

The lexical nature of alpha-beta desynchronisation in context-driven word production

Elena Rossetto¹, Jana Klaus¹, Vitória Piai^{1,2}

¹Radboud University, Donders Centre for Cognition, Nijmegen, The Netherlands; ²Radboud University Medical Center, Donders Institute for Brain Cognition and Behaviour, Department of Medical Psychology, Nijmegen, The Netherlands

INTRODUCTION

Previous studies: sentential constraint effect

- behavioral: picture naming is faster following constraining than non-constraining sentential contexts¹
- electrophysiological: alpha/beta desynchronization (8-30 Hz) for constraining relative to non-constraining contexts, pre-picture onset¹
- Evidence for different ease of memory access as function of sentential context

Is this pre-picture desynchronization reflecting lexical-semantic processes?

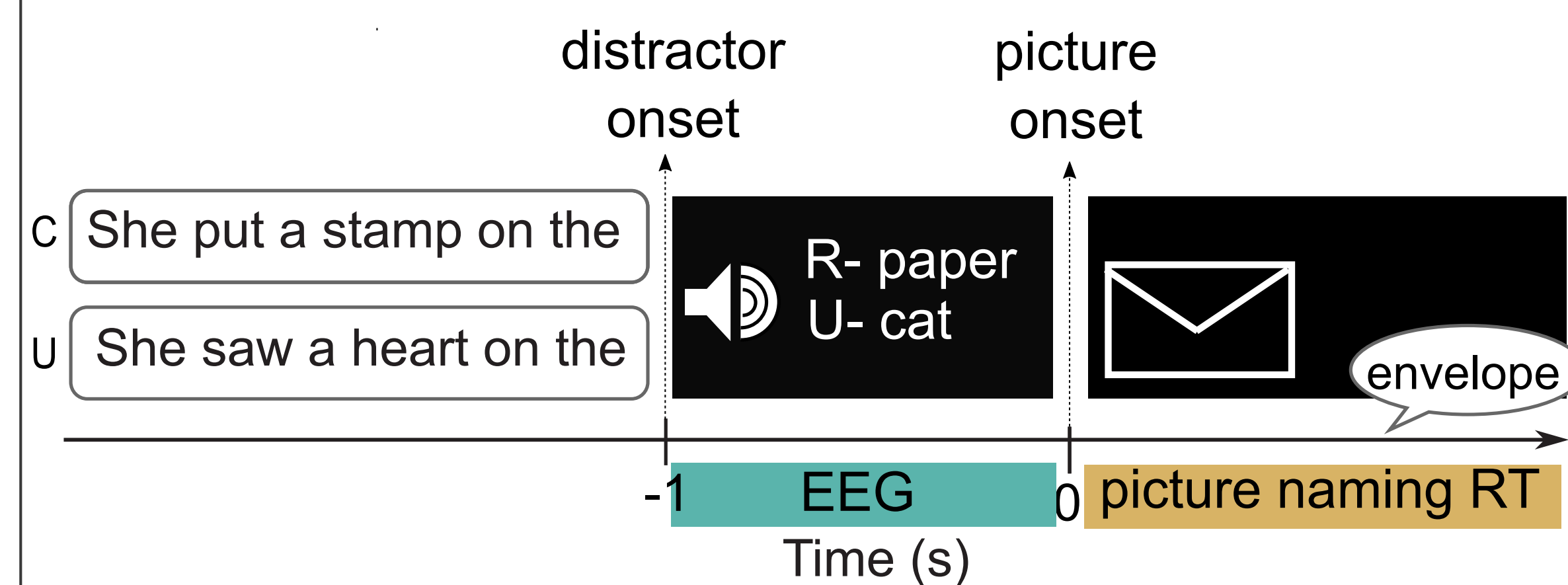
Current study: auditory³ distractor relatedness effect

Is the pre-picture alpha-beta desynchronization affected by the relatedness of the distractor to the context of the sentence?

METHOD

TASK

"name the picture after reading the sentence"



distractor words' average length: 602 ms ($sd = 132$)

PARTICIPANTS

- 16 native speakers of Dutch (6 m, mean age= 22.6, $sd=2.8$)
- All right-handed, with normal or corrected-to-normal vision, and no history of neurological or language deficits.

DESIGN

2x2 factorial design:

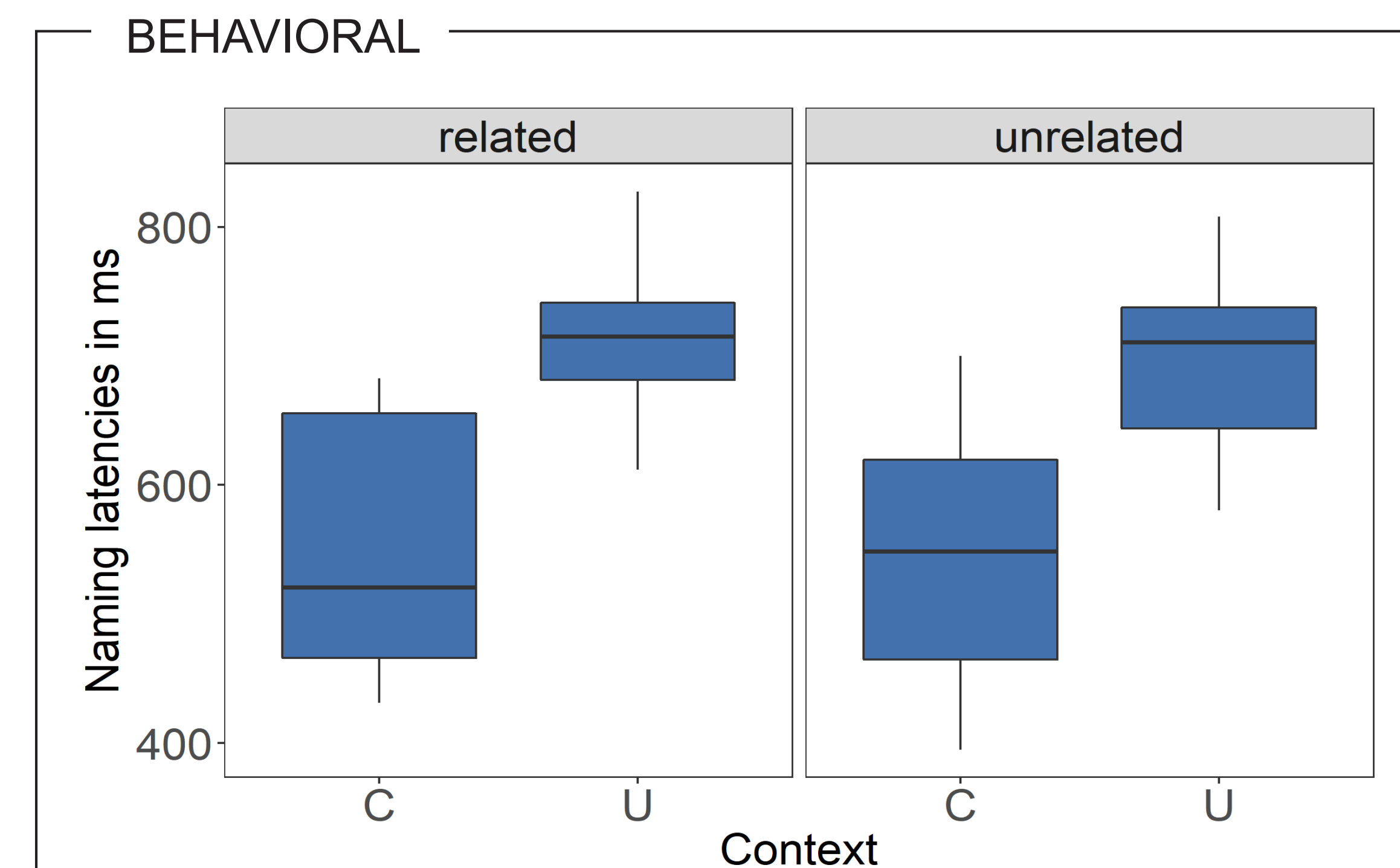
- sentential constraint (**C**onstrained or **U**nconstrained)
- distractor relatedness (**R**elated or **U**nrelated)

200 trials in total, 50 sentences per context-distractor pairs condition

ANALYSIS

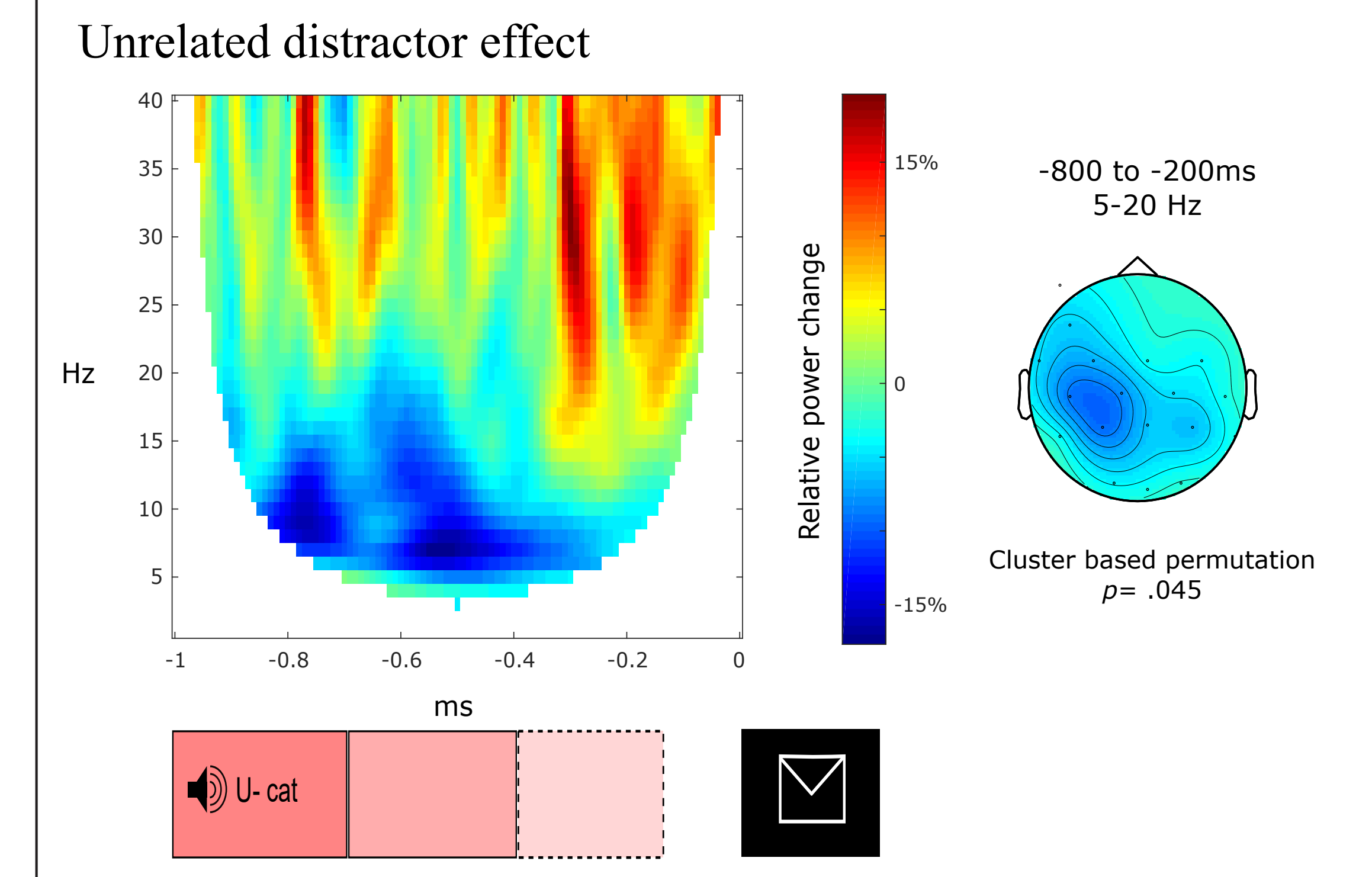
- Linear mixed-effects models analysis
- Time-resolved spectral decomposition
- Cluster-based permutation statistics

RESULTS



- Main effect of sentential constraint:
 $\beta = -76.52, SE = 8.44, t = -9.07$
- No effect of distractor relatedness:
 $\beta = 0.77, SE = 2.69, t = 0.29$
- No interaction sentential constraint and distractor relatedness
 $\beta = -1.82, SE = 2.63, t = -0.69$

OSCILLATORY BRAIN RESPONSES

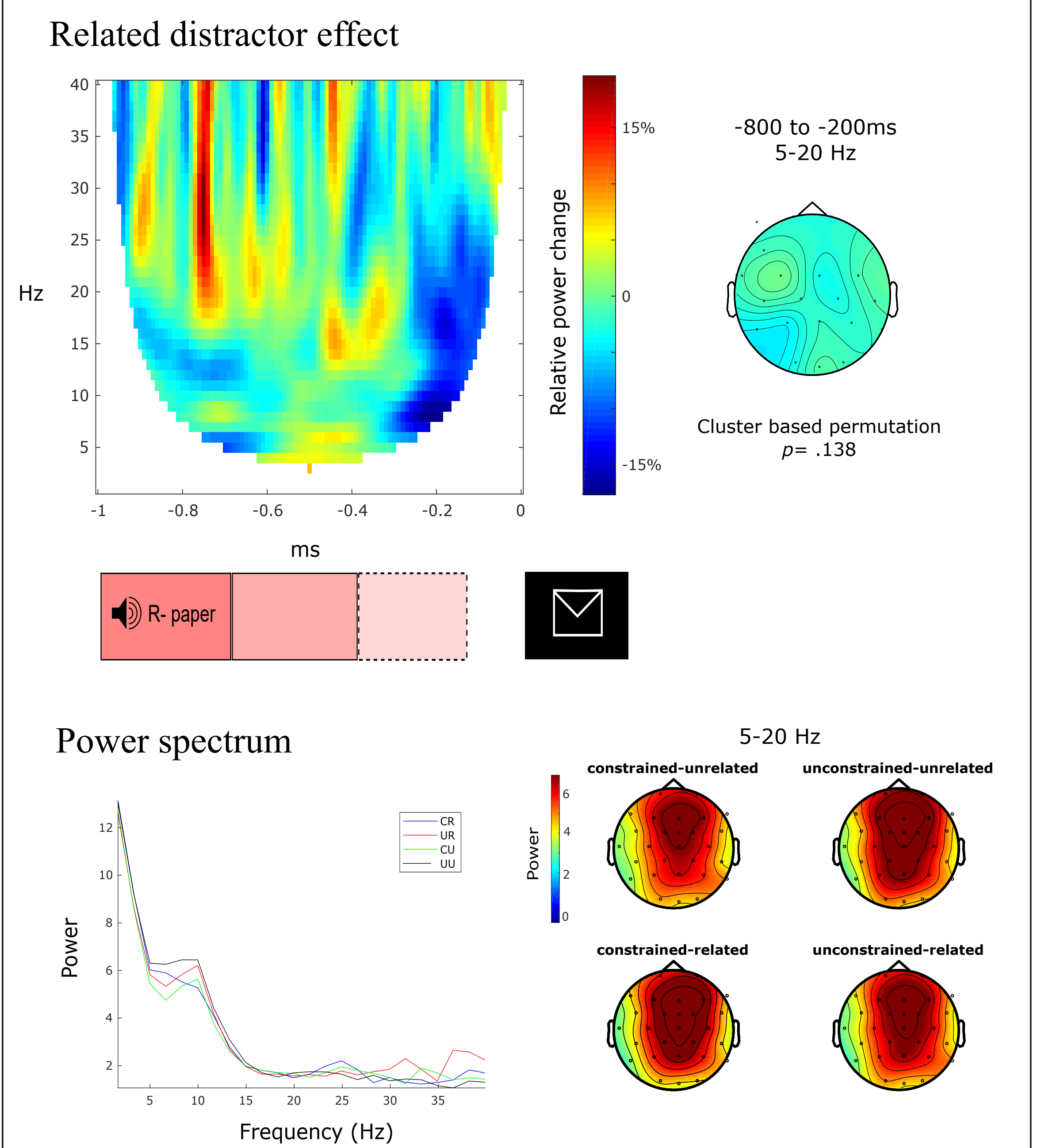


REFERENCES

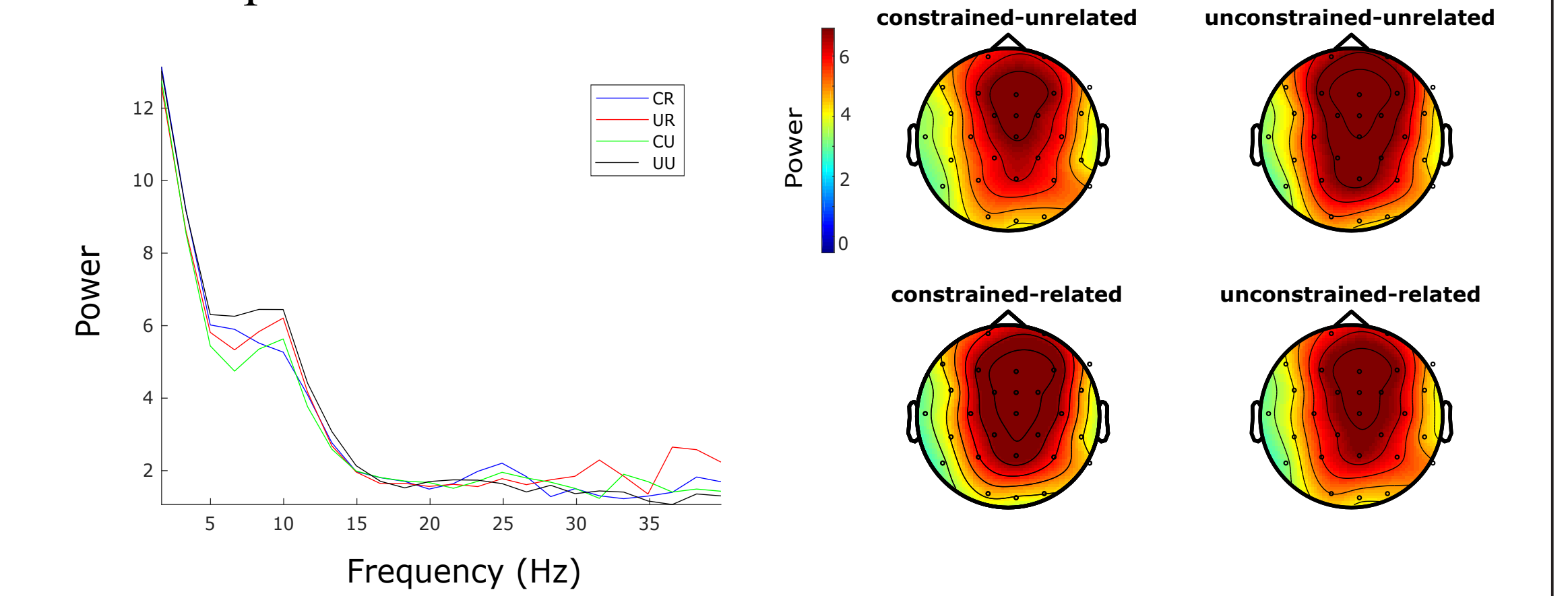
- 1 Piai, Roelofs, Maris (2014). *Neuropsychologia* 53, 146–156
- 2 Hanslmayr, Staudigl, Fellner (2012). *Front Hum Neurosci.* 6, 74
- 3 Damian, Martin (1999). *J Exp Psychol Learn Mem Cogn.* 25 (2), 345-361

RESULTS

OSCILLATORY BRAIN RESPONSES



Power spectrum



CONCLUSIONS

- The behavioral context effect was replicated but was not modulated by the distractor manipulation.
- The context-related alpha-beta desynchronization pre-picture onset was observed only when distractors were semantically unrelated to the picture.
 - unrelated distractor: more information to encode, higher desynchronization.²
 - related distractor: more lexical competition that needs to be inhibited through more synchronization², which results in the disappearance of the context effect

Alpha-beta desynchronization appears to be modulated by the relatedness of the distractors, showing a possible electrophysiological signature of lexical-semantic retrieval mechanisms during context-