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# **Methylphenidate remediates error-preceding activation of the default mode brain regions in cocaine-addicted individuals**

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## Abstract

Many previous studies suggest the potential of psychostimulants in improving cognitive functioning. Our earlier pharmacological brain imaging study showed that intravenous methylphenidate (MPH) improves inhibitory control by altering cortico–striato–thalamic activations in cocaine-dependent (CD) individuals. Here we provide additional evidence for the effects of MPH in restoring cerebral activations during cognitive performance. Ten CD individuals performed a stop signal task (SST) during functional magnetic resonance imaging (fMRI) in two sessions, in which either MPH (0.5 mg/kg body weight) or saline was administered intravenously. In the SST, a frequent go signal instructs participants to make a speeded response and a less frequent stop signal instructs them to withhold the response. Our previous work described increased activation of the precuneus/posterior cingulate cortex and ventromedial prefrontal cortex—regions of the default mode network (DMN)—before participants committed a stop error in healthy control but not CD individuals (Bednarski et al., 2011). The current results showed that, compared to saline, MPH restored error-preceding activations of DMN regions in CD individuals.

The extent of the changes in precuneus activity was correlated with MPH-elicited increase in systolic blood pressure. These findings suggest that the influence of MPH on cerebral activations may extend beyond cognitive control and provide additional evidence warranting future studies to investigate the neural mechanisms and physiological markers of the efficacy of agonist therapy in cocaine dependence.

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