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Using fMRI to Assess Effectiveness of Olanzapine Treatment for Schizophrenia

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Using fMRI to assess effectiveness of Olanzapine treatment for Schizophrenia

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Introduction

- Schizophrenia is a complex mental illness with neurobiological underpinnings and misconceptions about violence
- Schizophrenia is associated with high levels of creativity and structural traits like fewer D2 receptors
- Patients face reduced life expectancy due to cardiovascular diseases and cope through smoking and sedentariness
- Treatment involves pharmacological antipsychotics like olanzapine and nonpharmacological approaches
- Olanzapine works by antagonizing D2 receptors but has side effects like weight gain and diabetes risk
- fMRI is used to study treatment mechanisms and predict response, but research on olanzapine's brain network effects is limited
- The study aims to evaluate olanzapine's neurochemical effects and its impact on functional connectivity using fMRI to improve schizophrenia management

Discussion

- Olanzapine is second-gen antipsychotic for schizophrenia that has lower extrapyramidal risk than first-gen antipsychotics but greater metabolic side effects and influence of smoking/genetics on metabolism
- Functional connectivity assessed via fMRI methods (VMHC, fALFF, ReHo) showing altered pathways in schizophrenia and olanzapine's effects
- Baseline connectivity predicts efficacy, reductions in certain areas correlate with symptom improvement, which serves as a predictor for olanzapine success
- Clinical recommendations include personalized care via fMRI monitoring, continuous plan updates, and need for longitudinal studies
- Future directions should be aimed at advancements in fMRI tech for better insights, awareness of study limitations, and need for more comprehensive research

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APSEA - American Preventative Screening and Education Association

Table 1: Study Characteristics

Author	Year	Country	Design & scan interval	Analytical approach	AP-R Classification Analysis	PC Variables
Li et al.	2020	China	2 scans 1 week	GFC	SVR	GFC & PANSS
Shan et al.	2021	China	2 scans 8 weeks	VMHC	SVR	VHMC & PANSS
Zhu et al.	2018	China	2 scans 8 weeks	PAS	SVM	PAS & PANSS

PC: Pearson Correlation; VMHC: voxel-mirrored homotopic connectivity, PAS: parameter of asymmetry, SVR: support vector regression, SVM: support vector machine, PANSS: Positive and Negative Syndrome Scale

Table 2: Population Diagnosed with Schizophrenia Characteristics

Author	Sample Size	*Gender (M)*	*Disease state*	Ages (y)	*Mean age (SD) (years)*	*Baseline PANSS Score*	*Mean dose (SD) mg/day*
Li et al.	32	16	1e	18-47	30.94 (8.25)	> 70	18.59 (4.96)
Shan et al.	20	15	1e & Chronic	18-50	22.75 (4.38)	> 75	20.50 (1.54)
Zhu et al.	44	28	1e	18-37	23.45 (4.24)	> 70	18.30 (5.17)

1e: 1st episode; M: Male

Table 3: Olanzapine Treatment and fMRI Analysis Results

Author	*Mean Baseline Total PANSS Score*	*Mean Total PANSS score after 8 weeks of Treatment*	*Classification Analysis*	*Correlation Analysis*
Li et al.	77.38 (5.17)	36.50 (2.97)	Positive correlation between actual RR of PANSS subscale scores after 8 weeks of treatment and predicted score by GFC change in the bilateral ACC after 1 week of Olanzapine	No correlation between GFC changes in bilateral ACC at week 1 and RR in PANSS total scores at week 8
Shan et al.	103.00 (10.79)	56.05 (12.08)	Positive correlation between actual RR of PANSS total, positive, and negative scores and predicted scored by VHMC in the superior/middle MPFC at baseline	No correlation between abnormal VHMC values and PANSS scores at baseline or after treatment
Zhu et al.	90.70 (11.17)	38.70 (7.44)	A combination of PAS scores from the left MTG/ITG and PCC/precuneus was able to predict response to olanzapine treatment. However, PAS Scores from only one of these two brain regions was not predictive of clinical response to treatment. PAS scores from the left SPL, right PRC/POC gyrus, and a combo of the two was also able to differentiate good response from poor response patients.	No correlation between PAS and PANSS scores at baseline or after treatment

GFC: global-brain functional connectivity, ACC: Anterior cingulate cortex, PANSS: Positive and Negative Syndrome Scale, VMHC: voxel-mirrored homotopic connectivity, MPFC: medial prefrontal cortex, RR: reduction ratio PAS: parameter of asymmetry, MTG: middle temporal gyrus, ITG: inferior temporal gyrus, PCC: posterior cingulate cortex, SPL: superior parietal lobule, PRC: precentral gyrus, POC: postcentral gyrus