MedicalXpress

Parkinson's patients shed light on role of reward bias in compulsive behaviors

January 13 2010

New research unravels the brain mechanisms that underlie the ability of a standard drug treatment for Parkinson's to elicit compulsive behaviors in some patients with the disease. The study, published by Cell Press in the January 14th issue of the journal *Neuron,* provides fascinating new insight into the brain mechanisms that underlie a predisposition to behavioral addictions, such as pathological gambling and shopping.

The tendency to make a compulsive choice, even when faced with substantial negative outcomes and alternative choices, is characteristic of aberrant gambling or shopping behaviors. Therefore, it is likely that the decision-making process is disrupted in individuals who demonstrate these compulsive behaviors.

Abnormalities in "prediction error," which serves as a kind of teaching signal to update our future predictions and influence future choices, have been hypothesized to play a role in substance abuse disorders. However, prediction error has not yet been linked to such human behavioral pathologies.

Dr. Valerie Voon, from the National Institutes of Health, led a study of compulsive behaviors triggered in Parkinson's disease patients treated with drugs that stimulate the brain's dopamine system. "A constellation of pathological behaviors, including gambling, shopping, binge eating, and hypersexuality, is seen in13% of patients taking dopamine agonists," explains Dr. Voon. "These behaviors are associated with factors predisposing to general substance abuse disorders, thus emphasizing a

common underlying susceptibility."

In order to gain unique insight into the core biology of behavioral addiction in susceptible individuals, Dr. Voon and colleagues used brain imaging techniques to examine dopamine agonist-induced compulsive behaviors in Parkinson's patients and normal controls. The researchers observed that dopamine agonists elicited an increase in the rate of learning from beneficial outcomes and a greater prediction error, signifying a better than expected outcome, in susceptible individuals with Parkinson's disease.

"Taken together, our findings are consistent with a model whereby a distorted estimation of the gain underpins a choice bias towards gains," concludes Dr. Voon. "The results highlight a key decision-making process dysregulated by dopamine agonists in a population susceptible to compulsive behaviors and provide clues to mechanisms that underlie behavioral escalation in a disorder of behavioral addiction. The mechanism may also explain why anecdotally some patients describe the onset of their gambling symptoms after experiencing a 'win'."

Provided by Cell Press