The search for "theranostic biomarkers" in psychiatric disorders using resting-state functional connectivity-based biomarkers and functional connectivity-based neurofeedback.

Takashi Yamada[1, 2], Ryu-ichiro Hashimoto[1, 2, 3, 4], Noriaki Yahata[1, 5, 6], Naho Ichikawa[7], Yujiro Yoshihara[8], Yasumasa Okamoto[7], Nobumasa Kato[2], Hidehiko Takahashi[8], Mitsuo Kawato[1]

[1] Department of Decoded Neurofeedback, ATR Brain Information Communication Research Laboratory Group, Advanced Telecommunications Research Institute International, Kyoto, Japan
[2] Medical Institute of Developmental Disabilities Research, Showa University, Tokyo, Japan
[3] Department of Language Sciences, Graduate School of Humanities, Tokyo Metropolitan University, Tokyo, Japan
[4] Research Center for Language, Brain and Genetics, Tokyo Metropolitan University, Tokyo, Japan
[5] Department of Molecular Imaging and Theranostics, National Institute of Radiological Sciences, National Institutes for Quantum and Radiological Science and Technology, Chiba, Japan
[6] Department of Youth Mental Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan
[7] Department of Psychiatry and Neurosciences, Graduate School of Biomedical Sciences, Hiroshima University, Hiroshima, Japan
[8] Department of Psychiatry, Kyoto University Graduate School of Medicine, Kyoto, Japan

Abstracts:
Neuroimaging biomarkers for psychiatric conditions are required to optimally stratify patients and to allow for more personalized treatment approaches in order to achieve better treatment outcomes. Promising candidates for data-driven diagnosis include resting-state functional connectivity MRI (rs-fcMRI)-based biomarkers. Mounting evidence has shown that psychiatric conditions are associated with altered communication among large-scale brain networks. Although biomarkers have been developed with the aim of diagnosing patients and predicting the efficacy of therapy, the focus has shifted to the identification of biomarkers that represent therapeutic targets. This type of biomarker (i.e., "theranostic biomarker" [1]) is expected to elucidate the disease mechanisms of psychiatric conditions and to be able to offer individualized neural circuit-based therapeutic targets based on the neural cause of a condition. To this end, we developed rs-fcMRI-based potential biomarkers and investigated the causal relationship between these potential biomarkers and disease-specific behavior using functional MRI (fMRI)-based neurofeedback of functional connectivity. In this presentation, we will introduce our recent approach, which consists mainly of two parts: (i) developing an rs-fcMRI-based biomarker that can predict diagnosis and/or symptoms with high accuracy, and (ii) the introduction of a proof-of-concept study investigating the relationship between normalizing the biomarkers and symptom changes using fMRI-based neurofeedback.

References
1. Yahata N, Kasai K, Kawato M (2017) Computational neuroscience approach to biomarkers and treatments for mental disorders. *Psychiatry Clin Neurosci*. 71(4):215-237.