MedicalXpress

Researchers unlocking learning strategies in Parkinson's patients

May 12 2010

(PhysOrg.com) -- University of Michigan researchers are a step closer to understanding how medications affect learning in patients with early-stage Parkinson's disease.

The research, published recently in the *Journal of Neurophysiology* shows that patients are better able to learn tasks necessary for adapting to their disease—how to button their shirt differently or how to use a cane or walker for steadiness, for example—when they are not medicated during early stages of the learning process. This is particularly true for early-stage Parkinson's patients.

Most Parkinson's patients suffer from four main symptoms: Tremors, stiffness or rigidity of the limbs and trunk, slow movement, and impaired balance and coordination. As these symptoms become more pronounced and the disease progresses, patients may have difficulty walking, talking, or completing other simple tasks and often require physical therapy to help them learn how to manage.

Previous research showed that Parkinson's patients performed learning tasks better off medications than on medications, but U-M researcher Rachael Seidler was particularly interested in the effects of medication early in the learning process. Parkinson's disease often affects the upper region of the brain first, gradually working its way down to the lower region of the brain, where learning sequences of actions takes place. Normally, the brain relies on the chemical dopamine for communication between its parts. In people with Parkinson's disease, reduced levels of

dopamine hamper such communication. Several drugs currently used in Parkinson's treatment boost dopamine, but some of these medications can "overdose" unaffected regions of the brain, interfering with learning.

Seidler and colleagues hypothesized that patients would learn new sequences better and faster when "off" medication early in the learning process. The researchers expected this to be particularly true of patients with early-stage Parkinson's, because the lower parts of their brains would net yet be affected by the disease.

The study tested Parkinson's patients over two days, both on and off medication. Healthy people with no neurological impairments were also tested for comparison. The Parkinson's patients stopped taking their regular dose of dopamine-boosting medication 12 to18 hours before testing.

All subjects in the study were given a learning task that involved pressing a key in response to something flashed on a computer screen. Participants also were instructed to press the appropriate button as fast as possible when an "X" appeared, and to press the key in a specific sequential pattern. Different sequences were tested over the two-day period to assess new sequence-learning behaviors, the idea being that as patients learned the sequences, they would become faster at pressing the appropriate buttons.

Seidler and colleagues found that Parkinson's patients off medication responded exactly like healthy controls, while patients on medication showed clear signs of impairment. The researchers concluded that dopamine overdosing in healthy parts of the brain indeed hampers early stages of sequence learning.

"Normally you would think giving people a drug to replace dopamine would improve motor skills—and it does to an extent," said Seidler, a

professor at the School of Kinesiology and Department of Psychology and lead author of the study. "But there are other behaviors where the brain relies on dopamine as a neurotransmitter that are not affected in the early stages of the disease. Dopamine replacement medications are not spatially selective—they go everywhere in the brain. If you have too much dopamine going into healthy parts of the brain, it can cause behavioral impairments, as we witnessed in our study."

Seidler and colleagues hope the results of this study will lead to new treatment strategies for Parkinson's patients, specifically more targeted drug delivery.

Provided by University of Michigan