Comparison of the neuronal processing of schizophrenia patients and healthy controls during the Ultimatum Game

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Outline

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Introduction

Schizophrenia: severe and heterogeneous psychiatric disorder

- Positive symptoms: delusions, hallucinations, thought disorders
- Negative symptoms: anhedonia, asociality
- Reduced level of functioning in everyday life
- Cognitive deficits: attention, (working) memory, social cognition, executive functions
Introduction

- Ultimatum Game (UG): Paradigm to investigate monetary decision-making and social interactions

- No EEG studies comparing both groups so far

- AIM:
  - Compare the neuronal bases of patients and controls during the UG
Methods

- Participants: 19 controls, 16 patients
- 128 electrode encephalography

Analysis:
- Event-Related Potential Analysis
- Source Reconstruction
## Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients Group</th>
<th>Control Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>16</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Age range</td>
<td>22 – 36</td>
<td>20 – 35</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>26.38 (4.37)</td>
<td>26.37 (4.04)</td>
<td>0.996</td>
</tr>
<tr>
<td>Sex (male : female ratio)</td>
<td>12:4</td>
<td>10:9</td>
<td>0.177</td>
</tr>
<tr>
<td>Education (years)</td>
<td>12.13 (3.46)</td>
<td>15.76 (2.85)</td>
<td>0.003</td>
</tr>
<tr>
<td>WAIS – IV b</td>
<td>96.64 (9.93)</td>
<td>110.97 (12.62)</td>
<td>0.001</td>
</tr>
<tr>
<td>PDI c (total score)</td>
<td>96.94 (42.10)</td>
<td>55.68 (26.22)</td>
<td>0.003</td>
</tr>
<tr>
<td>BPRS d</td>
<td>52.31 (9.01)</td>
<td>28.53 (2.39)</td>
<td>0.000</td>
</tr>
<tr>
<td>SAPS e</td>
<td>7.20 (4.18)(^1)</td>
<td>0.32 (0.57)</td>
<td>0.000</td>
</tr>
<tr>
<td>CPZ equivalents f</td>
<td>541.98 (582.65)</td>
<td>–</td>
<td>0.003</td>
</tr>
</tbody>
</table>

\(^a\) Number of participants  
\(^b\) Wechsler Adult Intelligence Scale – 4th edition: mean of mathematics and vocabulary subscale  
\(^c\) Peters et al. Delusions Inventory  
\(^d\) Brief Psychiatric Rating Scale  
\(^e\) Scale for the Assessment of Positive Symptoms  
\(^f\) Chlorpromazine equivalents  
\(^1\) One missing value: not included in the corresponding analysis
Task Design

Proposer

Press the spacebar to start

+ Make your offer

or

F1

S1

Responder

Press the spacebar to start

Do you accept the offer

F1

S1

O1

R1

R1

O1

Goal: Gain maximum amount of money
Range: 1-10 CHF
Repetition: 3 alternated blocks of 30 trials (total: 90) each
Behavioral Results

Propositions

Acceptance Rates

* $p<0.05$
** $p<0.01$
Event-Related Potentials

P2:
- Working memory (WM) and attention

Feedback-Related Negativity (FRN):
- Resolution of conflict
- Emotional feedback
  (fair/unfairness; better/worse than expectation)
Event-Related Potentials

**p<0.01
Source Reconstruction

FRN (320 - 360ms) in the responder condition

Significant difference (p<0.05) between the two groups in the left medial prefrontal cortex (mPFC)

mPFC: implicated in decision-making, reasoning, social cognition and empathy
Summary of Main Findings

- More hyperfair offers by patients
- FRN component less pronounced in patients in responder condition
- Different activation of mPFC in FRN timeframe in responder condition
Conclusions

- Only difference in the neuronal processing in the FRN component of the responder condition

- Distrust leads to little expectations and positive surprise might be reflected in less pronounced FRN component

- Difference associated with difficulty in interpreting somebody else’s behavior
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