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Pharmacological Modulations on the Human Cognitive Processes: An fMRI Study

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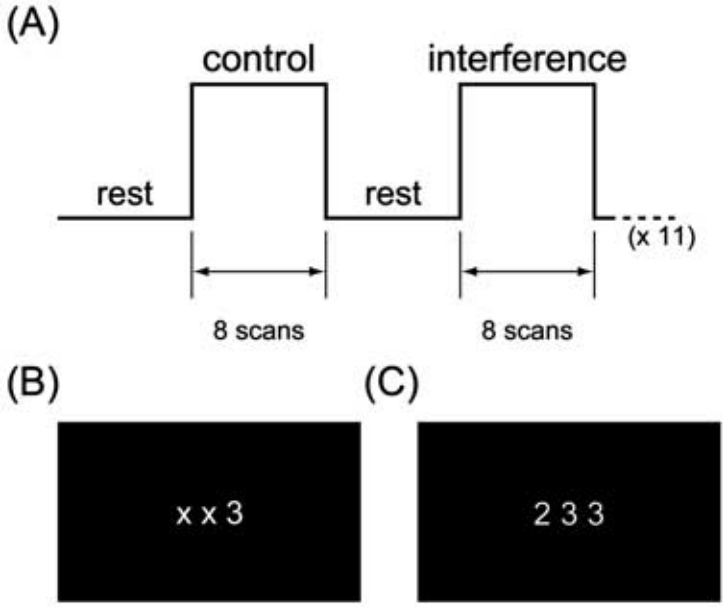

Fig. 1

Investigating modulatory effects of psychopharmacological agents in the human brain allows for not only functional characterization of particular neurotransmitter systems in the human cognition, but better understanding of pathophysiology and treatment of neuropsychiatric disorders[1]. Here we conducted a functional magnetic resonance imaging (fMRI) study to map effects of a dopamine D_2 antagonist (sultopride) on a decision-making process. In a single scanning session, ten male, right-handed, healthy subjects performed a Stroop-like cognitive interference task[2] (**Fig. 1**). In the absence of dopaminergic manipulations, comparison of blood oxygenation level dependent (BOLD) signals during the interference condition against those during the control condition revealed a widely distributed network implicated in the decision-making process with cognitive interference (**Fig. 2A**). Upon the administration of the D_2 antagonist, however, many of these regions exhibited decreased activities, and the effects were found to be most prominent in regions around the cerebellum, the thalamus, the anterior cingulate cortex, and the motor areas (**Fig. 2B**). Subsequent studies should address the role of individual components in the observed brain circuits, as well as what the decrements of activations mean in the neurophysiological context.

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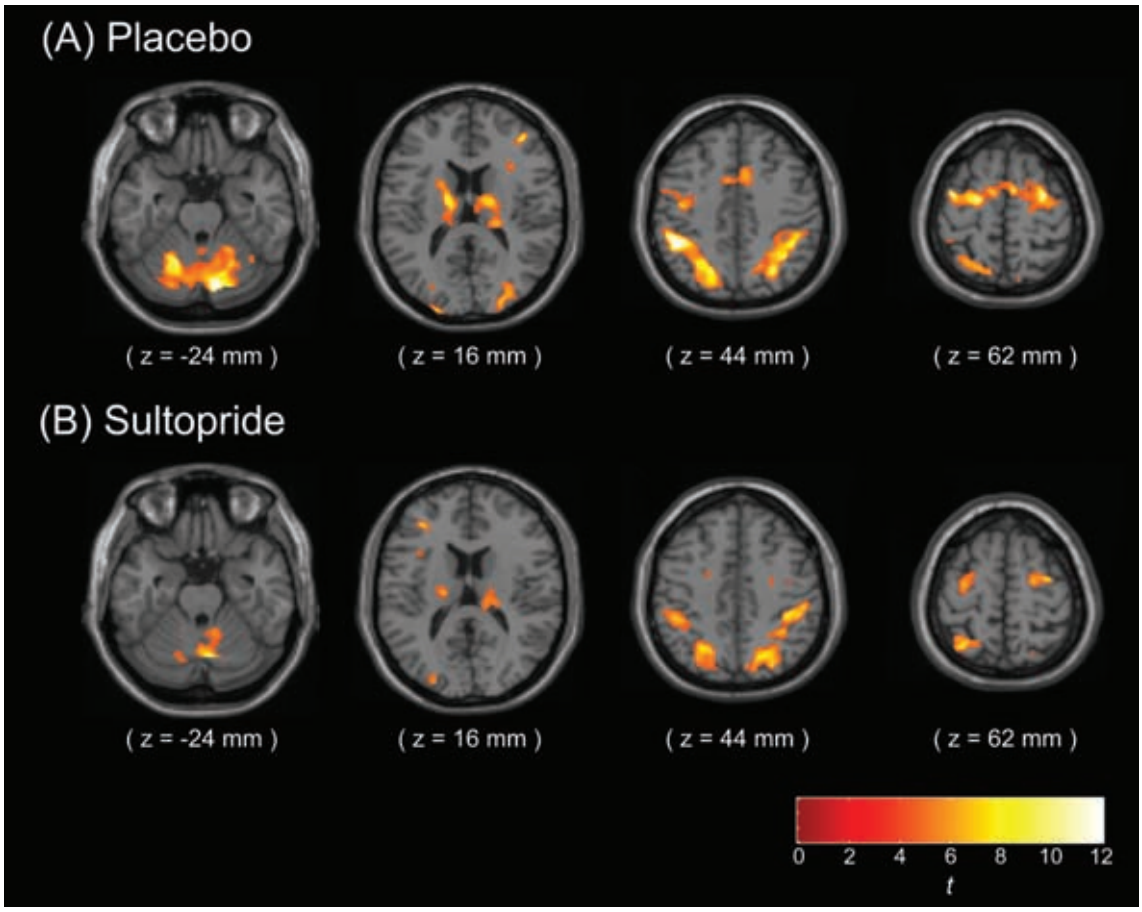

Fig. 2

Fig. 1 (A) Schematic diagram illustrating the cognitive interference task employed. A single scanning session consisted of blocks (containing eight scans) of control and interference trials interspaced by resting periods. During the trials, subjects are instructed to report by button press the identity of the number that differs from the other two. (B)-(C) Examples of the trials. During the control trials, the distractors were the letter 'x', whereas during the interference trials, the distractors were other numbers, thereby imposing higher cognitive demands.

Fig. 2 Activated regions during the interference trials in contrast to the control trials (A) with no dopaminergic manipulations and (B) under the administration of a D_2 antagonist (sultopride). The results are based on a group analysis with statistical parametric mapping (SPM) software[3] and with a statistical threshold of $P < 0.001$ (uncorrected).

References

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