Responsive brain stimulation could improve life for Parkinson's sufferers

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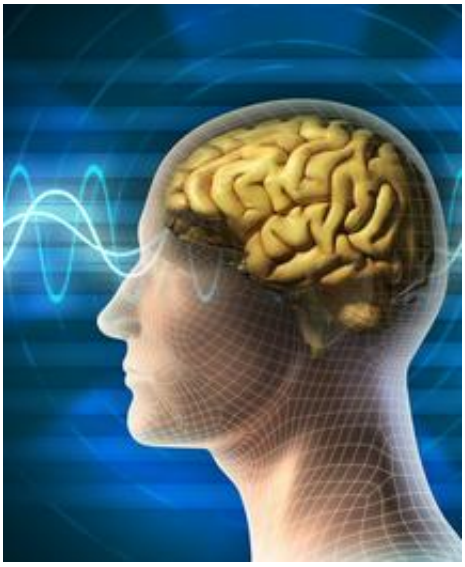

The new system cancels out Parkinson's-related brainwaves only when needed.

(Medical Xpress)—Researchers in Oxford have demonstrated a significant improvement in the treatment of advanced Parkinson's disease with deep brain stimulation.

Deep brain stimulation involves permanently inserting electrodes into the brain to deliver electrical impulses that cancel out the brain signals causing symptoms of Parkinson's.

The new 'adaptive' system, successfully trialled by a Oxford University

team based at the John Radcliffe Hospital, only delivers electrical stimulation when it detects the brainwaves responsible for causing the symptoms.

This is a significant refinement – present systems deliver continuous electrical stimulation to the brain.

The personalised system, which actively detects and responds to a patient's brainwaves using a brain-computer interface, proved more effective than conventional stimulation. By using less than half the power of existing systems, it could also reduce the need for repeat operations to replace batteries.

Deep brain stimulation (DBS) is used to treat the difficulties in moving and involuntary shaking experienced by those living with advanced Parkinson's disease, although it is not suitable for all patients.

Professor Peter Brown of the Nuffield Department of Surgical Sciences at the University of Oxford and consultant neurologist at Oxford's John Radcliffe Hospital, led the study. He said: 'Parkinson's symptoms fluctuate on a moment by moment basis and the brain signal activity causing symptoms is not continuous, it comes in bursts. By only delivering stimulation when these bursts are detected, you increase the effectiveness and reduce the amount of electrical stimulation delivered to the brain, reducing power consumption.

'DBS treatment is used by Parkinson sufferers for many years. We believe reducing the amount of electrical stimulation will lower the risk of side effects, although further research is needed on this aspect.' Potential side effects of deep brain stimulation can include speech and cognitive deterioration.

His team's proof of concept study is published in the journal *Annals of*

Neurology. The research was supported by the National Institute for Health Research (NIHR) Oxford Biomedical Research Centre (a collaboration between Oxford University Hospitals NHS Trust and Oxford University), the Medical Research Council and The Wellcome Trust.

Professor Brown said a major advantage of adaptive DBS was the potential to significantly extend battery life.

He added: 'At present patients need an operation every three or four years to replace the battery. These are elderly patients who are operated on under general anaesthetic. By extending battery life we can reduce the need for these operations.'

The adaptive system was trialled with eight patients. The trial was for 10 minute periods and compared to the effect of no stimulation, constant stimulation and randomised intermittent stimulation.

Professor Brown said: 'We have believed for some time that this adaptive system could work, but this study has now proved the concept. Our conclusions were backed by independent assessment from experts at University College London.

'However, this was a small-scale proof of concept study. We now need to trial the system for longer periods. For anything longer than a few hours we will need to overcome technological hurdles in terms of miniaturising the system.

'The ultimate goal is a closed loop system small enough to be implanted in the body, similar to conventional DBS systems.'

More information: onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291531-8249

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