MINI SYMPOSIUM

3rd Mini Symposium on Cognition, Decision-making and Social function

April 20 (Monday), 2015
13:30 – 16:20
1F Seminar Room, BSI Central Building

13:30-13:35 Opening

13:35-14:25
Exploring cognitive foundations of distributive justice: The maximin rule as a key anchor in distributive and risky decisions.
Prof. Tatsuya Kameda
The University of Tokyo

14:25-15:15
Frequency specific effects of the neural oscillations in interval-timing perception, as examined by behavioral testing and neural simulations
Prof. Yuko Yotsumoto
The University of Tokyo

15:15-15:30 Break

15:30-16:20
Visual motion antagonism
Prof. Ikuya Murakami
The University of Tokyo

Host:
Hiro Nakahara Lab for Integrated Theoretical Neuroscience

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Exploring cognitive foundations of distributive justice: The maximin rule as a key anchor in distributive and risky decisions

Prof. Tatsuya Kameda

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Distributive justice concerns how societies should morally distribute resources. Although vigorously debated across many social-science disciplines, the relationships between normative theories of distributive justice (“should”) and actual human behavior (“do”) remain unclear. Here we ask whether moral argument of John Rawls, a philosopher whose foundational work in justice has been exerting a major impact until today, may have cognitive and neural underpinnings in our minds. In the well-known thought experiment (e.g., “veil of ignorance”), Rawls reasoned that distributive justice is functionally equivalent to decision-making under uncertainty and can be grounded on people’s primary concerns about risk of occupying the worst-off position in a society. We investigate the function of such Maximin concern in justice judgment by examining people’s cognitive and neural responses in two disparate tasks, distribution of rewards for others as a third party and gamble choices for self, in experiments using attention-monitoring and brain-imaging techniques. We find that subjects’ distributive choices match closely their risk preferences, with Rawlsians who care most for the worst-off position in social distribution tending to avoid risky gambles for self. Most importantly, beyond individual differences in choice preferences, subjects unanimously show the greatest spontaneous attention to information about how bad choice-outcomes could be in both distribution and gambling. We show that such robust spontaneous concerns about the worst-off outcomes are correlated with activations of the right temporo-parietal junction for tracking how choice options compare in terms of minimums. Our results provide convergent evidence that social distribution is closely linked to risky-decision making in the human mind as Rawls envisioned, drawing on common cognitive-neural processes with a spontaneous focus on the Maximin criterion.

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Brain Science Institute RIKEN

Frequency specific effects of the neural oscillations in interval-timing perception, as examined by behavioral testing and neural simulations

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Temporal information we use in our everyday activities range from microseconds for the auditory source localization to hours for the wake-sleep cycle. We also consciously perceive the elapse of time of some hundreds of milliseconds to some seconds. The perception for the hundreds of millisecond to some seconds is called interval-timing perception, and is known to involve dynamic subcortical-cortical network, including basal ganglia and sensory cortices. Striatal beat frequency (SBF) model explains the mechanism by multiple neural oscillators with various intrinsic vibration frequencies, and a detector neutron that receives projections from the oscillator neurons. In the talk, I will introduce two recent studies that investigated mechanisms of the interval-timing perception in the framework of SBF model. In the experiments, the perceived durations were measured while temporal characteristics of the visual or auditory stimuli were modulated with various temporal frequencies. The distortions of the perceived duration depended on the temporal frequencies of the modulations, and the distortions occurred in the modality specific manner. Neural simulations based on the new model, that implemented neural entrainments into the existing SBF model, revealed the frequency specific interactions in the dynamic system.

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Visual motion antagonism

Prof. Ikuya Murakami
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This talk gives an overview of my investigations of visual motion for over 20 years: center-surround antagonistic processing of motion signals. As a well-known visual illusion in relation to spatial differentiation of motion, I initially focused on induced motion, in which a physical stationary stimulus appears to move opposite to its surround motion. This phenomenon preferred an optimal stimulus size with respect to the average receptive field size of the macaque MT neurons at each retinal eccentricity, indicating a major contribution of antagonism in motion domain to our motion perception. In another intriguing illusion named visual jitter, adaptation to dynamic random noise causes a previously unadapted region of the visual field to appear jittery for a few seconds, reflecting retinal image motions originating from the observer's own small eye movements. This phenomenon was also accounted for by assuming that motion signals that are not detected by antagonistic detectors are left unnoticed. I will also show that other phenomena such as the rotating-snakes illusion offer further examples in which antagonistic motion detectors play a major role. Finally, I will also talk about a recent investigation that revealed that the presence of task-irrelevant induced motion can surprisingly improve a direction discrimination task.

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