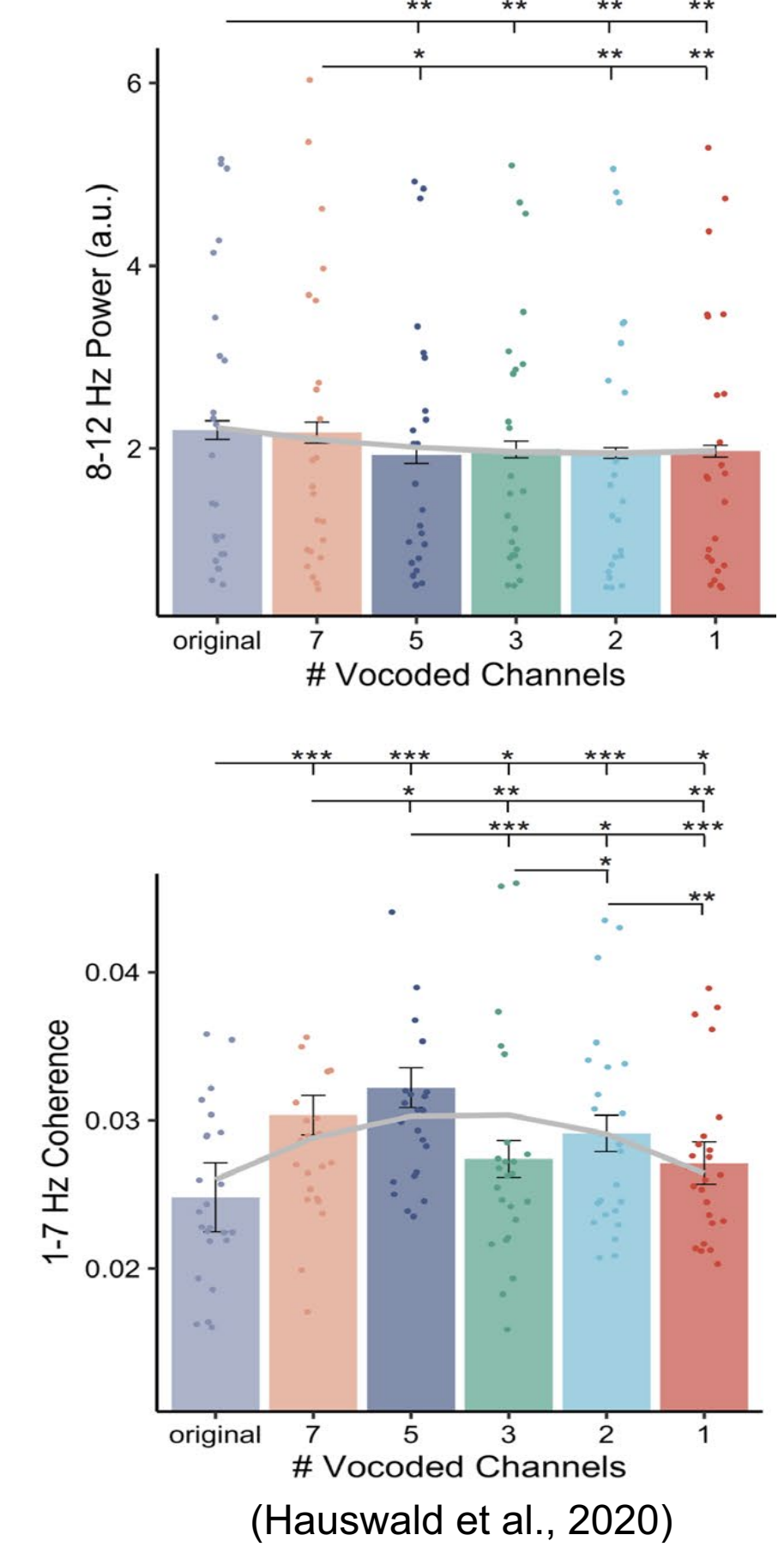


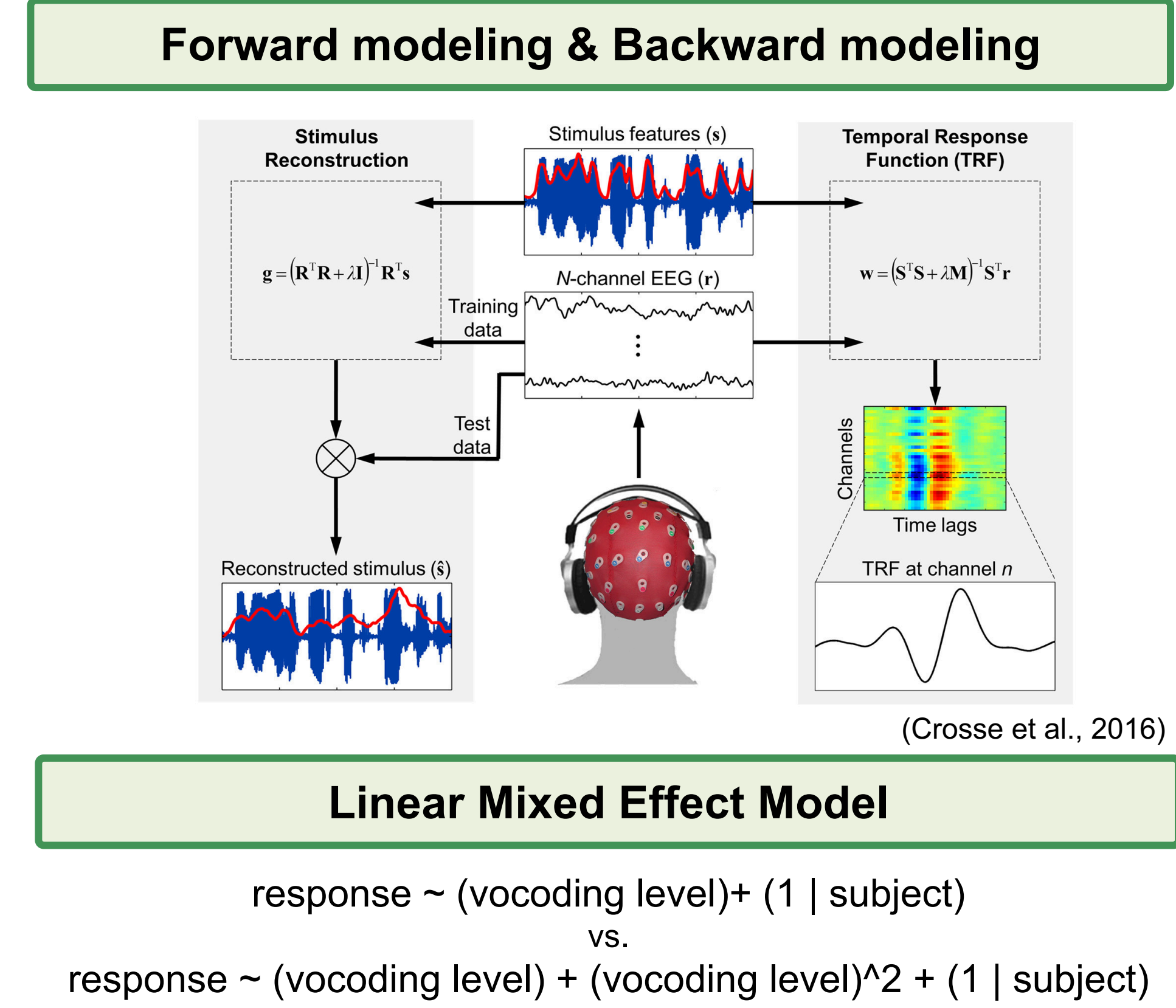
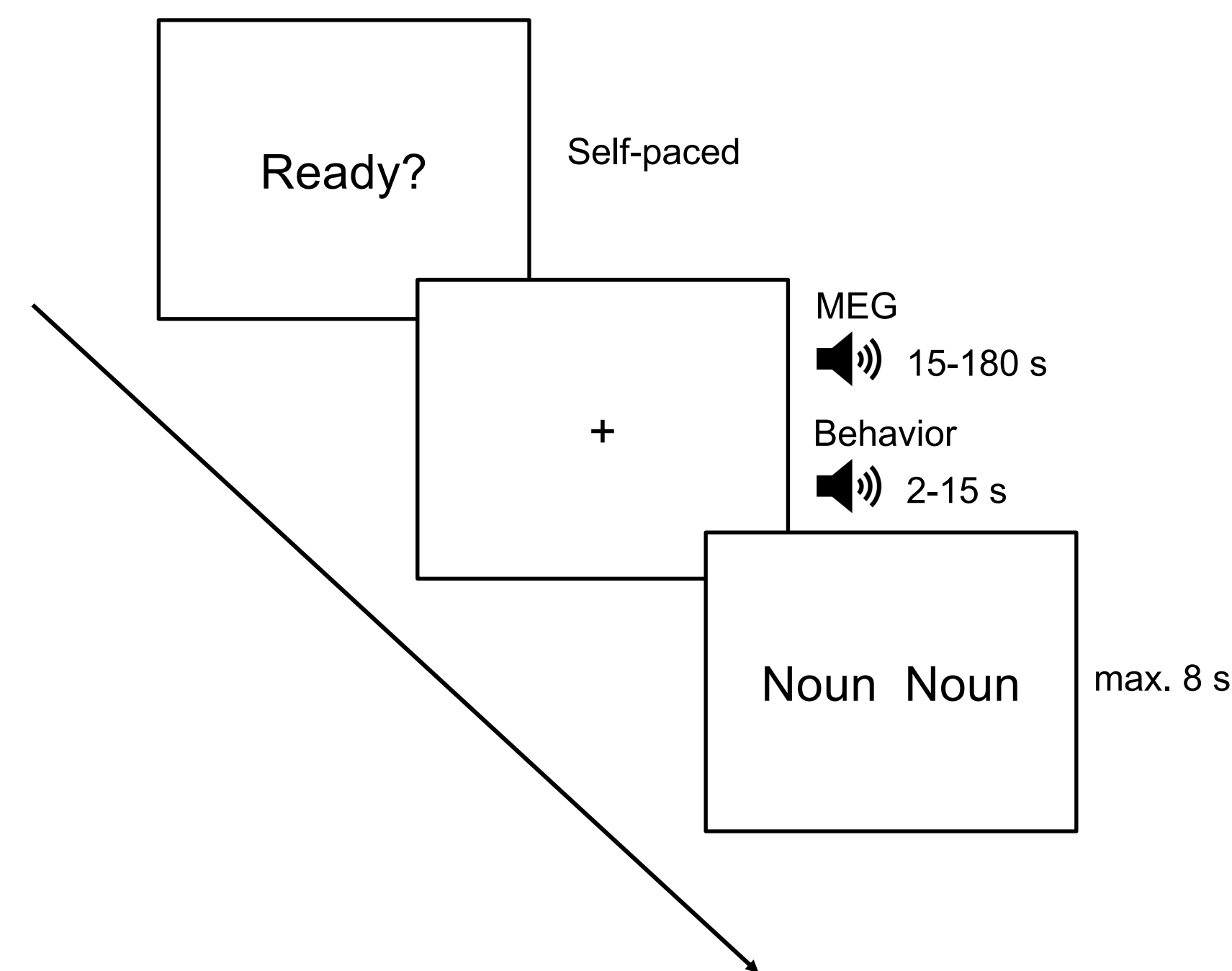
# Neural Temporal Dynamics of Continuous Degraded Speech Processing

## Introduction

- We have shown recently (Hauswald et al., 2020) for continuously vocoded speech that alpha power decreases with increased degrading, whereas theta coherence increases as long as the speech is comprehensible. However, the applied measures provide a static measure of neural activities.
- In the present study, we applied temporal response functions (TRFs) in order to derive the spatio-temporal sequence of neural activities elicited by changes in the signal envelope.
- We also reconstructed the speech envelopes to explore how vocoded speech modulates speech tracking with regularized linear regression approach.



## Methods

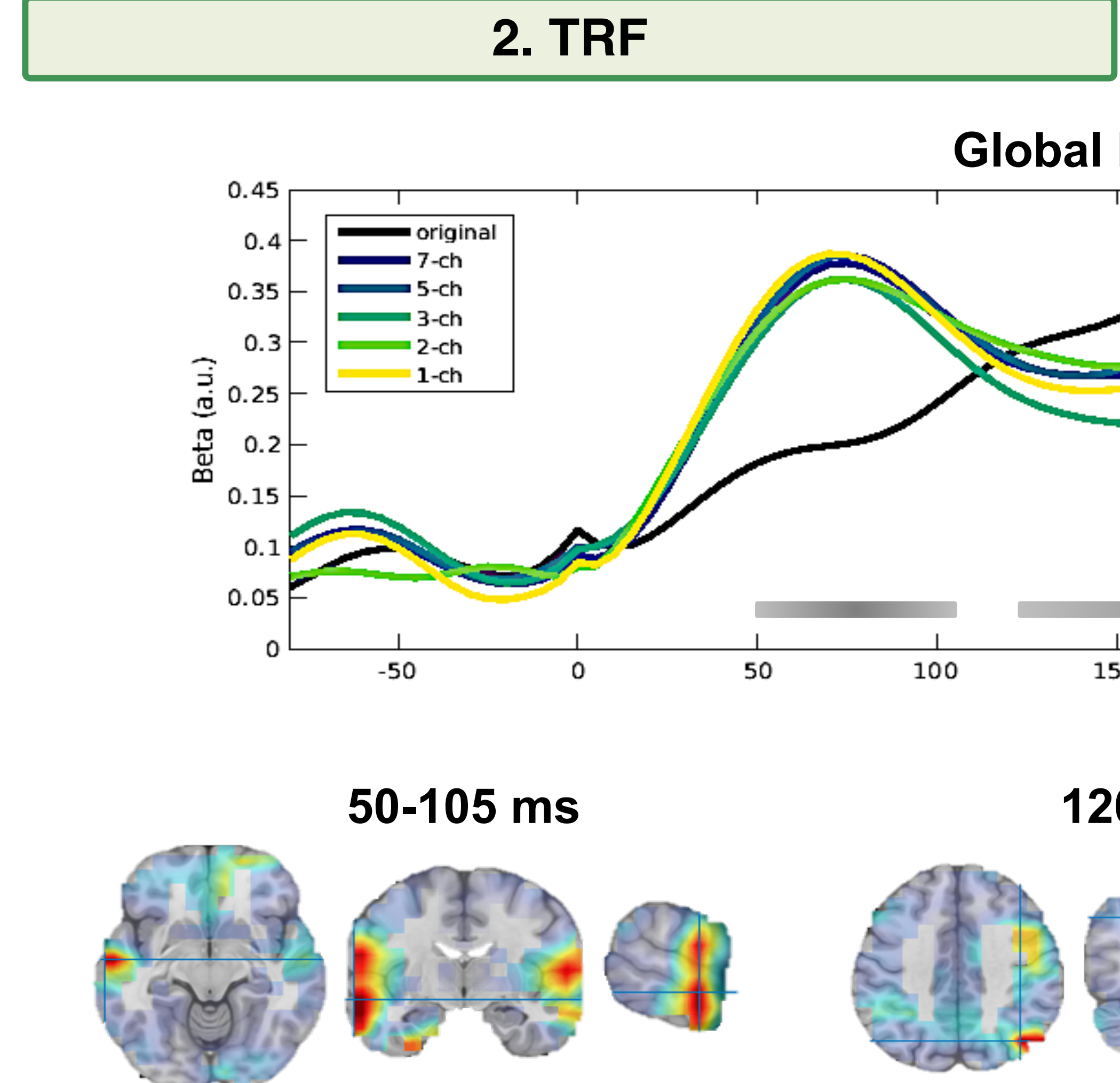
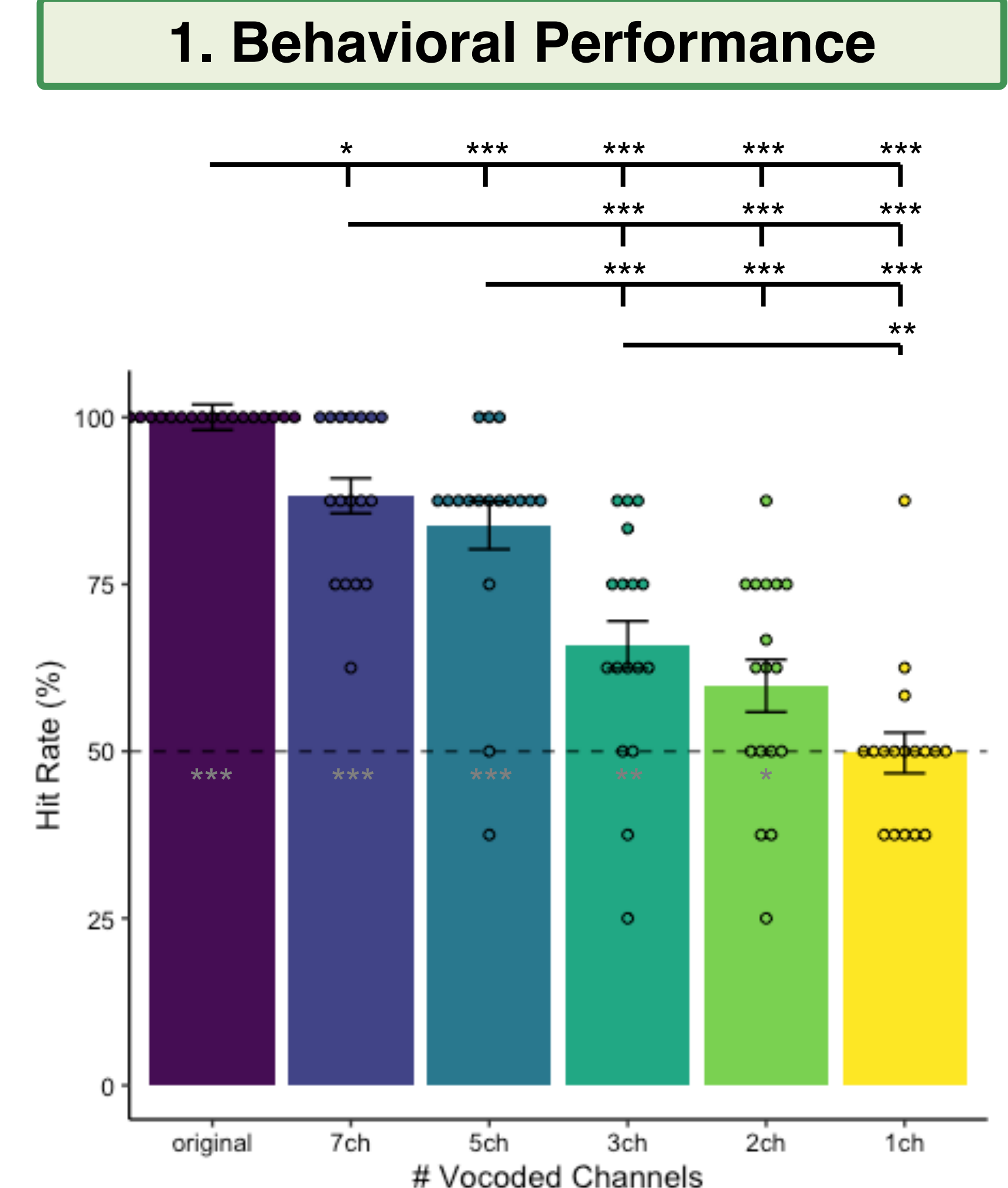


- There were 24 healthy adults participating in an MEG experiment, and 17 of them also participated in a behavior experiment.
- In both tasks, there were six levels of vocoding conditions (original, 7-, 5-, 3-, 2-, and 1-channel).
- Participants were required to indicate which word is the last noun they heard in the last sentence.

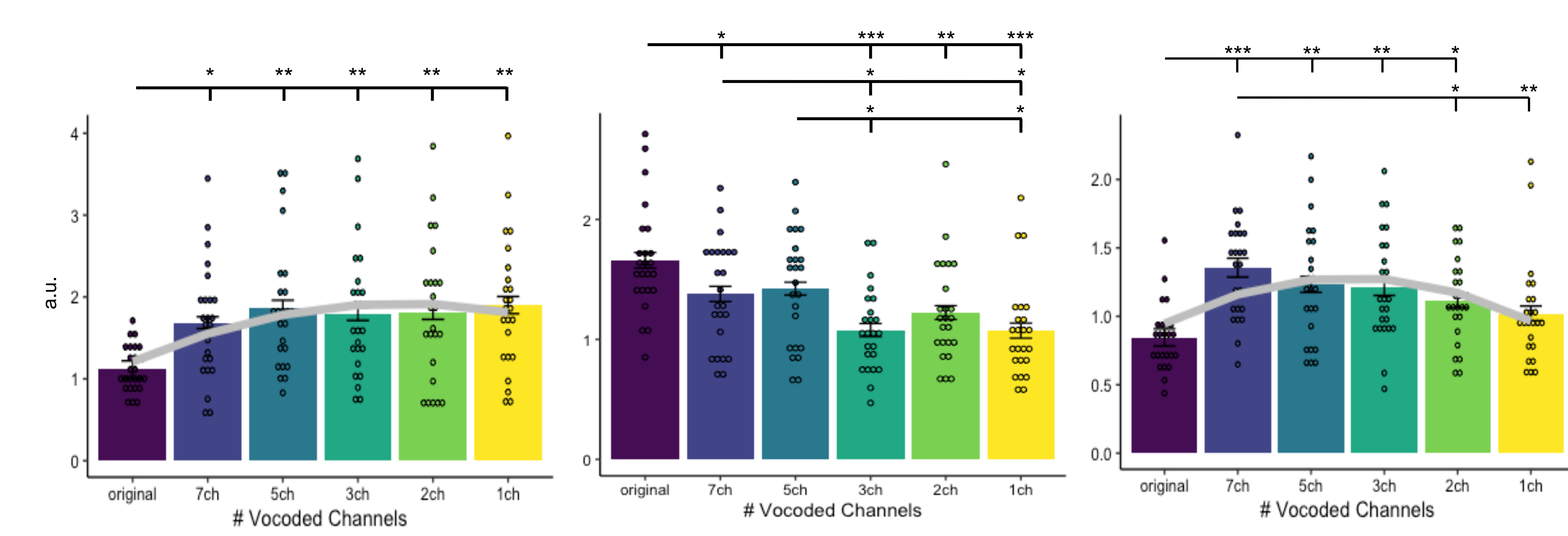
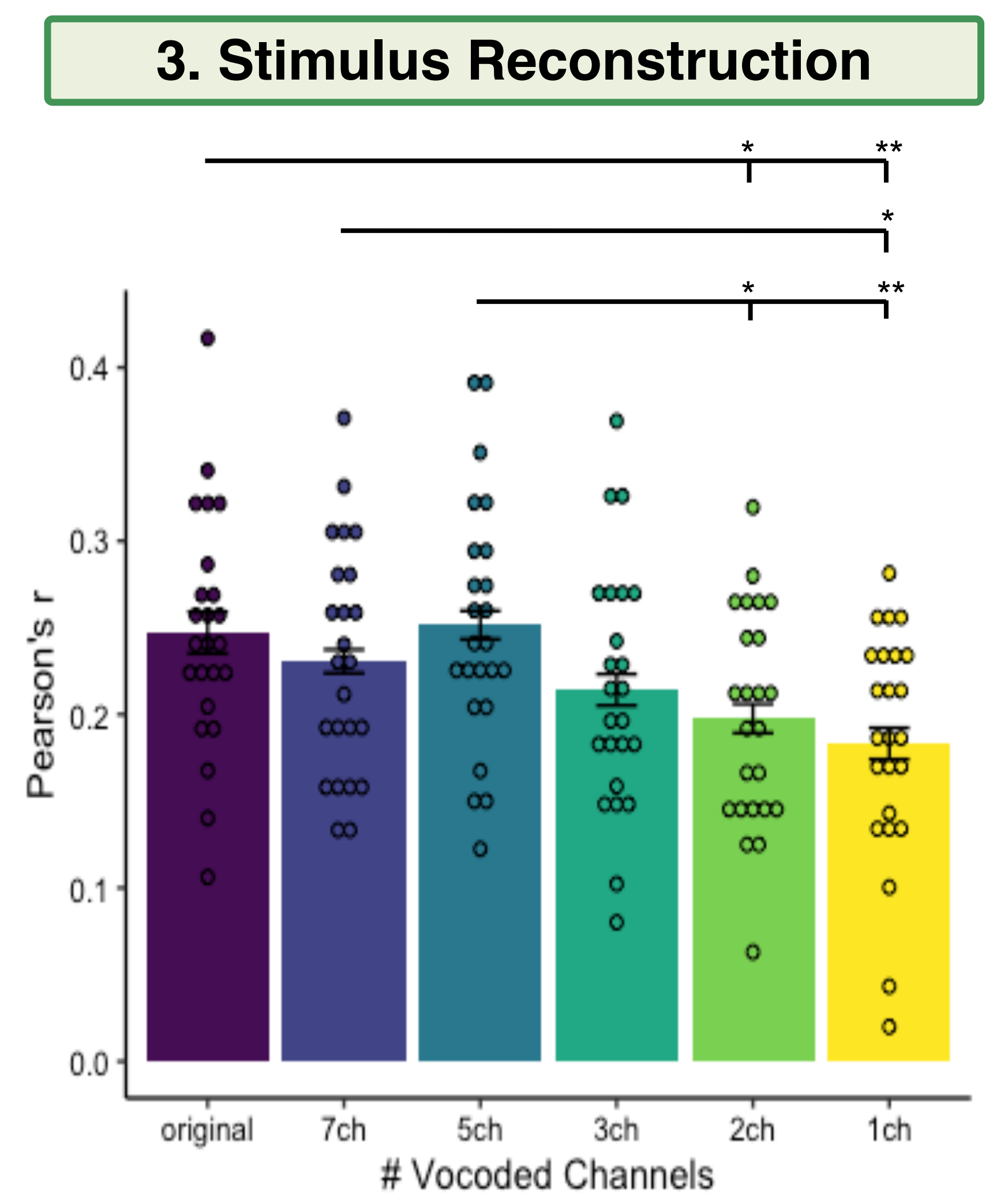
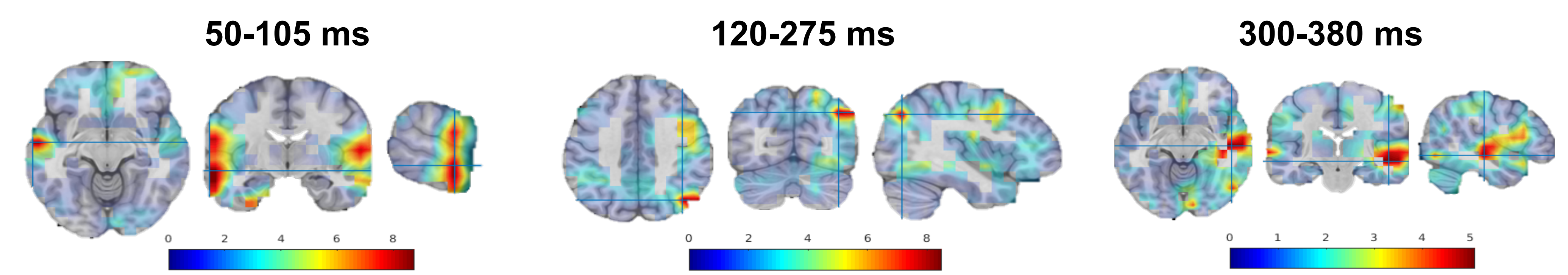
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## Results



\*\*\*p < 0.001, \*\*p < 0.01, \*p < 0.05



## Highlights

- The TRF analysis showed that the vocoded speech differentially modulates the neural response at three distinct time windows. The early effect was observed with vocoding massively increasing the peak response. The second declined with the reduction of intelligibility. The third showed the maximum response in those still comprehensible degraded speech.
- The modulation on the TRF early and late response both showed in a nonlinear fashion which support what we found in the theta coherence result.

## Acknowledgement

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