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Dopamine Activation in the vmPFC: Impact on Impulsive Choice in Social Contexts and Neural Connections

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We are still developing and optimizing this protocol



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Abstract

This study protocol details the experimental procedures aimed at assessing the effects of dopamine activation in the vmPFC on impulsive behavior and social interaction. Experiment 1 will focus on fMRI responses. Experiment 2 will assess behavior using the Go/No-Go Task and Social Interaction Task. Experiment 3 will evaluate the longitudinal impact of vmPFC dopamine activation on both fMRI outcomes and behavioral tasks.

- 1 The first experiment aims to determine the effect of dopamine activation in the vmPFC. Long-Evans rats will be used for this study. The experimental group of rats will undergo a procedure where dopamine in the vmPFC is activated by injecting an amphetamine solution. Both the control group and experimental group will undergo whole-brain fMRI scans. Activation patterns will be compared using contact ICA and dual regression methods.
- 2 The second experiment will aim to determine whether dopamine activation in the vmPFC affects impulsive action and social interaction. For this test, two behavioral experiments will be conducted. The Go/No-Go task will involve multiple FR schedules (F3, F5, etc.), with grain/fat pellets used as rewards. In the social interaction tasks, there will be two major components: assessing social behavior in a 3 chamber cage and introducing a stranger rat in a circular wire cage placed in the left or right chamber of the cage. Another experiment will assess behavior towards intruders. Following the experiments, the rats will undergo fMRI imaging. The behavior from the Go/No-Go task and the social interaction task will be compared, along with their fMRI data. Additionally, the fMRI data between the two behavioral tasks will be compared to explore the neurological relationship between impulsive action and social interaction.
- 3 The last experiment aimed to investigate the longitudinal effects of dopamine activation in the vmPFC. Rats underwent the same procedure as in experiments 1 and 2, with regular activation. Subsequently, they underwent a specific period without activation. After this period, activation levels were assessed using fMRI imaging, and behavioral tasks were conducted.