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Neural signature of auditory hallucinations: comparison between schizophrenia patients with and without auditory hallucinations using 18F-FDG PET

Nam-In Kang Kang[1], Woo Sung Kim[2], Young-Chul Chung[2,3,4]

[1]Department of Psychiatry, Maeumsarang Hospital, Wanju, Jeollabuk-do, Korea, [2]Department of Psychiatry, Chonbuk National University Medical School, Jeonju, Korea, [3]Department of Psychiatry, Chonbuk National University Hospital, Jeonju, Korea, [4]Research Institute of Clinical Medicine of Chonbuk National University-Biomedical Research Institute of Chonbuk National University Hospital, Jeonju, Korea

Aim: Auditory verbal hallucinations (AVH) is a common symptom that is reported by 50~80% of schizophrenia patients and sustains 25~30% of them despite appropriate pharmacological treatment. Understanding its exact pathophysiology is crucial in developing more optimal treatment strategies. We compared relative glucose metabolic rate (rGMR) between schizophrenia patients with and without auditory verbal hallucinations using [18F]-FDG PET.
Methods: We recruited schizophrenia patients with (n=10) and without (n=12) prominent, predominant, and persistent AVH. AVH was evaluated using psychotic symptom rating scales-auditory hallucinations (PSYRATS-AH). Image acquisition began 40 minutes after [18F]-FDG injection, using a HRRT-PET scanner. Then, high-resolution structural data were acquired using a 7T MRI system.
Results: The mean ages and duration of illness for patients with and without AVH were 39.20±10.55, 31.00±9.09 yrs, and 136.20±76.07, 112.50±78.01 ms, respectively. Compared to patients without AVH, significantly higher metabolic rates (thresholded at $p \leq 0.001$, uncorrected, cluster size ≥ 20 voxels) in middle temporal gyrus, inferior temporal gyrus, fusiform gyrus, and putamen were observed in patients with AVH. Whole-brain correlation analysis with the PSYRATS total score in patients with AVHs yielded positive correlations in the middle temporal gyrus, inferior temporal gyrus, fusiform gyrus, putamen, posterior cingulate cortex, and thalamus and negative correlations in the superior frontal gyrus, middle frontal gyrus, and precuneus.
Conclusions: Our results indicate that AVHs in patients with schizophrenia may be mediated by an alteration of neural pathways responsible for normal language function. Our findings also point to the potential role of the fusiform gyrus and putamen in the pathophysiology of AVHs. We discuss the relevance of findings in the study of AVHs.

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Multimodal imaging focused on meso-cortico-limbic system and its specificity for psychiatric diseases

Shinsuke Koike, Kentaro Morita, Eisuke Sakakibara, Naohiro Okada, Kiyoto Kasai

University of Tokyo, Italy

Introduction: Meso-cortico-limbic system is thought to be a core neural basis for positive and negative symptoms in schizophrenia and depressive symptoms in major depression, however, little neuroimaging studies has been conducted focused on this system. Recently advances in neuroimaging techniques has enabled us to explore micro structures in the brain and their function using magnetic resonance imaging (MRI). Thus, we investigated using these techniques focused on meso-cortico-limbic system. Then, we explored its specificity among psychiatric diseases such as schizophrenia and major depression.
Methods: First, we used T1-weighted brain images from 20 healthy participants in this study. Several analysis methods were tested for validation to detect the ventral tegmental area (VTA) in the midbrain, the nucleus accumbens (NAc), and subareas in the prefrontal cortex (e.g orbitofrontal cortex, medial prefrontal cortex, anterior cingulate). Second, if we can acquire enough validity for the methods, MRI data from 20 patients with schizophrenia and 20 patients with major depression were analyzed to explore disease-specific characteristics in meso-cortico-limbic system. This study is approved by the ethics committee of the Faculty of Medicine, The University of Tokyo, and all participants gave written informed consents to this study.
Results and discussion: The results will be shown in the conference. Since the disturbance of meso-cortico-limbic system is a core hypothesis for psychiatric symptoms, the results could interpret the pathophysiology of psychiatric diseases from neuroimaging.

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Non-pharmacological modulation of cerebral white matter integrity: a systematic review

Tina Dam Kristensen[1,2,3], Rene Mandl[6,2], Jens Richardt M. Jepsen[5,2], Egill Rostrup[4], Louise B. Glenthoej[1,2,3], Merete Nordentoft[1,2,3], Birte Glenthoej[3,2], Bjørn H. Ebdrup[2]

[1]Mental Health Centre Copenhagen, University of Copenhagen, DK-2900, Hellerup, Denmark, [2]Centre for Neuropsychiatric Schizophrenia Research (CNSR) & Centre for Clinical Intervention and Neuropsychiatric Schizophrenia Research (CINS), Mental Health Centre Glostrup, University of Copenhagen, DK-2600 Glostrup, Denmark, [3]Department of Clinical Medicine, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark, [4]Functional Imaging Unit, Department of Diagnostics, Rigshospitalet, University of Copenhagen, DK-2600 Glostrup, [5]Child and Adolescent Mental Health Centre, Mental Health Services Capital Region ofDenmark, University of Copenhagen, [6]Neuroimaging Research Group, University Medical Center Utrecht, Nl

Background: Studies using functional magnetic resonance imaging have provided increasing evidence that specified training regimens can affect functional cerebral connectivity. To what extend active training regimens can alter structural connectivity is not clear. The purpose of this review is to summarize the evidence and discuss the relevance of using cerebral white matter organization as a biological outcome measure in non-pharmacological psychiatric intervention studies.
Methods: Prospective registration of the review has been submitted to PROSPERO (Reg.No. CRD42016038639). Study search is performed in accordance with PRISMA-guidelines in the electronic databases PubMed and EMBASE. Longitudinal intervention studies published in peer-reviewed journals, with human participants aged 18–60 years are included. Interventions must be non-pharmacological, and any type of active training regimens will be included. Duration of interventions is between 1 day and 1 year. Randomized, controlled trials (RCTs); controlled clinical trials (CCTs) and controlled before-after (CBA) studies are included. The primary outcome is task-associated significant changes in cerebral white matter organization, as measured from baseline to follow-up with diffusion-weighted imaging parameters. We systematically assess risk of bias in RCTs according to the recommended approach for assessing risk of bias in Cochrane reviews, and for CCTs using the Newcastle-Ottawa Scale (NOS).
Results: Database search delivered 2037 hits. 19 eligible studies have been identified. Final results will be presented at the conference, including characteristics of subjects, studies, interventions, MRI-methodology, outcomes and risk of bias.