



**HAL**  
open science

## Rivalry and reward processing: an ERP study

Agnès Falco, Eve Fabre, Anne-Claire Rattat, Isabelle Paul, Cédric T. Albinet

► **To cite this version:**

Agnès Falco, Eve Fabre, Anne-Claire Rattat, Isabelle Paul, Cédric T. Albinet. Rivalry and reward processing: an ERP study. NeuroFrance 2017, May 2017, Bordeaux, France. . hal-02902144

**HAL Id: hal-02902144**

**<https://hal.science/hal-02902144>**

Submitted on 22 Jul 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Agnès Falco<sup>a</sup>, Eve Fabre<sup>b</sup>, Anne-Claire Rattat<sup>a</sup>, Isabelle Paul<sup>a</sup>, Cédric Albinet<sup>a</sup>,  
a, Laboratoire Sciences de la Cognition, Technologie, Ergonomie (SCoTE) EA 7420, Université de Toulouse, INU Champollion, ALBI, France  
b ISAE-supaero, Université Fédérale de Toulouse

[agnes.falco@univ-jfc.fr](mailto:agnes.falco@univ-jfc.fr)

## 1-INTRODUCTION

The Ultimatum Game (Guth et al., 1982) has been widely used to investigate fairness consideration during economic interactions in social context (e.g., Alexopoulos et al., 2012; Fabre et al., 2015). In this paradigm, the proposer receives a fix amount of money (e.g., 10€) and s/he was required to share a given sum of money with the responder. If the responder accepts the share, the sum will be divided as chosen by the proposer, however if the responder refuses, none of them will receive anything.

Usually, proposers and responders are randomly paired in this paradigm. However, the impact of being chosen by the proposer for an economic interaction (i.e., social reward) on the responder's fairness consideration of an offer has never been investigated.

**Aim:** In the present study, we investigated to what extent being chosen for an economic interaction over a rival modifies the fairness consideration of an economic offer and the associated neural correlates.

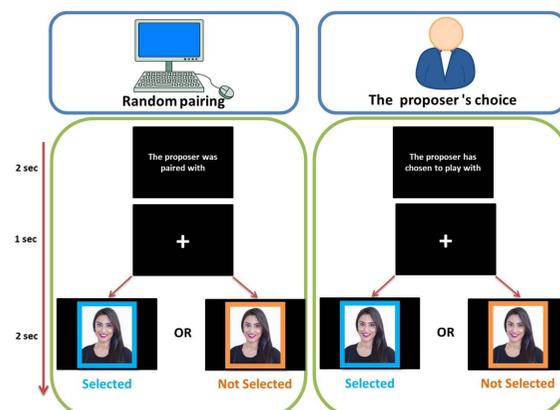
Participants played a modified Ultimatum game as responders. They were in competition with a "rival" responder, in that only one of them was selected to interact economically with the proposer. The pairing between the proposer and one of the responders could be randomly done by a computer (i.e., random pairing) or chosen by the proposer (i.e., proposer choice) based on the responders' photos. Participants were unaware that both the proposer and the rival responder were fictitious.

Here we present the preliminary electrophysiological results associated with the selection feedback (i.e. being selected or not for the economic interaction) depending on the selection mode (i.e., random pairing vs. proposer's choice).

## 2- Method

**Participants :** 30 participants (15 women) play the ultimatum game as responder.

**Acquisition and EEG processing :** EEGs were recorded from 32 scalp sites using electrodes mounted in an elastic cap (Biosemi) according to the international 10–20 system.



**Figure :** Depending on the experimental condition, the following inscription appears: "the proposer was paired with / has chosen to play with". Then the participant's photo appears on the screen, framed in blue or orange respectively whether he was selected or not for the economic interaction. The electrophysiological measurements are fixed on the onset of the participant's photo.

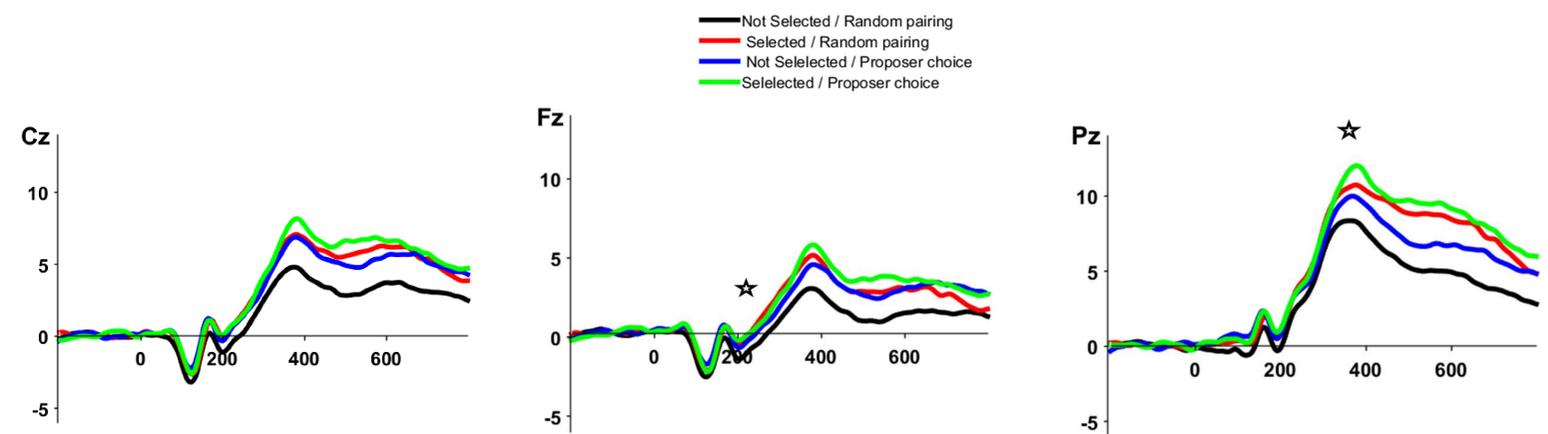
## 3- RESULTS

**Data analysis:** We present the evoked potentials (PE) associated to the fact of being selected or not by a human or a computer on social interactions. The N200 component and the P300 component were assessed at Fz, Cz and Pz in terms of Peak latency amplitude respectively in the 180-220ms time window and in the 310-410ms time window. Each time, a 2 ANOVA [2 (Genre: Man, Woman) x 2(Choice: selected; not selected) x 2 (Selector: Proposer; computer) analysis of variance (ANOVA) tests were performed. LSD was used for post hoc contrasts.

### Electrophysiological results:

**N200 component:** The ANOVA revealed a main effect of choice  $F(1,28) = 7.71, p < .01, \eta p^2 = .22$  with greater amplitude measured at FZ when the competitor was selected ( $M = -1.16 \mu V$ ) than when the participant was selected ( $M = -.40 \mu V$ ).

**P300 component:** The ANOVA revealed a significant Choice x Selector interaction [ $F(1, 28) = 48.18, p < .000, \eta p^2 = .63$ ] at Pz, with greater P300 amplitudes when participants were chosen by the proposer ( $M = 10.99 \mu V$ ) than when the participant was randomly paired with the proposer by the computer ( $M = 4.93 \mu V$ ). No significant differences were found when competitors were selected.



**Figure :** Grand average ERP waveforms at Fz, Cz, Pz

## 4- DISCUSSION

The aim of this study was to investigate the impact of rivalry on social interactions and the associated neural correlates.

The greater N200 amplitudes were observed when the competitor was selected for the interaction, regardless of the nature of the selection (i.e., random pairing vs. selection by the proposer). This increase in amplitude reflects the negativity of the selection feedback, i.e., the participant has been excluded from the economic interaction.

The greater P300 amplitudes were observed when participants were chosen by the proposer but not when they were randomly selected by the computer. However, no significant amplitude differences were observed for the competitors.

The greater P300 amplitudes observed when the participants are chosen by the proposer suggest an increase in attentional resources allocated to the task when the participants are selected by a human being (i.e., social interaction) than by a machine.

This research has partially been supported by the Région Occitanie / Pyrénées-Méditerranée

## 5- References

- Alexopoulos, J., et al., (2012). *Frontiers in Human Neuroscience*, 6, 59.
- Güth, W., et al., (1982). *Behavior and Organization* 3(4), 367–388
- Fabre, E.F., et al., (2015). *Neuropsychologia* 75, 221-232.
- Rigoni, D., et al., (2010). *Brain Research Bulletin*. 81, 445–452.