

Causal contributions of parietal cortex to perceptual decision-making during stimulus categorization

With the support by the National Natural Science Foundation of China and the Chinese Academy of Sciences, the research team led by Dr. Xu NingLong (徐宁龙) at the Institute of Neuroscience, State Key Laboratory of Neuroscience, Chinese Academy of Sciences, clarified the role of posterior parietal cortex in perceptual decision-making. This study was published in *Nature Neuroscience* (2019, 22: 963–973).

Making judgements upon sensory stimuli is a fundamental cognitive capability, called perceptual decision-making. The posterior parietal cortex (PPC), a higher order association cortex, is widely believed to play an important role in decision-making based on its correlations choice behavior and stimulus categorization. However, several recent studies failed to identify any causal effects on decision-making behavior following inactivation of PPC, leading to a widespread debate about the role of PPC, and the neural mechanism of perceptual decision-making becomes even more elusive than ever.

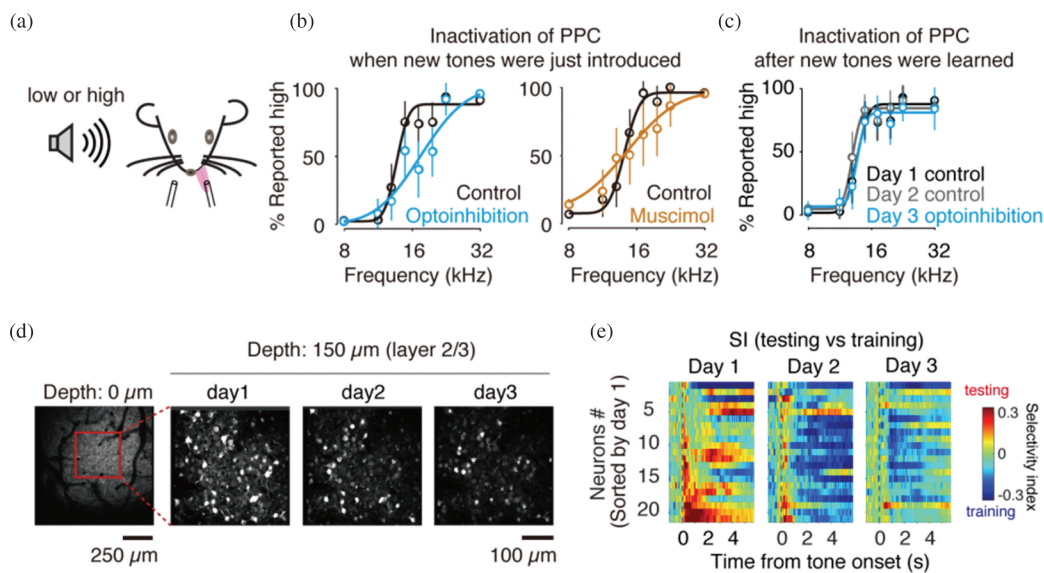


Figure Behavior results and two-photon calcium imaging recording.

The new study carried out by Dr. Xu’s group provides compelling evidence to support that PPC plays a critical and causal role in perceptual decision-making, under the critical conditions where animals need to categorize unknown sensory stimuli. By establishing a novel behavior paradigm in mice to measure animals’ categorization performance, and by applying precise manipulation and *in vivo* two-photon imaging to task performing animals, Dr. Xu’s group show that PPC neurons encode prior categories information to guide decisions on new sensory stimuli. Inactivation of PPC not only impaired categorization performance, but also led to a stronger bias of decisions by recent behavioral history. Furthermore, PPC inactivation also impaired animals’ ability to make new decisions upon previously learned stimuli. Finally, the authors found that the feedback circuit from PPC to auditory cortex plays a critical role in the auditory categorization decision process. Together, these findings provide long-sought evidence for the causal role of PPC in decision-making, and propose an updated conceptual framework for understanding the neural circuit mechanisms of decision-making.