioning to be affected in patients with schizophrenia.

The game, Wizard, was the result of a nine-month collaboration between psychologists, neuroscientists, a professional game-developer and people with schizophrenia. It was intended to be fun, attention-grabbing, motivating and easy to understand, whilst at the same time improving the player's episodic memory. The memory task was woven into a narrative in which the player was allowed to choose their own character and name; the game rewarded progress with additional in-game activities to provide the user with a sense of progression independent of the cognitive training process.

The researchers assigned twenty-two participants, who had been given a diagnosis of schizophrenia, to either the cognitive training group or a control group at random. Participants in the training group played the memory game for a total of eight hours over a four-week period; participants in the control group continued their treatment as usual. At the end of the four weeks, the researchers tested all participants' episodic memory using the Cambridge Neuropsychological Test Automated Battery (CANTAB) PAL, as well as their level of enjoyment and motivation, and their score on the Global Assessment of Functioning (GAF) scale, which doctors use to rate the social, occupational, and psychological functioning of adults.

Professor Sahakian and colleagues found that the patients who had played the memory game made significantly fewer errors and needed significantly fewer attempts to remember the location of different patterns in the CANTAB PAL test relative to the control group. In addition, patients in the cognitive training group saw an increase in their score on the GAF scale.

Participants in the cognitive training group indicated that they enjoyed the game and were motivated to continue playing across the eight hours of cognitive training. In fact, the researchers found that those who were most motivated also performed best at the game. This is important, as

lack of motivation is another common facet of schizophrenia.

Professor Sahakian says: "We need a way of treating the cognitive symptoms of schizophrenia, such as problems with episodic memory, but slow progress is being made towards developing a drug treatment. So this proof-of-concept study is important because it demonstrates that the memory game can help where drugs have so far failed. Because the game is interesting, even those patients with a general lack of motivation are spurred on to continue the training."

Professor Peter Jones adds: "These are promising results and suggest that there may be the potential to use game apps to not only improve a patient's episodic memory, but also their functioning in activities of daily living. We will need to carry out further studies with larger sample sizes to confirm the current findings, but we hope that, used in conjunction with medication and current psychological therapies, this could help people with schizophrenia minimise the impact of their illness on everyday life."

It is not clear exactly how the apps also improved the patients' daily functioning, but the researchers suggest it may be because improvements in memory had a direct impact on global functions or that the cognitive training may have had an indirect impact on functionality by improving general motivation and restoring self-esteem. Or indeed, both these explanations may have played a role in terms of the impact of training on functional outcome.

In April 2015, Professor Sahakian and colleagues began a collaboration with the team behind the popular brain training app Peak to produce scientifically-tested cognitive training modules. The collaboration has resulted in the launch today of the Cambridge University & Peak Advanced Training Plan a memory game, available within Peak's iOS app, designed to train visual and episodic memory while promoting

learning.

The training module is based on the Wizard memory game, developed by Professor Sahakian and colleague Tom Piercy at the Department of Psychiatry at the University of Cambridge. Rights to the Wizard game were licensed to Peak by Cambridge Enterprise, the University's commercialisation company.

"This new app will allow the Wizard memory game to become widely available, inexpensively. State-of-the-art neuroscience at the University of Cambridge, combined with the innovative approach at Peak, will help bring the games industry to a new level and promote the benefits of cognitive enhancement," says Professor Sahakian.

The game is built for four weeks of training and is priced at $14.99 / £10.99.

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