



UMEÅ UNIVERSITET

Umeå University Medical Dissertations, New Series No 2189

Dopamine and the affective-cognitive gradient in the human striatum studied with multimodal brain imaging

Filip Grill

Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av filosofie doktorsexamen framläggs till offentligt försvar i Hörsal Betula, målpunkt L, Norrlands universitetssjukhus, fredagen den 10 juni, kl. 13:00.

Avhandlingen kommer att försvaras på engelska.

Fakultetsopponent: Dr. Alison Adcock, MD, PhD, Department of Biological Psychiatry, Duke University School of Medicine, Durham, United States of America.

Organization

Umeå University
Department of Radiation Sciences

Document type

Doctoral thesis

Date of publication

20 May 2022

Author

Filip Grill

Title

Dopamine and the affective-cognitive gradient in the human striatum studied with multimodal brain imaging.

Abstract

Both dopamine and the dopamine rich brain area, striatum, have been linked to behaviors related to incentives, motor action, and associative processing. Most of the cortex sends projections to the striatum, these connections have been described as a gradient organization representing a repertoire of functional behaviors. Although considerable research efforts have been made on the functions of dopamine, it is still unclear how and when it is released in the striatum in humans and what role it has for everyday behavior.

The overarching aim of this thesis is to contribute to our understanding of the role of striatal dopamine release during human behaviors relating to incentive, motor, and associative processing. Using a combination of multimodal brain imaging (positron emission tomography and functional magnetic resonance imaging) as well as cognitive modelling this thesis investigates: how a reproducible striatal response to incentives can be divided into behaviorally relevant components relating to affective and cognitive processes, how striatal dopamine release during motor action represent several component processes of behavior, and also provides evidence that striatal dopamine is released during reward prediction errors in humans. The results are consistent with an affective-cognitive gradient in the striatum and suggest that dopamine release into the striatal gradient might facilitate the integration of component processes into complex representations of behavior. The results of this thesis are based on healthy young individuals, however, aberrant dopamine signaling is a hallmark of several psychiatric and neurological diseases making it crucial to further understand the healthy dopamine system.

Keywords

dopamine, striatum, incentive, motor, associative, reinforcement learning, reward prediction error, positron emission tomography, functional magnetic resonance imaging, PET/MR, cognitive modelling

Language

English

ISBN

print: 978-91-7855-823-0
PDF: 978-91-7855-824-7

ISSN

0346-6612

Number of pages

75 + 3 papers