Symposium

2025年9月28日(日) 16:30 ~ 18:00 Session Room 1 (Main Hall A)

[Symposium 108] Recent Advances and Future Directions in Nuroimaging and Neurophysiological Studies in Schizophrenia

Moderator: Yoji Hirano (University of Miyazaki), Shunsuke Koike (University of Tokyo)

[SY-108]

Recent Advances and Future Directions in Nuroimaging and Neurophysiological Studies in Schizophrenia

Yoji Hirano[1], Shunsuke Koike[2], Ming H. Hsieh[3], Tao Li[4] (1.University of Miyazaki(Japan), 2.University of Tokyo(Japan), 3.National Taiwan University(Taiwan), 4.Zhejiang University School of Medicine(China))

[SY-108-01]

Brain-MINDS Beyond Human Brain MRI study project in Japan: A multimodal brain images for various neuro-psychiatric disorders through the lifespan

*Shinsuke Koike (The University of Tokyo(Japan))

[SY-108-02]

Automated diagnosis of schizophrenia using ERP components in the auditory oddball paradigm through deep learning

*Ming H. Hsieh[1], Yi-han Sheu[2], Yi-Ting Lin[1] (1.Department of Psychiatry, National Taiwan University Hospital and College of Medicine, Taipei(Taiwan), 2.Center for Precision Psychiatry, Massachusetts General Hospital, Boston, MA(United States of America))

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In recent years, advancements in technologies such as magnetic resonance imaging (MRI), functional brain imaging, electroencephalography (EEG), and magnetoencephalography (MEG) have progressively revealed insights into the neurobiological underpinnings of patients with schizophrenia. However, current neuroimaging methods and studies limited to single institutions have not yet fully illuminated the disorder's pathological basis and its heterogeneity. As a result, the development of biomarkers for clinical applications, including differential diagnosis and assessment of disease states, has been notably slow. To tackle this challenge, it is essential to identify robust biomarkers and rigorously validate their reproducibility. This should be accompanied by large-scale, multi-institutional investigations, as well as multimodal assessments that integrate diverse biomarkers. Additionally, establishing biologically informed subtyping frameworks and translating these findings into personalized therapeutic strategies in clinical practice is crucial. This symposium will feature leading researchers from Japan, Taiwan, and China who are at the forefront of schizophrenia research. They will present and discuss the latest discoveries, emerging trends, and future directions in the field.

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キーワード：Magnetic Resonance Image、Multi-site Study、Harmonization、Cross-disorder Comparison、Life Course Trajectory

MRI signals in clincial studies can be divided into three key factors: measurement bias, arising from differences in MRI machines and protocols; non-disease-related sampling bias, influenced by the variations of age distribution and sex ratios in both case and control groups; and disease-related signals. When exploring cross-disorder analysis using a multi-site dataset, the measurement and sampling biases usually provide a greater effect size compared to the difference between psychiatric disorders. Furthermore, the clinical sites were unable to apply the standardized measurement procedure and eligibility criteria because of the restrictions of each research site (Koike et al. *Neurosci Biobehav Rev* 2025; Shi and Koike. *JMA J* 2024). The AMED Brain/MINDS Beyond Human Brain MRI (BMB-HBM) project aimed to establish clinically relevant imaging biomarkers for neuropsychiatric disorders with high-quality harmonized data collection through the lifespan (Koike et al. *Neuroimage Clin* 2021). We established high-quality multimodal scanning protocols, data sharing and preprocessing pipelines, and traveling subject harmonization data and techniques, which can only diminish measurement bias in the brain signals. In this project, we intend to publicly share more than 7000 samples targeting neuropsychiatric disorders and adolescent development. In this presentation, I intend to introduce the BMB-HBM project and ongoing multi-site data harmonization for schizophrenia, major depressive disorders, bipolar disorders, and autism spectrum disorders as well as clinical high risk for psychosis. Finally, expanding to larger sample size, multimodal investigation, and more targeted conditions including neuropsychiatric disorders and development and aging will be discussed in the AMED Brain/MINDS 2.0 project.

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[SY-108-02] Automated diagnosis of schizophrenia using ERP components in the auditory oddball paradigm through deep learning

*Ming H. Hsieh[1], Yi-han Sheu[2], Yi-Ting Lin[1] (1.Department of Psychiatry, National Taiwan University Hospital and College of Medicine, Taipei(Taiwan), 2.Center for Precision Psychiatry, Massachusetts General Hospital, Boston, MA(United States of America))

キーワード：mismatch negativity、schizophrenia、single-subject classification、deep learning、event-related potential

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Neuroimaging-based disease diagnosis has been widely used in many fields of clinical medicine. In addition, single-subject classification of psychiatry disorders based on MRI dataset is also the focus of clinical research. Auditory event-related potentials (ERP) have been utilized to study defective information processing of patients with schizophrenia. However, there are only few automated diagnosis studies utilizing the pre-attentional, task-independent, high temporal resolution ERP.

The auditory oddball paradigm, a common experimental framework in cognitive repetitive ones, enabling researchers to investigate cognitive processing anomalies associated with schizophrenia. By focusing on ERP components such as MMN/P3a, researchers can assess how individuals with schizophrenia process auditory information differently compared to healthy controls, providing insights into the cognitive dysfunction characteristic of the disorder. Our dataset comprised 400subjects (256 patients with schizophrenia and 144 healthy controls). The classification and predictive accuracy of schizophrenia according to different models of deep learning would be presented. This innovative approach holds promise for early detection and personalized treatment strategies.

Overall, the automated diagnosis of schizophrenia through ERP components and deep learning offers a promising avenue for enhancing diagnostic precision and treatment personalization, yet requires ongoing research to fully realize its potential in clinical practice.