Attentional modulation of functional connectivity in the face processing network of the brain

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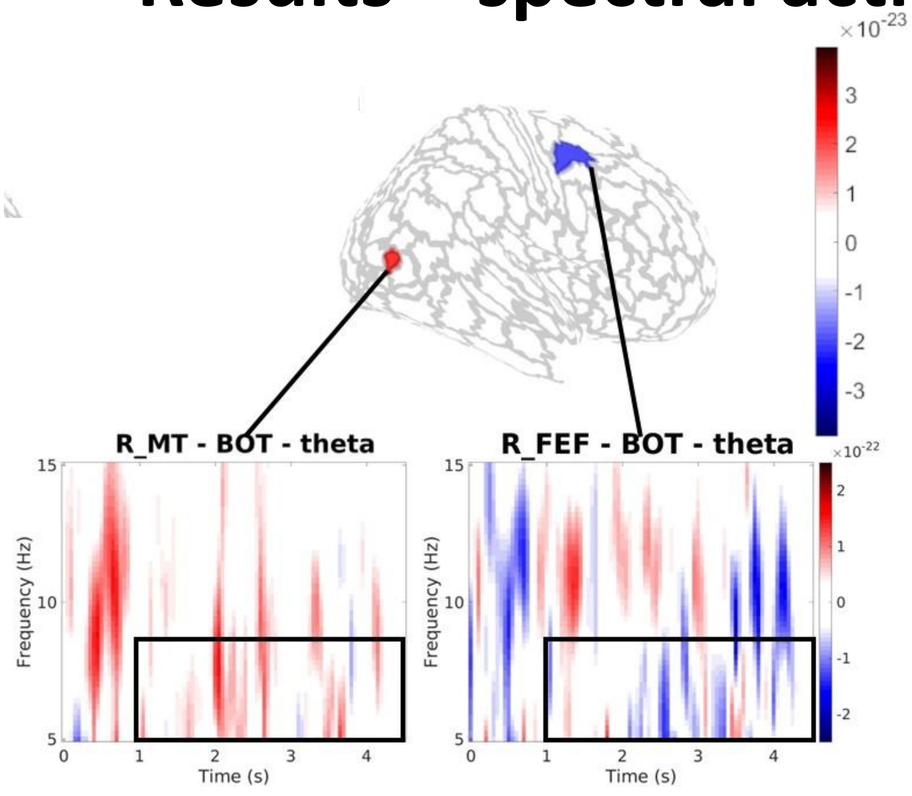
Introduction

- The face processing network, including regions like the FFA [3], OFA [5] and a region in the STS [4], is one of the most important networks in our social interactions
- The prefrontal cortex was shown to play a crucial role in selective attention, especially IFJ (non-spatial attention, object and feature encoding) and FEF (spatial attention) [6, 7]
- Modulation of **spectral activity** and **functional connectivity patterns** in **a face detection task** based on what **the covert spatial attention** is set on in different frequency bands

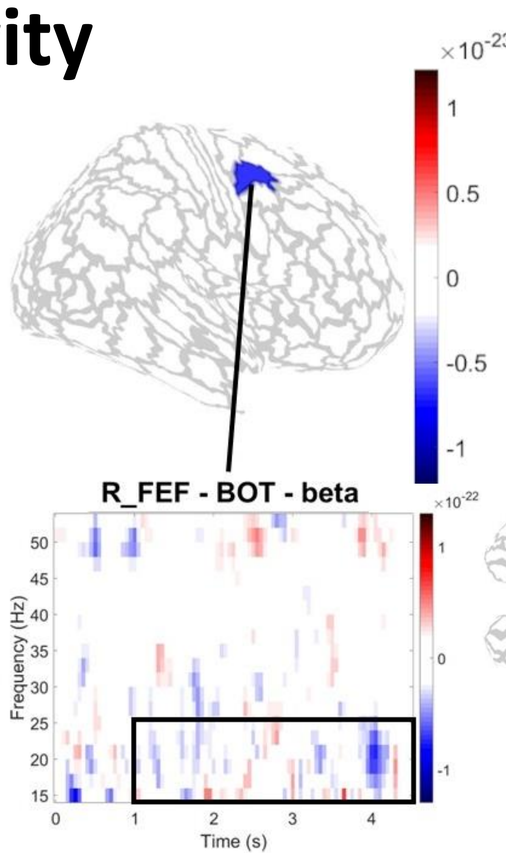
Methods

- 10 participants (five female, mean age = 26.3 years, SD = +/- 3.59)
- Magnetoencephalography (MEG) study
- Participants were presented composite face stimuli
- Had to attend to either eyes, mouth or facial identity
- Data from de Vries and Baldauf (2019) [1]
- We applied a state-of-the-art atlas, the HCP-MMP 1.0 atlas [2] onto the individual anatomy of subjects
- Performed anatomic likelihood estimation (ALE) for FFA, OFA, STS
- The Regions of interest were:
  IFJa/p, **FEF**, **FFC**, **VVC**, **V4**, **TPOJ2**, **LIPd**, **MT**, **PeEC**
- 'Attend IN – Attend OUT' contrast
- Analysis in **theta** (5 – 8 Hz), **alpha** (8 – 12 Hz), **beta** (15 – 25 Hz), **gamma** (30 – 100 Hz)

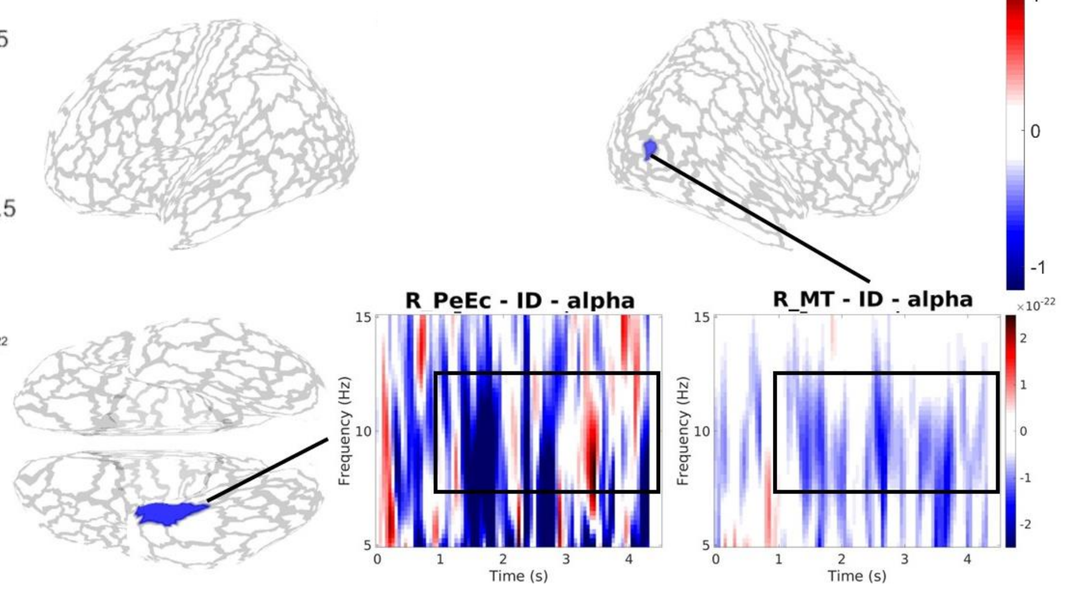
Results – spectral activity



Attend to mouth condition in the theta band

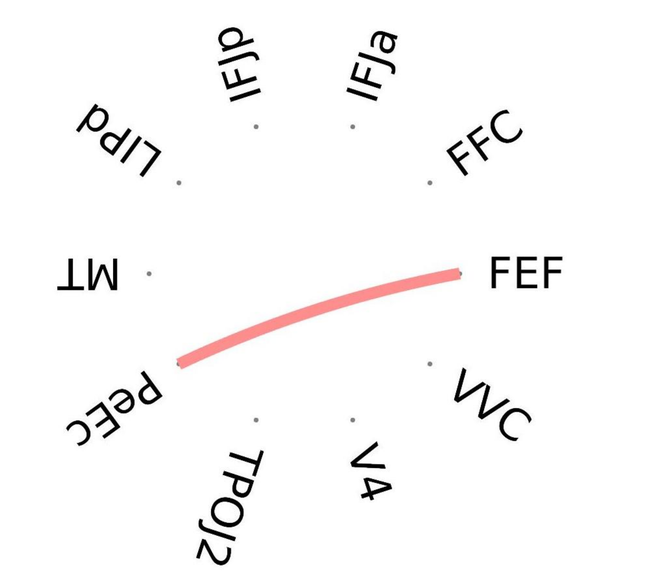


Attend to mouth condition in the beta band

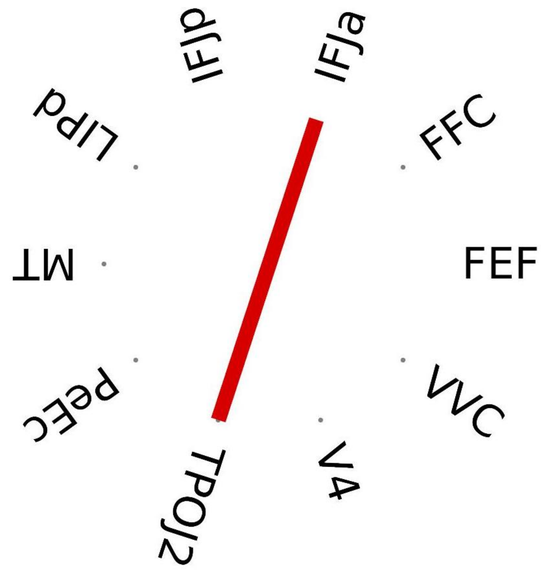


Attend to identity condition in the alpha band

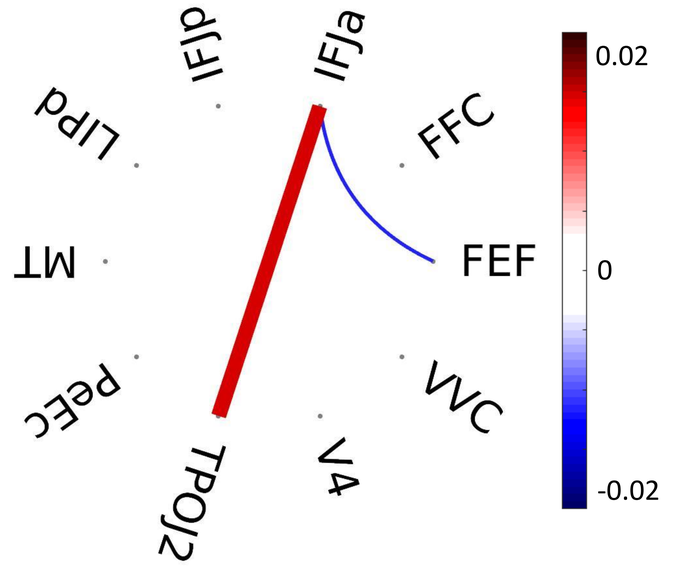
Results – functional connectivity



Attend to identity condition in the alpha band



Attend to eyes condition in the alpha band



Attend to mouth condition in the beta band

Discussion

Attend to mouth

- Lesser effect of spatial attention
- Perception of motion
- OFA and STS

Attend to identity

- Perception of motion
- Effect of spatial attention
- Areas related to identity processing

Attend to eyes

- Effect of feature attention
- Involvement of the STS

Conclusion

- Attention modulates spectral activity and functional connectivity
- FEF and IFJa → crucial role in selective attention during face processing
- Difference between holistic and single facial feature processing

References

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[7] Soyuhos, O., & Baldauf, D. (2023). Functional Connectivity Fingerprints of the Frontal Eye Field and Inferior Frontal Junction Suggest Spatial versus Nonspatial Processing in the Prefrontal Cortex. European Journal of Neuroscience, 57(7), 1114–1140.