Association between Language Functional Network and Attenuated Psychotic Symptoms in Clinical High-risk Psychosis Patients in Shanghai

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INTRODUCTION

- The onset of psychotic symptoms occurs during young adulthood.
- ~30% of clinical high risk (CHR) patients with schizophrenia (SZ) convert to chronic disorder within 3 ys.
- CHR patients show language dysfunction (e.g. verbal communication and auditory hallucinations).
- Previous research found chronic SZ patients exhibit
  - Increased activation in bilateral frontotemporal networks during auditory hallucination [1]
  - Decreased activation in left inferior frontal gyrus [2]
  - Reduced structural and functional connectivity between frontal and posterior temporal regions [2,3]
- Goals
  - To understand the neural characteristics of language-related neural network at the earliest onset of psychosis symptoms in a group of population naïve to anti-psychotics.
  - To dissociate the risk markers from the compensatory process in the CHR patients.

IMAGING ACQUISITION AND ANALYSIS

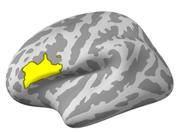
- **Acquisition**
  Resting-state functional MRI: Siemens Trio 3T MRI scanner, 32-channel head coil; 37 interleaved oblique, 3.5 mm axial slices covering the entire brain. TR = 2500 ms, TE = 30 ms, FOV 224x224mm with 3.5 mm isotropic voxels, flip angle 90º. Participants were instructed "Keep your eyes open and think nothing in particular".

- **Analysis**
  •Functional connectivity data were analyzed with CONN v16b [4] and SPM12b. Sources of non-neurophysiological noise were identified through an anatomical component based approach (aCompCor).
  •Motion outlier criteria: composite movement (relative to the previous time point) > 1mm, global signal intensity > 3SD.
  •Motion outliers were regressed out in the first-level GLM.
  •Seed-to-voxel: Voxel-level p <0.05 (two-sided) and cluster-level FDR-corrected p < 0.05.
  •ROI-ROI: Connection-level p < 0.05 (two-sided) and seed-level FDR-corrected p < 0.05, tested by Network Based Statistics [5].

SEED SELECTION

Seed-to-voxel Analyses

Left IFG

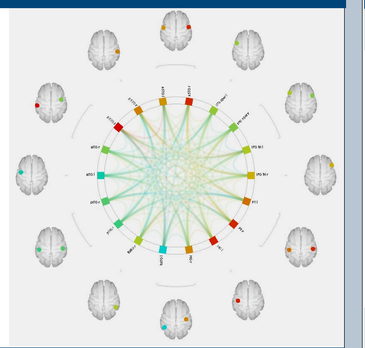


Left pSTG

Seeds selected from FSL Harvard-Oxford Atlas [6].

ROI-ROI Analyses

18 ROIs: Bilateral IFG-triangularis, IFG-opercularis, aSTG, pSTG, aITG, pITG, toITG, Heschl's gyrus, planum temporale



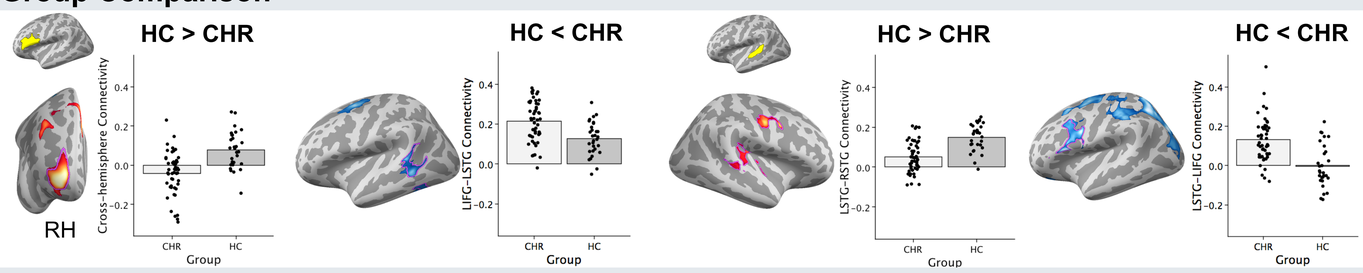
PARTICIPANTS

	CHR	HC	Statistical Significance
# of participants	50	30	-
Gender (female/male)	20/30	14/16	$\chi^2(1,80) = 0.34$, p=0.56
Age (years)	19.72±4.55	21.23±3.70	t(78)=1.62, p=0.13
Education (years)	10.52±2.44	12.33±2.25	t(78)=3.31, p=0.001 *
# of motion artifacts	6.30±6.07	6.83±5.89	t(78)=0.38, p=0.70
SIPS-positive	8.98±3.24	-	-
SIPS-negative	12.74±6.43	-	-
SIPS-disorganization	6.66±2.93	-	-
SIPS-general	9.10±3.20	-	-
Medicine	12 subjects started taking anti-psychotics for a short period of time (mean duration < 3.8 weeks)		

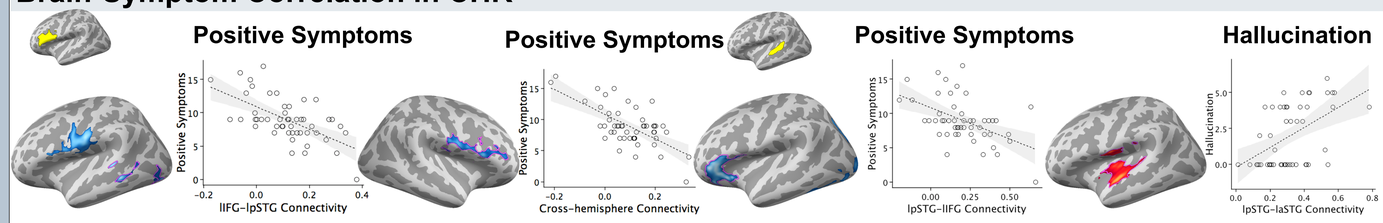
- 50 CHR patients from Shanghai Mental Health Center
- 30 age- and gender-matched healthy controls (HC) recruited from the Great Shanghai Area.
- Education was entered as a covariate in group comparison.
- SIPS: Structural Interview for Prodromal Syndromes of SZ
- All analyses were repeated in the subset of 38 patients naïve to anti-psychotics and the results maintained the same. We hereby report the results from all 50 CHR patients.

IMAGING RESULTS

Group Comparison



Brain-Symptom Correlation in CHR



Among 18 language and speech-related ROIs:
Only reduced inter-hemispheric connectivity between left IFG-triangularis and right IFG-opercularis is associated with more severe positive symptoms (T(48) = -3.23, p-FDR = 0.0381)

SUMMARY

•Compared to HC, CHR patients exhibited
- Hypo-connectivity between hemispheres at frontal and temporal regions
  => more severe positive symptoms
  - Similar as chronic SZ patients
  - Impaired inhibition pathways as predisposition to psychosis.

- Hyper-connectivity between left IFG and pSTG
  => less severe positive symptoms
  - Different from chronic SZ patients
  - A potentially protective mechanism for a subset of CHR patients by providing extra support for sound-meaning integration.

REFERENCE

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