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

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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

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

[a] Number of participants

[b] Wechsler Adult Intelligence Scale – 4th edition: mean of mathematics and vocabulary subscale
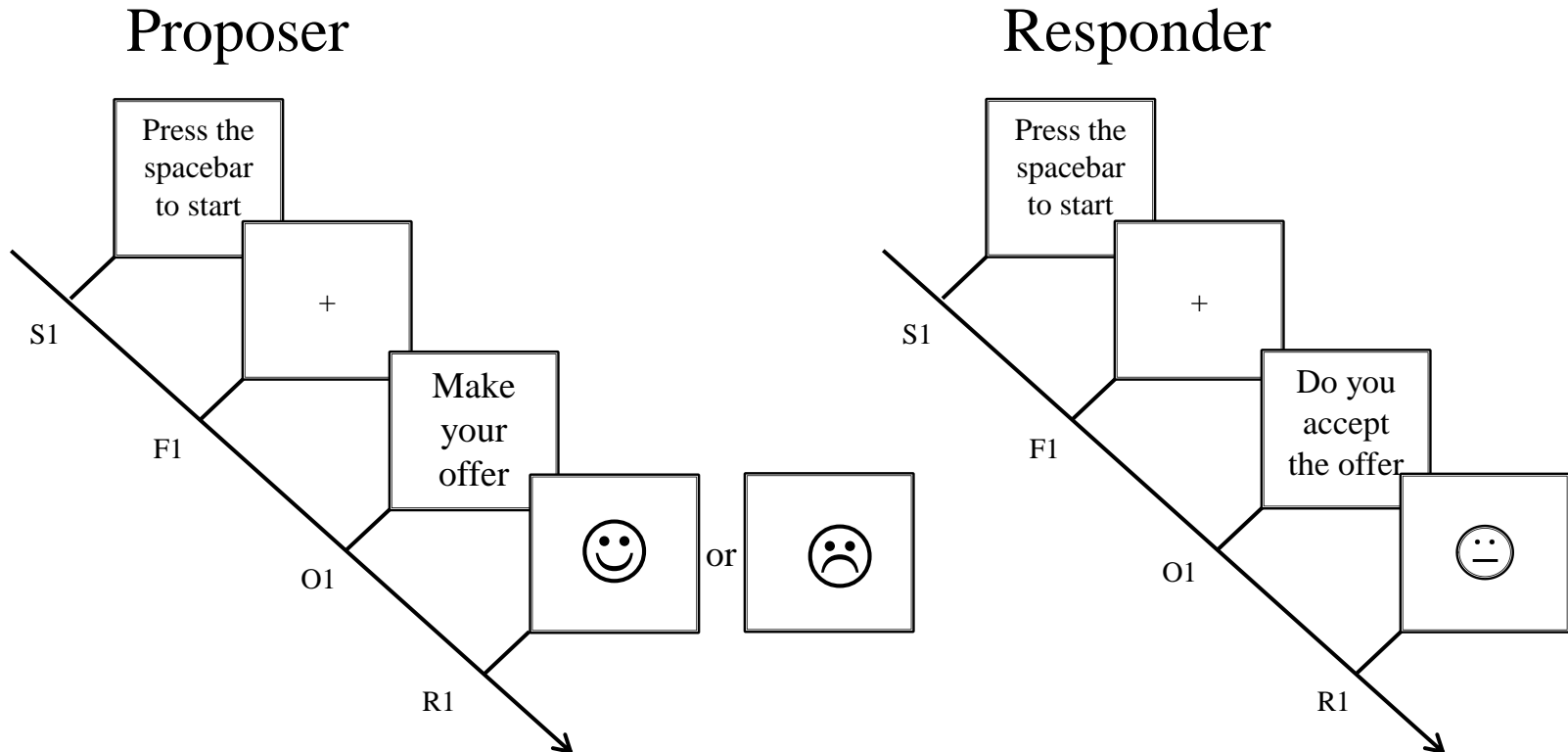
[c] Peters et al. Delusions Inventory

[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

Responder

Press the spacebar to start

S1

+

F1

Make your offer

O1

☺ or ☹

R1

Press the spacebar to start
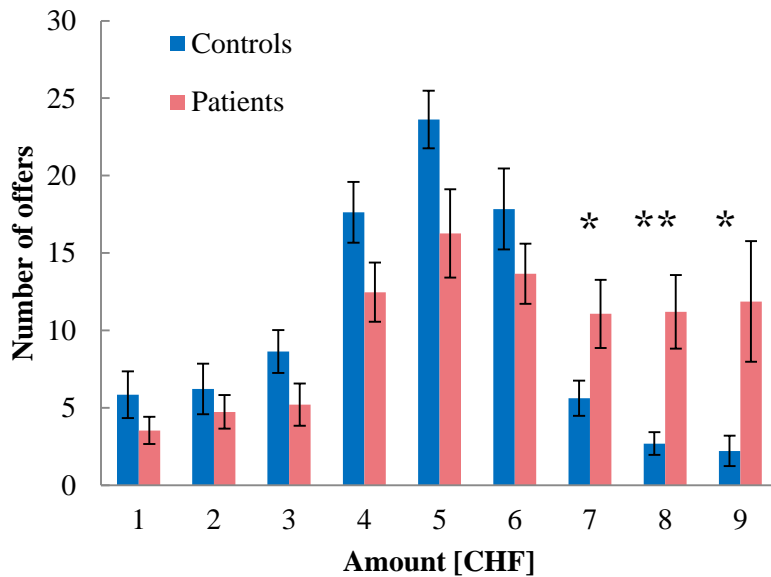
S1

+

F1

Do you accept the offer

O1

😐

R1

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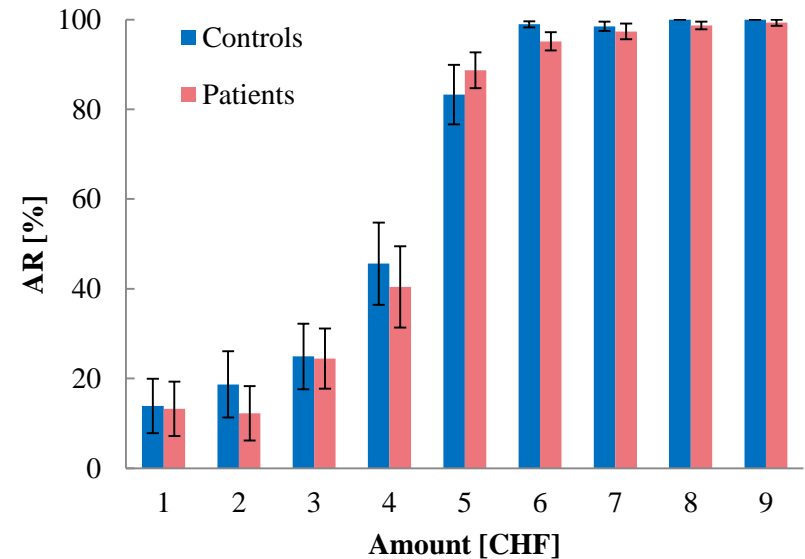Repetition: 3 alternated blocks of 30 trials (total: 90) each
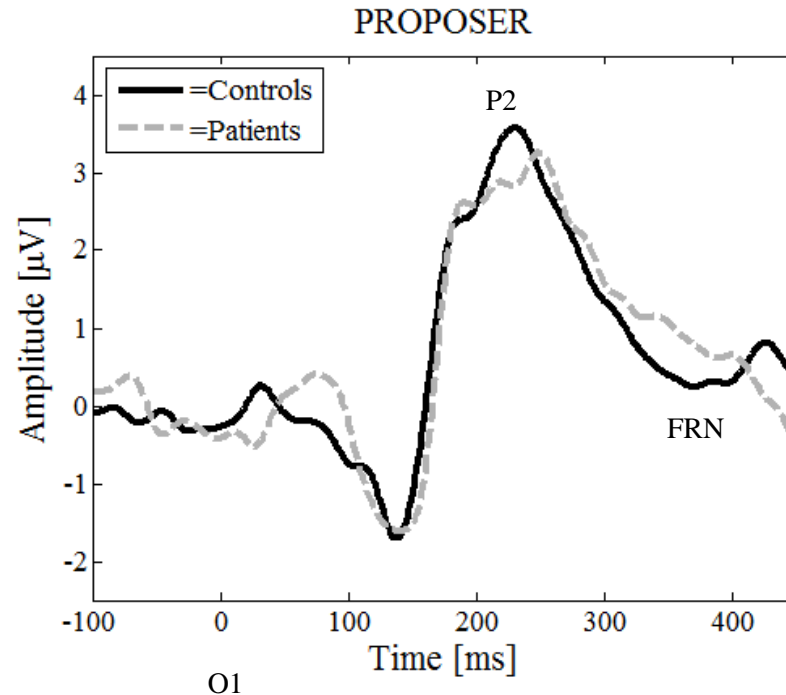
Behavioral Results

Propositions

Acceptance Rates

*p<0.05
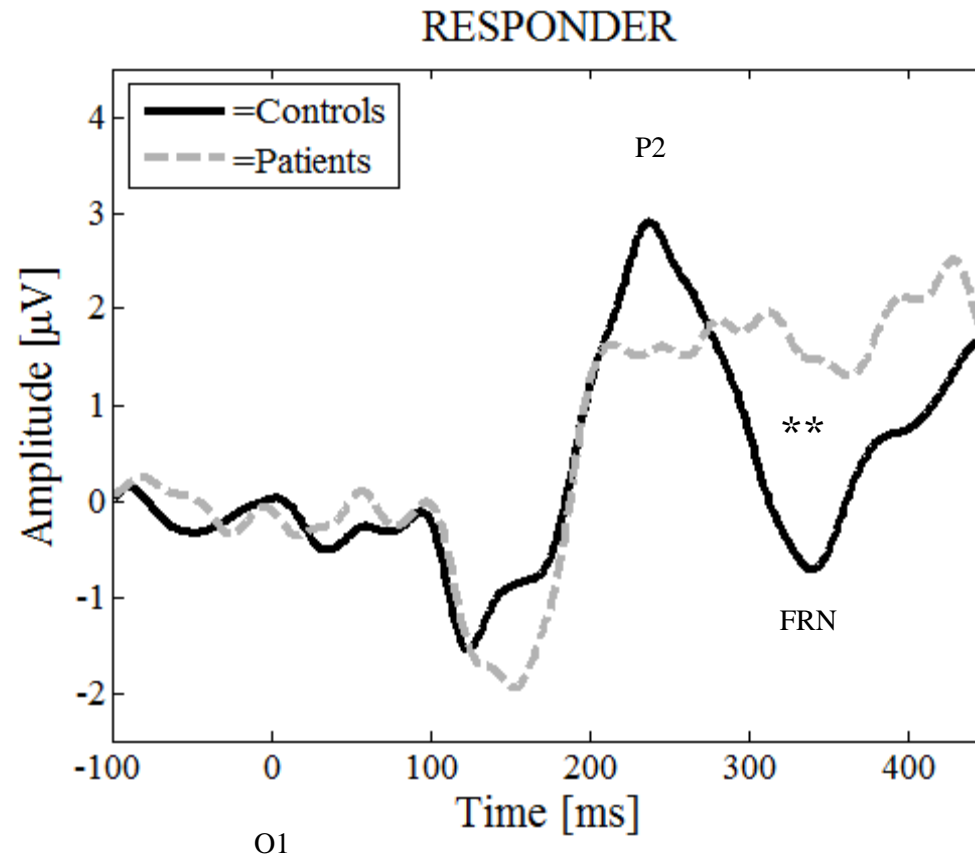**p<0.01

Event-Related Potentials

P2:
- Working memory (WM) and attention

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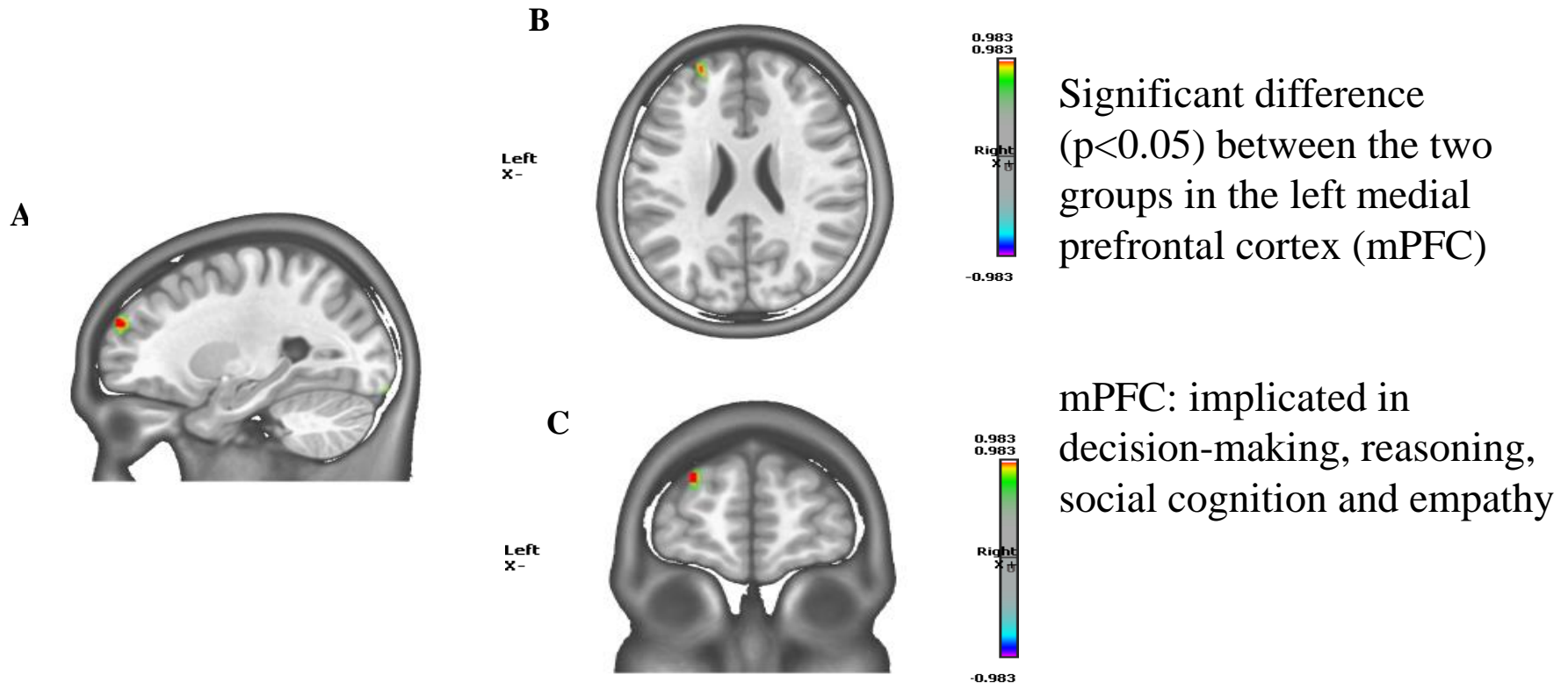- Emotional feedback (fair/unfairness; better/worse than expectation)

Event-Related Potentials

RESPONDER

**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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