ANTICIPATION AND ITS TROUBLES

My research activity is devoted to the study of anticipatory eye movements. In order to better understand the neuronal bases of anticipation, behavioral and electrophysiological experiments are realized. The role of the cortical region referred to as the ‘Supplementary Eye Field’ in anticipation is investigated with electrophysiological methods (single neuron recordings, EEG). Moreover, we also carry out an important set of behavioral studies in Parkinson’s disease patients. The dual approach consisting in studying fundamental processes in healthy subjects and at the same time doing experiments with Parkinson’s disease patients is particularly fruitful and improves our understanding of anticipation and temporal cognition in health and disease.

DOPAMINE AND TEMPORAL EXPECTATION

I. Ameqrane, M. Missal

The goal of this project is to better understand the role of dopamine in temporal expectation using anticipatory eye movements as a tool. Anticipatory eye movements are analyzed in Parkinson’s disease patients during a task where events can be predicted on the basis of temporal information. In an animal model, injections of dopaminergic agonists and/or antagonists in the dorsal striatum will help us better understand the role of that structure in temporal cognition and anticipation.

NMDA RECEPTORS AND TEMPORAL EXPECTATION

I. Ameqrane, M. Missal

The goal of this project is to better understand the role of NMDA receptors in temporal expectation using anticipatory eye movements as a tool. Anticipatory eye movements are analyzed during a task where events can be predicted on the basis of temporal information. In an animal model, injections of subanaesthetic doses of ketamine will help us better understand the role of NMDA receptors in temporal cognition and anticipation.
ANTICIPATION AND CAUSALITY PERCEPTION
K. Wende, A. Drowdsewska, M. Missal

When viewing one object move after being struck by another, humans perceive that the action of the first object caused the motion of the second, not that the two events occurred independently. Although established as a perceptual and linguistic concept, the neuronal bases of causality perception are unknown. Therefore, eye movements of human observers are measured while viewing a display in which a launcher impacts a tool to trigger the motion of a second “reaction” target. EEG recordings and single neuron recordings will be performed to better understand how causality perception emerges from neuronal activities.

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SELECTED PUBLICATIONS


COGNITION AND ACTION
Our research mostly focuses on the neural correlates of complex motor behavior in humans. Most daily life situations require making decisions about actions. The fluid and flexible manner with which we make such decisions indicates the operation of a selection process that takes into account multiple factors including perceptual evidence, biomechanical constraints, personal goals, contextual rules or the expected outcome of actions. A number of current projects are concerned with the study of how these factors are integrated during action selection and the role of inhibitory mechanisms during movement planning in this context.

Besides, another important research topic of our group revolves around the mechanisms by which the brain copes with the limited resources that are available to a living organism, being computational, energetic or otherwise. This encompasses our previous research topics, namely effort-based decision making, which consists in the processes involved in minimizing the effort cost of our decisions, and especially in the context of Parkinson disease but also mental fatigue, which can be viewed as a consequence of an excess of mental effort investment, visual selective attention, a process dealing with the allocation of limited visual resources to the most potentially relevant information, habitual learning, a process allowing us to learn how to behave in a complex environment while saving computational resources and finally, chunking, a mechanism originally viewed as a strategy aimed at reducing working memory load, but operational in many other behaviors, including sequence learning, language and perception.