

Research field: Cognitive and Behavioral Neuroscience

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Major Scientific Interests of the Group

We aim to understand fundamental biological systems of value-based decision making. Our ultimate goal is to understand how human make a choice in an environment. For this purpose, we used model animal macaque monkeys who is trained to behave very similar to humans. In addition, these knowledge help to understand the mental illness, which though to be disfunction of these value-based decision making system, such as depression.

Projects for Regular Students in Doctoral or Master's Programs

- 1) Developing primate model for human cognitive function, and neural mechanisms for economic decision makings are examined.
- 2) Examination of neural circuitry underlying economic decision makings.
- 3) Examining how the motivation and willingness to act are emerged in the brain.

Selected Publications

- 1) Yamada H, Tymula A, Louie K, Glimcher PW. Thirst-dependent risk preferences in monkeys identify a primitive form of wealth. **Proc Natl Acad Sci U S A**. 2013 110(39):15788-93.
- 2) Yamada H. Hunger enhances consistent economic choices in non-human primates. **Sci Rep**. 2017 7(1):2394.
- 3) Yamada H, Louie K, Tymula A, Glimcher PW. Free Choice Shapes Normalized Value Signals in Medial Orbitofrontal Cortex. **Nat Commun**. 2018 9:162
- 4) Enomoto K, Matsumoto N, Inokawa H, Kimura M, Yamada H*. Topographic distinction in long-term value signals between presumed dopamine neurons and presumed striatal projection neurons in behaving monkeys. **Sci Rep**. 2020 10(1):8912.
- 5) Inokawa H, Matsumoto N, Kimura M, Yamada H*. Tonically active neurons in the monkey dorsal striatum signal outcome feedback during trial-and-error search behavior. **Neuroscience**. 2020 446:271-284.
- 6) Yamada H*, Imaizumi Y, Matsumoto M. Neural population dynamics underlying expected value computation. **J Neurosci**. 2021 24;41(8):1684-1698.
- 7) Imaizumi Y, Tymula A, Tsubo Y, Matsumoto M, Yamada H*. A neuronal prospect theory model in the brain reward circuitry. **Nat Commun**. 2022 13(1):5855.
- 8) Tymula A, Wang X, Imaizumi Y, Kawai T, Kunitatsu J, Matsumoto M, Yamada H*. Dynamic prospect theory: two core decision theories coexist in the gambling behavior of monkeys and humans. **Sci Adv**. 13(1):5855.
- 9) Chen H, Kunitatsu J, Oya T, Imaizumi Y, Hori Y, Matsumoto M, Minamimoto T, Naya Y, Yamada H*. Comparison of neural population dynamics in the regression subspace between continuous and categorical task parameters. **eNeuro**. 2023 ENEURO.0016-23.2023.
- 10) Suwa Y, Kunitatsu J, Kamata A, Matsumoto M, Yamada H*. A method for evaluating hunger and thirst in monkeys by measuring blood ghrelin and osmolality levels. **eNeuro** 2024, ENEURO.0481-23.2024