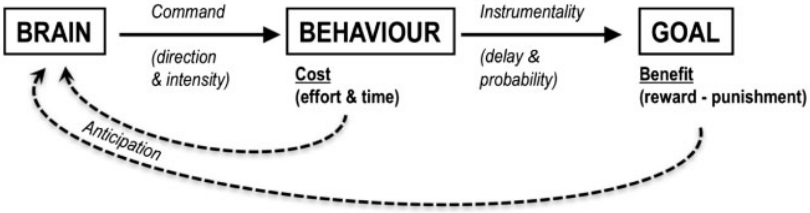
Neurophysiological correlates of motivation deficits in schizophrenia

Schizophrenia is a severe psychiatric disorder that affects 1% of the population worldwide. Cognitive deficits are core features of schizophrenia and provide a unique window into understanding both local and large-scale brain functional dynamics underlying the pathophysiology (1).

Motivation is particularly affected in schizophrenia, the abolition of will (avolition) being one of the cardinal dimensions of the symptomatology. This clinical symptom results in a significant reduction of goal-directed actions and may lead to a significant decrease in autonomy in interpersonal relationships and daily tasks (2) .



The motivation to perform an action is determined by several components including the estimation and anticipation of the value of the reward/punishement linked to this action and the estimation of the level of effort and time required to achieve it. Other cognitive processes such as exploration of response alternatives and learning from outcome can also be implicated. This cognitive framework can be integrated into computational models that account for the sensitivity to each of these components (3). Neurobiologically, motivation is closely related to activity and connectivity between the dorsal anterior cingulate cortex and the striatum as well as dopaminergic neurotransmission, two mechanisms that are strongly altered in schizophrenia (4).

Although a growing body of evidence demonstrates general motivation impairment in patients, it is still unknown which components are impaired in schizophrenia and what is the underlying neurophysiology of these discrete motivation components' deficits.

This project aims at 1) disentangling these motivation components and 2) exploring their brain underpinnings in schizophrenia. To do so, we will rely on the opportunity to engage motivation-related brain structures in patients with schizophrenia using a battery of fine-grained motivation paradigms and measure the corresponding changes with electroencephalography (EEG). We will compare behavioral measures and cortical correlates of motivation (recorded with EEG) between patients with schizophrenia and healthy controls using computational modeling.

We are currently developing behavioral paradigms to systematically capture each of the above-described motivation components. EEG responses that reflects motivation processes taking place in the anterior cingulate cortex and the striatum will be recorded, including the error-related negativity (ERN) and feedback-related negativity (FRN) (5). In addition,

correlation between neural signals/ behavioral performance at motivation tasks and clinical symptoms scales will be used to show the contribution of motivation deficits to other clinical manifestations of schizophrenia.

The selected candidate will develop experimental behavioral paradigms, collect behavioral and electrophysiological data, analyze and interpret data. Applicants should have skills in computer programming, statistics, computational modeling and signal processing (Matlab, R, SPSS or Python).

Applicants should speak basic French, or be willing to learn rapidly in order to interact with participants. Applicants with a background in engineering, computer science, or physics are also encouraged to apply.

In case of COVID-19 escalation and subsequent isolation measures that would disrupt data collection during the internship, the selected candidate will be provided with backup ready-to-use data including cognitive behavioral and clinical measures in samples of schizophrenia patients.

The work will take place at the Grenoble institut Neurosciences (GiN, U1216 "*Brain stimulation and systems neuroscience"*) and University Hospital Center Grenoble Alpes (CHUGA) in Grenoble.

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