

Distinct neuronal bases involved in the proposer and responder condition of the ultimatum game

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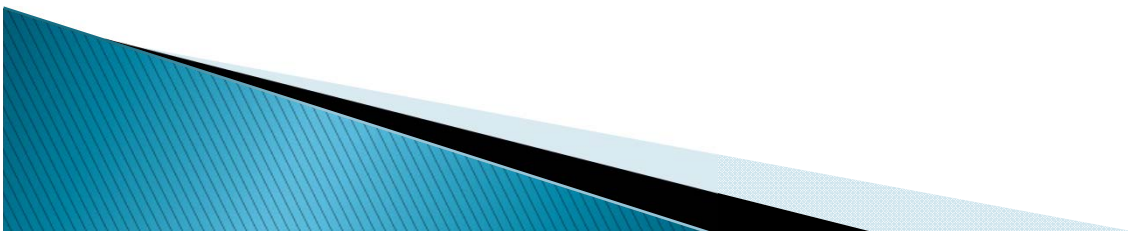
Outline

- ▶ Introduction
- ▶ Methods
- ▶ Task Design
- ▶ Behavioral Results
- ▶ EEG Results
 - Event-Related Potentials
 - Independent Component Analysis
 - Source Reconstruction
- ▶ Summary
- ▶ Conclusion
- ▶ Acknowledgements

Introduction

- ▶ Ultimatum Game (UG): Paradigm to investigate monetary choices
- ▶ Behavior of humans already well established
- ▶ Underlying cognitive processes remain poorly understood

- ▶ AIM:
 - Examine the neuronal bases of the specific behaviors of the proposer and responder condition

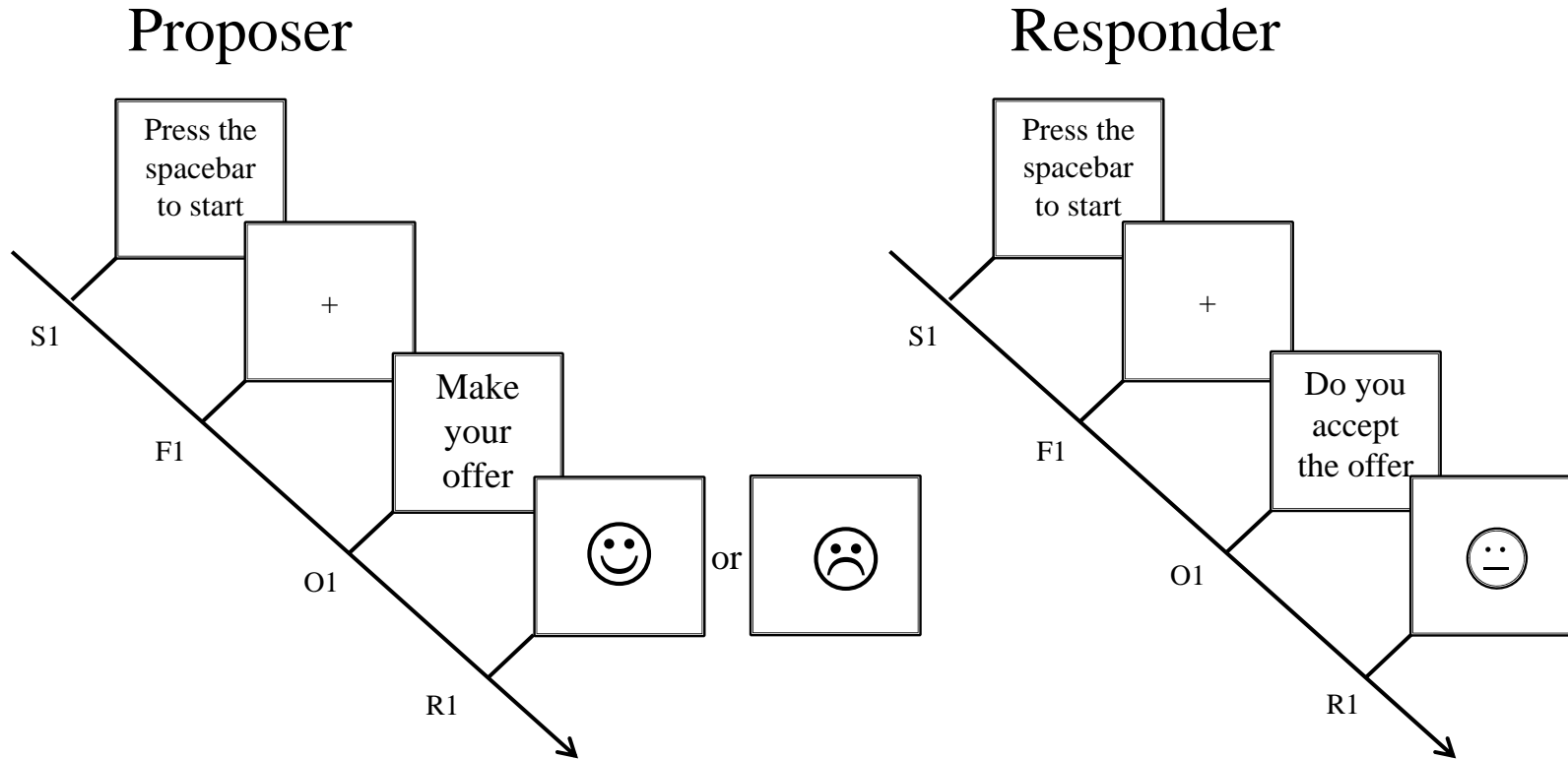


Methods

- ▶ 12 healthy participants
- ▶ 128 electrode encephalography
- ▶ Analysis:
 - Event-Related Potential Analysis: time-locked brain responses
 - Independent Component Analysis
 - Source Reconstruction



Task Design



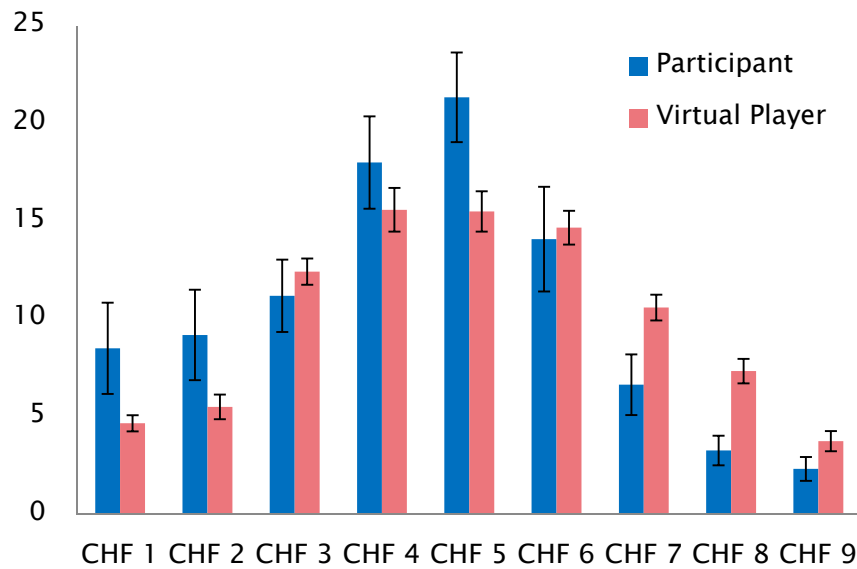
Goal: Gain maximum amount of money

Range: 1-10 CHF

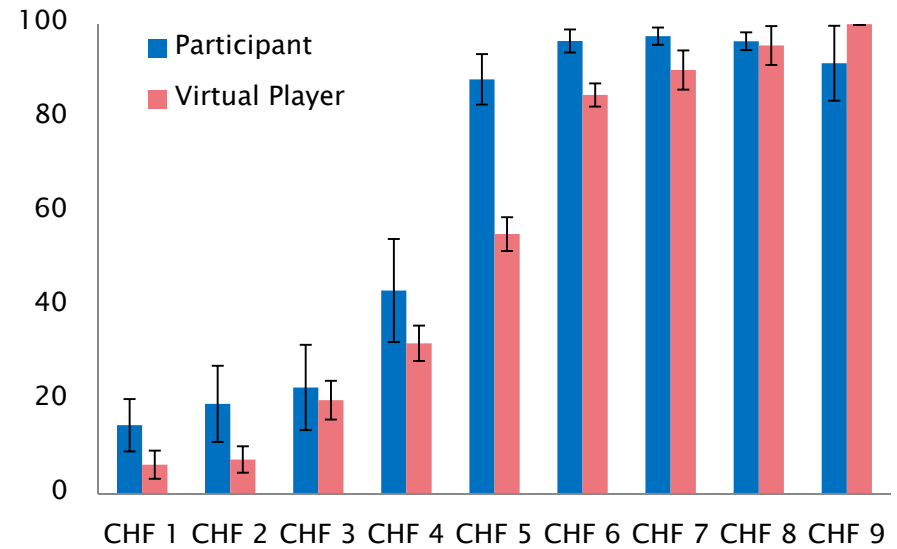
Repetition: 3 alternated blocks of 30 trials (total: 90) each

Behavioral Results

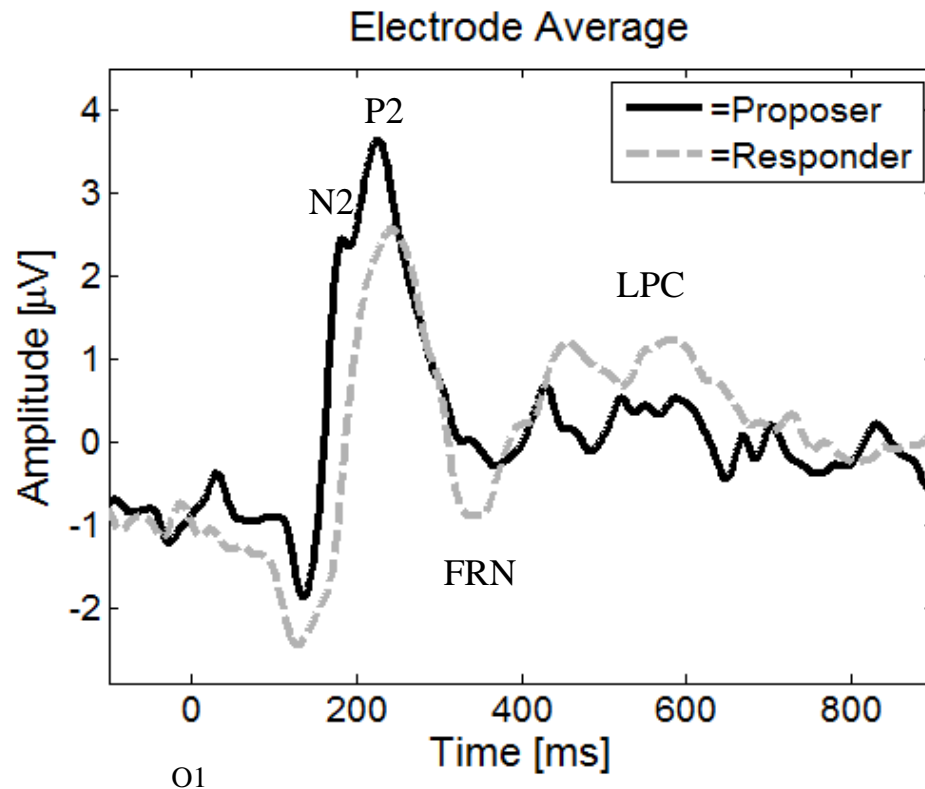
Propositions



Acceptance Rates (%)



Event-Related Potentials



PROPOSER

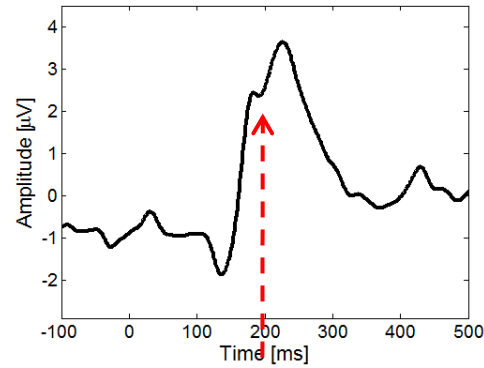
- Shorter latency and increased amplitude for the P2 component (170 – 260ms)
- Supplementary component N2 (170 – 190ms)

RESPONDER

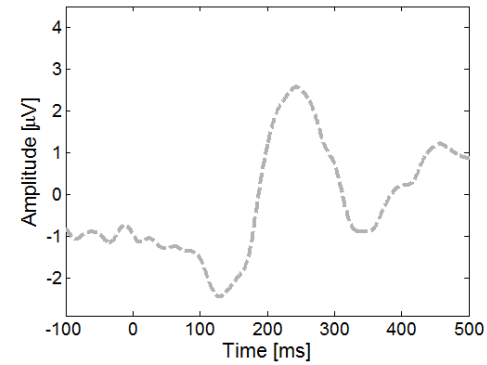
- Shorter latency and increased amplitude for the feedback-related negativity (FRN) component (280 – 360ms)
- Higher mean activity for the late positive component (LPC) (360 – 820ms)

Independent Component Analysis

Proposer



Responder



N2

ICA-1P

6.6%



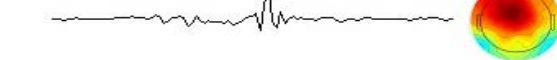
ICA-1R

2.5%

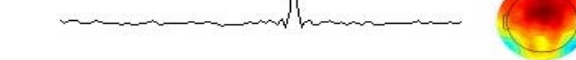


P2

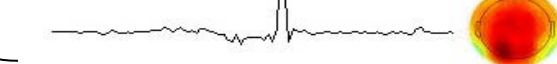
ICA-2aP



ICA-2aR



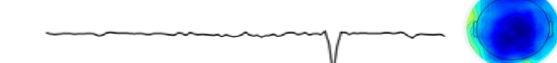
ICA-2bP



ICA-2bR



ICA-3aP



ICA-3aR



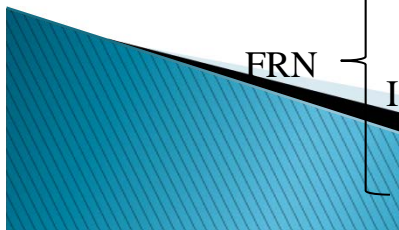
ICA-3bP



ICA-3bR

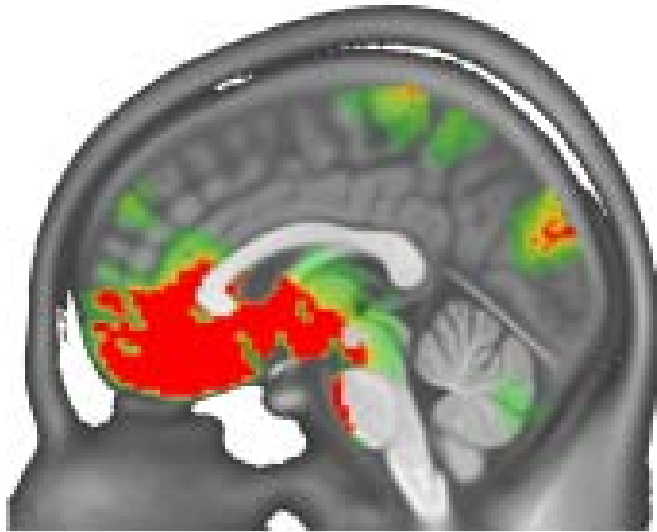


FRN



Source Reconstruction

N2 time range (170-190ms)



PROPOSER

- Higher activity in orbitofrontal cortex
- Higher activity in anterior cingulate cortex

Summary of Main Findings I

- ▶ N2:
 - only present in Proposer condition
 - ACC and orbitofrontal cortex activation
 - Conflict monitoring – more choices in Proposer

- ▶ P2:
 - Longer latency and smaller amplitude for Responder
 - Working memory (WM) and attention involved
 - Responder condition demands a higher WM activation as threshold of acceptance has to be kept in mind

Summary of Main Findings II

- ▶ Feedback-Related Negativity:
 - Higher amplitude and shorter latency for Responder
 - Resolution of conflict if rules change (feedback processing)
 - Emotional feedback (fair/unfairness)

- ▶ Late Positive Component:
 - Higher mean activity for Responder condition
 - Active maintenance and updating of WM
 - Responder condition demands a higher WM activation as threshold of acceptance has to be kept in mind

Conclusions

- ▶ Proposing an offer or responding to it require the involvement of distinct neuronal networks at different time points during the decision-making process
- ▶ Different cognitive processes seem to be engaged in both conditions although proposer and responder both aim to gain the maximal amount of money

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- ▶ Dr. Jonas Richiardi, PhD (UniGe): Source Reconstruction
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