Medical Xpress

Imaging study shows dopamine dysfunction not the main cause of attention deficit hyperactivity disorder

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(Medical Xpress)—A study funded by the Medical Research Council (MRC) and published in *Brain* today found that administering methylphenidate (more commonly known as Ritalin) to healthy volunteers, as well as those who exhibit symptoms of ADHD as adults, led to similar increases of the chemical dopamine in their brain. Both groups also had equivalent level of improvements caused by the drug when they then carried out tests of their ability to concentrate and pay attention.

This double-blind study, which was carried out by researchers at the University of Cambridge MRC/Wellcome Trust Behavioural and Clinical Neuroscience Institute (BCNI), therefore questions previous suggestions that ADHD is the result of fundamental abnormalities in dopamine transmission, and suggests that the main cause of the disorder may lie instead in structural differences in the grey matter in the brain.

This landmark study could significantly improve understanding of how ADHD is caused and help inform the development of treatments in the future.

Dopamine is a crucial chemical for concentration or sustained attention, working memory and motivational processes in the brain and acts as a chemical transmitter between brain cells by combining with specialised receptors on nerve cells. Ritalin works by increasing the levels of this

chemical which binds to the receptors and increases the flow of communication between these cells.

By combining positron emission tomography (PET) imaging techniques to measure dopamine receptors with functional magnetic resonance imaging (fMRI), the researchers were able to measure how Ritalin affects dopamine in patients with ADHD and patients unaffected by the illness. Both groups were given either a dose of Ritalin or a placebo pill. They then analysed the results of tasks which tested their ability to concentrate and pay attention over a period of time.

Patients with ADHD showed significant impairments in attentional performance compared with healthy controls; interestingly Ritalin also improved performance in the patients and in some healthy controls as well. However, dopamine receptor levels in an area of the brain called the striatum were similar in the two groups and the effects of Ritalin on dopamine levels in the two groups were also equivalent.

Professor Barbara Sahakian who led the study at the BCNI said: "We feel these results are extremely important since they show that people who have poor concentration improve with methylphenidate(Ritalin) treatment whether they have a diagnosis of adult ADHD or not. These novel findings demonstrate that poor performers, including healthy volunteers, were helped by the treatment and this was related to increases in dopamine in the brain in an area of the striatum called the caudate nucleus."

Professor Trevor Robbins, co-author and Director of the BCNI, said: "These findings question the previously accepted view of major abnormalities in dopamine function as the main cause of adult ADHD patients. While the results show that Ritalin has a 'therapeutic' effect to improve performance it does not appear to be related to fundamental underlying impairments in the dopamine system in ADHD."

Provided by Medical Research Council