

Unveiling unique visual perceptual characteristics of different animal species: behavioral and electrophysiological studies

Mohamed Faiz Bin Mohamed Mustafar

The dynamics and the complexity of the visual system have attracted various areas of science to investigate it from different viewpoints. Different level of animal-related research has proposed different models to elucidate the underlying neuronal process involved in visual perception. Our work investigated various components of visual perceptual processes in different experimental task across different animal species. We aimed to understand further the basic underlying factor that influences the visually based behavior. These works provide behavioral and electrophysiological data suggesting for a common behavioral and physiological visual perceptual characteristic across those animal species.

In the first study, we looked at object-picture perception in macaque monkeys by assessing the spontaneous looking behavior in a free viewing task using an eye tracking system. The experiment revealed that the monkeys look spontaneously longer at the objects compared to the corresponding pictures. The temporal and spatial dynamic of the eye behavior as well as the strategy used were highlighted and discussed. In the second experiment, we compared the behavioral performance of three different animal species on three-alternative forced choice visual discrimination task to understand visual-related learning behavior. We found unique behavioral characteristics of different animal species during the learning process. In the third experiment, we were looking at the brain activity in relation to the flicker perception with the aim to understand how temporally the light dark transient affect behavioral and neural responses in primary visual cortex (V1) in human and Tree Shrews. Both species exhibited higher visual temporal resolution for dark than light stimuli which was consistent with the single neuron recording data. Overall, the present research enriched our understanding of the visual perceptual system in different animals, particularly the object-picture perception, visual-related learning and decision-making as well as behavioral and neuronal response to flicker perception.

Jury:

Prof. Gregor Rainer (thesis supervisor)

Prof. Eric Rouiller (internal co-examiner)

Prof. Klaus Zuberbuehler (external co-examiner)

Prof. Jean-Pierre Bresciani (president of the jury)