Early Emotional Face Processing Deficits in Schizophrenia: an MEG Study

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Introduction

- N/M170 in the fusiform has been related to facial expression and emotional processing, which is essential for social interaction.
- Previous researches have shown that N/M170 is disturbed in schizophrenia (SZ) [1].
- We investigated whether other cortical areas involved in visual processing are influenced in patients with SZ.

Method

Participants
- HC: N =23; 12 male, 11 female; mean age 36.48 y (range 29-49)
- SZ: N=16; 6 male, 10 male; mean age 37.56 y (range 28-47)

Tasks
- The participants watched multiple series of images with the one-back working memory task embedded, and each series consisted of images of the same category (fearful faces, neutral faces, or houses).

MRI
- MRI acquisitions were performed using a Siemens 3-Tesla Trio scanner with a 12-channel head coil (Siemens, Erlangen, Germany) at Gunma University Hospital.

MEG Recording and Analysis Methods
- 306 sensors (102 triplets of two orthogonal planar gradiometers and one magnetometer), recorded with VectorView, Elekta Neuromag.
- During acquisition, the signals were bandpass filtered between 0.1 and 200 Hz. The sampling rate was 1000Hz.
- Elekta Neuromag Maxfilter was used to suppress noise generated by sources outside the brain.
- 1 - 98 Hz bandpass filter and 50 Hz notch filter were applied.
- ICA was used for artefact detection and correction.
- A reconstructed MRI contour was co-registered with the MEG head coordinate system using head-shape points.
- Source localisation was performed for the average data using noise-normalised minimum norm estimation (MNE), executed with dynamic statistical parametric mapping (dSPM) [2].
- Source activity was reconstructed at specific regions of interest (ROI) in V1, V2d, V2v, V3, V4, V8 (Fusiform).
- In order to priorly select time windows of interest, we performed independent t-test on each data points in 100-300ms and acquired the time windows by cluttering neighbouring data points,
- We applied classical permutation test on the selected time windows of more than 20 data points.
- Response time (RT) and error rate (ER) were analysed with ANOVAs with the design Group (HC/SZ) X Stimulus (Fearful face / Neutral face / House).

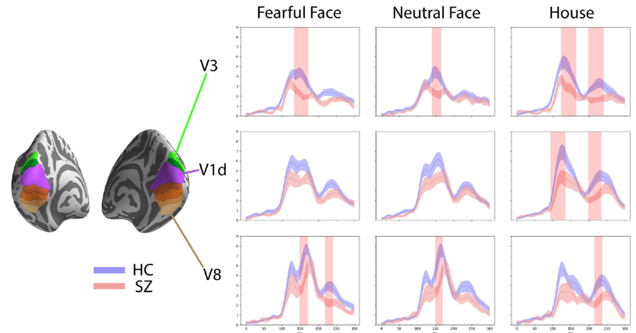
Results

Behavior

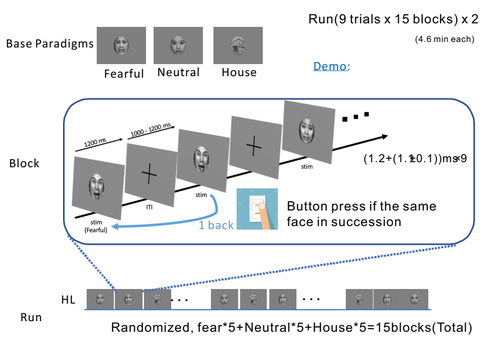
RT
- The Group X Stimulus interaction was not significant.
- RT was longer in SZ than HC. ($p < .05$).
- RT was shorter in house than in fearful face and neutral face. ($p < .05$).

ER
- The Group X Stimulus interaction was not significant.
- ER was bigger in SZ than HC. ($p < .05$).
- ER was in house than in fearful face and neutral face. ($p < .05$).

Source Waveform
- After selecting a-priori time of interest, the permutation test revealed a significant difference between HC and SZ in multiple ROIs of both right and left hemispheres (RH, LH).
- The difference of the effect for the early component (appx. 90 - 130 ms) was revealed to be significant between HC and SZ in V1d, V2d, and V2v in RH for house.
- The difference of the effect for M170 (appx. 150 - 170 ms) was revealed to be significant between HC and SZ in V8 (fusiform gyrus) in the right hemisphere for face stimuli (fearful face and neutral face).
- The difference of the effect for M250 (appx. 200 - 250 ms) was revealed to be significant between HC and SZ in ROIs below: V2v and V8 in LH, V2v, VP, V4v, V8 in RH for fearful face, V2v and VP in RH for neutral face, V1d, V2d, V2v, V3, V4v, and V8 in RH, and V1d, V2v, V3, VP. V4v, and V8 in LH for house.
- The effect for the peak component (appx. 130 - 160 ms) in V3 in RH was found to be significantly different in HC and SZ for all three stimuli.



Future Directions
- Study oscillatory changes in time-frequency domain.
- Develop social reconstruction techniques to investigate interaction of visual cortices with subcortical regions such as amygdala and hippocampus.
- Potential: collaboration with animal studies.



Conclusions

- In alignment with previous researches [3], the M170 activity was reduced in SZ, and the effect was dominant in RH.
- Contrary to some previous researches, the early component (appx. 90 - 130 ms) in early visual cortices (V1, V2d, V2v) did not reveal a significant difference in HC and SZ for face stimuli, but the difference was shown for house (V1d and V2d in RH).
- The behavioural study indicates the attention bias towards human faces could be retained in patients with SZ [4].

References

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