DEVELOPMENTAL PSYCHOLOGY

Neurostimulator makes Parkinson's patients more impulsive

by Jorn Hövels



After years of medication use, patients with Parkinson's disease often start suffering from negative side effects such as uncontrolled movements. As an alternative doctors can insert a neurostimulator under the skin at the sternum for so-called deep brain stimulation. It sends electrical pulses to the brain to promote signal transmission. That makes patients' movements more fluid. With Scott Wylie from the University of Virginia (USA) and others, Wery van den Wildenberg, assistant professor in the Developmental Psychology Program Group, studied the effect of deep brain stimulation on the brain and behavior of Parkinson's patients. They published their findings in the scientific journal *Brain**.

What did the study look like?

'Seventeen patients with Parkinson's had to complete the so-called Simon task twice, the first time with the neurostimulator turned on and then with it turned off. We wanted to know what the behavioral effects are of stimulating the subthalamic nucleus, the part of the brain responsible for motor and cognitive functioning. We were primarily interested in knowing what the effect of deep brain stimulation is on the degree to which patients behave impulsively.'

What does the Simon task entail?

'It's a cognitive task during which subjects are instructed to press a button with their left hand as soon as possible upon seeing a blue circle appear on a computer screen, and to press with their right hand when a green circle appears. However, both circles appear on the left at times and on the right side of the screen at other times. That creates a conflict situation. You see, our motor system works in such a way that we respond more quickly with our left when something appears on the left, and more quickly with the right hand when something appears on the right. That's due to our automatic reflex, which especially troubles Parkinson's patients.'

What does that have to do with impulsivity?

'When you're impulsive, your behavior is being controlled by stimuli that you might suppress if you had more time to think. The Simon task is an instrument that helps us determine how well subjects suppress irrelevant information or stimuli, with or without help from a neurostimulator. The better they are able to do that, the less impulsive they are.'

What is the most important conclusion?

'When the neurostimulator is on, Parkinson's patients make more fast, impulsive mistakes. That's when they let the Simon task throw them off. When the stimulator is off they respond more slowly, but make fewer mistakes.'

How do you explain that?

'My colleague Richard Ridderinkhof developed the Activation Suppression Model. It explains that in order for the cognitive control system to suppress irrelevant information, it needs time to become active. When the stimulator was off, patients responded more slowly and as a result made fewer fast mistakes. They used the correct hand to press the correct button because they did not respond to their first, erroneous impulse.'

So the conclusion didn't work out well for the neurostimulator.

'It's really not that bad. When the neurostimulator is on, patients do indeed make more fast, impulsive mistakes, but at the same time it has a positive effect on the motor system. When we turned the stimulator off, patients immediately started suffering from severe motor problems. But the fact MUNIDUAL NDIVIDUAL PARKINSON'S PATIENTS CAN GO THROUGH A CAN GO THROUGH A PERSONALITY CHANGE AFTER DEEP BRAIN CTIMULATION remains that impulsivity is a nasty byproduct of neurostimulation and that hasn't been highlighted enough until now. Doctors should really educate their patients more on this.'

How impulsive do patients get?

'There are clinical stories about patients who go through a personality change after deep brain stimulation. They showed risky behavior such as gambling, ill-judged investments, and hypersexuality.'

In short, do patients have a choice between two evils?

'Paradoxically, the study also showed that if we zoomed in on the slow response times with the stimulator, subjects were actually better able to suppress irrelevant information. That implies that when patients take more time to think they will have less trouble with the Simon task, even when the stimulator is on. In short, it would be good if we could teach patients with a stimulator to take more time to think, so they can avoid falling prey to their first impulse.'

http://www.wery.dds.nl/ http://home.medewerker.uva.nl/w.p.m.vandenwildenberg/ http://www.healthsystem.virginia.edu/internet/wylielab/researchteam/ researchteam.cfm http://home.medewerker.uva.nl/k.r.ridderinkhof/

*Wylie, S.A., Ridderinkhof, K.R., Elias, W.J., Frysinger, R.C., Bashore, T.R., Downs, K.E., van Wouwe, N.C., & van den Wildenberg, W.P.M. (2010). Subthalamic nucleus stimulation influences expression and suppression of impulsive behavior in Parkinson's Disease. *Brain, 133*, 3611–3624.

(http://www.wery.dds.nl/publications/Wylie_etal_STN-DBS.SIMON_ Brain.pdf)



Interventies in het onderwijs: werken aan goede verhoudingen

RECENTLY PUBLISHED

M.H. Taal & C. Poleij (red.) INTERVENTIES IN HET ONDERWIJS: WERKEN AAN GOEDE VERHOUDINGEN

2011 - Den Haag: Boom/Lemma