Form 2-3

Japan-U.S. Brain Research Cooperation Program
Group Joint Study Project Program FY2018- FY2021 : Report

Field: Behavioral/Systems/Cognitive

1. Principal Researcher
   Name: Ken-ichi Amemori
   Title: Associate Professor
   Affiliation: Institute for the Advanced Study of Human Biology (ASHBi), Kyoto University

2. Research Title: Identifying the function of primate striosome-related circuitry on pessimistic valuation and anxiety

3. Japanese Group Organization
   Principal Researcher
   Name: Ken-ichi Amemori
   Title and Affiliation: Associate professor, Institute for the Advanced Study of Human Biology (ASHBi), Kyoto University

4. U.S. Group Organization
   Principal Researcher
   Name: Ann M. Graybiel
   Title and Affiliation: Institute Professor, McGovern Institute for Brain Research, Massachusetts Institute of Technology
   Collaborating Researcher
   Name: Georgios Papageorgiou
   Title and Affiliation: Postdoctoral associates, McGovern Institute for Brain Research, Massachusetts Institute of Technology

5. Research Period, from/to (yyyy/mm/dd) and total number of years.
   From 2018/04/01 to 2022/03/31 (4 years)

6. Abstract, Results, and Research Significance (300 words):

Identifying the function of the primate striosome-related circuit is particularly important to understand the basis of mood-related disorders. We proposed to study the physiological features of the cortico-striosome pathway in the primate striatum. The group has found clear preferential projection from focal sites in the cOFC to the striosome compartment in the primate striatum. We have further found the microstimulation of cOFC can induce change in value evaluation as evaluated by the approach-avoidance decision-making (Ap-Av) task, suggesting that the cOFC may send specific value information to the striosomes. These experimental results were published in the European Journal of neuroscience in 2020. Moreover, the group has further examined the influence of the microstimulation of the striatum in the Ap-Av task and has found that the striatal microstimulation could induce pessimistic decision-making. The group found that the striatal microstimulation induced irrationally repetitive choices with negative evaluations. Furthermore, local field potentials recorded in the same microstimulation sessions exhibited modulations of beta-band oscillatory activity that paralleled the persistent negative states influencing repetitive decisions. These findings demonstrate that local striatal zones can causally affect subjective states influencing persistent negative valuation and that abnormal beta-band oscillations can be associated with persistency in valuation accompanied by an anxiety-like state. These experimental results were published in the Neuron in 2018. In addition to these works in non-human primates, Amemori further participated in the experiments in the Graybiel lab that studied the physiological features of the striosome compartment in the rodent striatum. The striosome cell group had significantly more neurons encoding prediction errors than the other striatum cells, indicating that the striosome cells are involved in integrating prediction errors. These findings reveal how the striatum and its compartmental divisions contribute to adaptive behaviors guided by rewards and punishments in uncertain environments. These results were published in Nature Communication in 2020.

7. Other (Research-related concerns, particular points of note):
Due to Covid-19 pandemic, Amemori could not visit MIT in the FY 2020-2021.

*Please attach any reference materials as necessary.