**Unraveling the Neural Mechanisms of Decision-Making in Uncertain Environments: Insights from a Probabilistic Foraging Task in Mongolian Gerbils**

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Decision-making can be challenging when faced with uncertain situations. Optimal decision-making typically involves understanding past events and complex statistical computations. However, in constantly changing environments with limited information, we rely on simplified rules to make judgments about probabilities and predictions. While researchers have investigated the impact of these decision heuristics through different behavioural experiments, little is known about how they are neurally implemented in the brain. Therefore, our study aims to explore the neural mechanisms involved in decision-making during an exploitation/exploration dilemma using an animal model.

We analyzed data from Mongolian gerbils engaged in a probabilistic foraging task (*adapted from* Lottem et al., 2018). Here, the task posed an exploitation/exploration dilemma, requiring gerbils to choose between exploiting a current food source or exploring an alternative option. Exploration incurred travel costs but held the potential for higher food density. This required the gerbils to allocate their attention and corresponding neural resources based on the probabilistic information about food availability in a changing environment. Building on previous findings of the frontopolar cortex's significance in human decision-making, including exploratory decisions in gambling (Daw et al., 2006), we conducted chronic laminar multielectrode recordings from the anterior frontal field A (FrA) of gerbils during the task.

Analysis of the current source density (CSD) profiles from the FrA revealed distinct cortical activity related to the foraging task (nose pokes) and the respective outcomes (reward and reward prediction error). We found an overall frontal activity to gradually increase before the subject switched from exploitation to exploration, consistent with random walk models of evidence accumulation (Gold & Shadlen, 2007). Moreover, layer-specific CSD profiles demonstrated the selective recruitment of infragranular and supragranular layers in the FrA, which correlates to exploitation and exploration behaviors, respectively. Our findings provide the initial evidence in rodents that the FrA neural circuitry orchestrates the choice between exploitation and exploration strategies in a layer-dependent manner, shedding light on the neural mechanisms underlying decision-making and attentional resource allocation during probabilistic changes in the environment.