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

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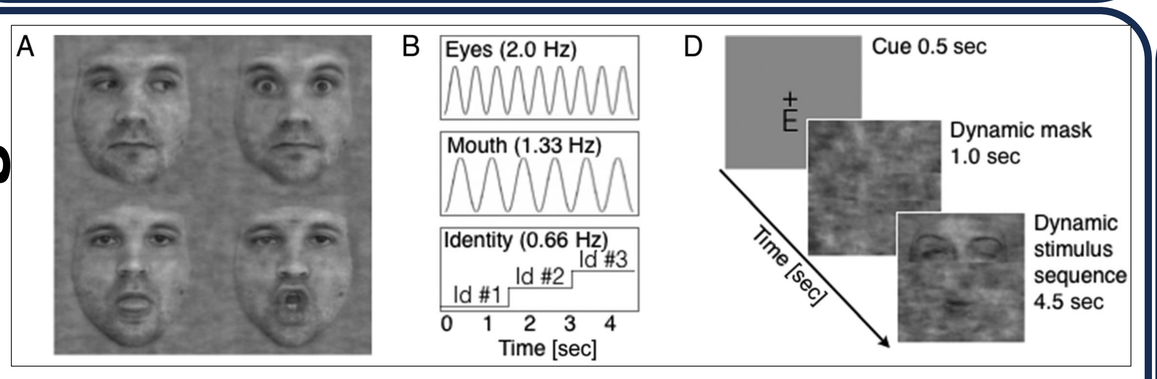
Introduction

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

Methods

- 10 participants saw composite face stimuli in the MEG and had to attend either to the **eyes**, the **mouth** or the facial **identity** [1]
- We applied the HCP-MMP 1.0 atlas [2] onto the individual anatomy of subjects
- The Regions of interest were:
  IFJa/p, **FEF**, **FFC**, **VVC**, **V4**, **TPOJ2**, **LIPd**, **MT**, **PeEC**
- Analysis in **theta** (5 – 8 Hz), **alpha** (8 – 12 Hz), **beta** (15 – 25 Hz), **gamma** (30 – 100 Hz)
- *Analysis*: **'Attend IN – Attend OUT' contrast**
  (Mean of non-attended conditions subtracted from attended condition)

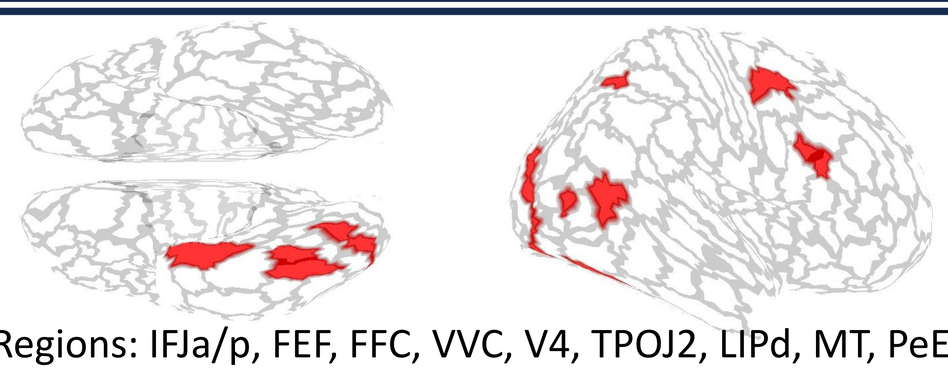
Paradigm



Note. Examples of the database of stimuli and the respective trial sequence used in the study.

Figure adapted from [1]

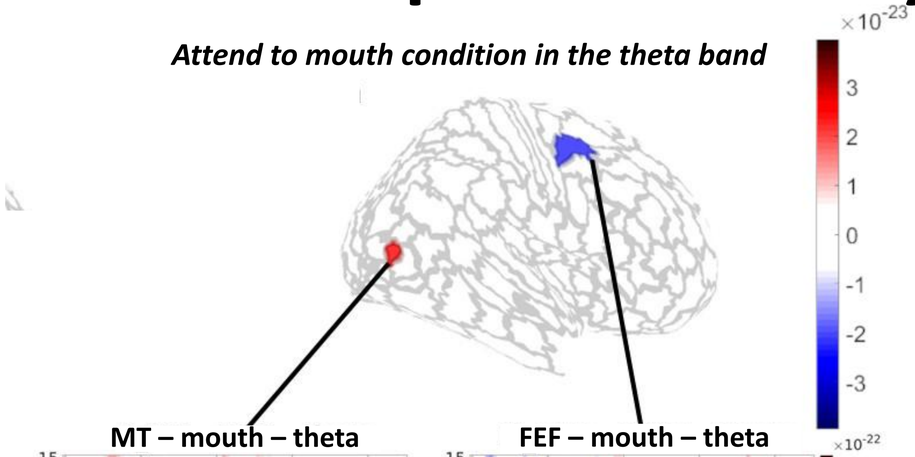
Regions of Interest



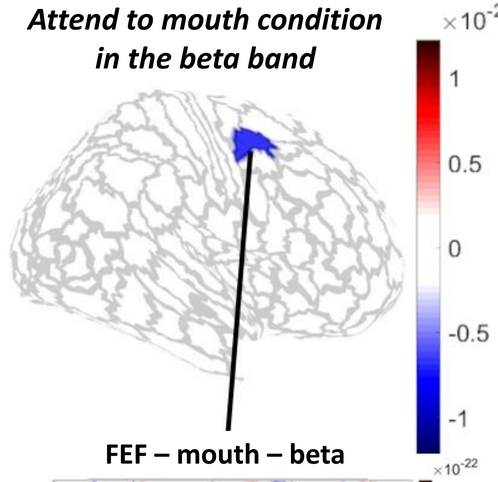
- Regions: IFJa/p, FEF, FFC, VVC, V4, TPOJ2, LIPd, MT, PeEC
- Performed anatomic likelihood estimation (ALE) for FFA, OFA, STS

Results – spectral activity

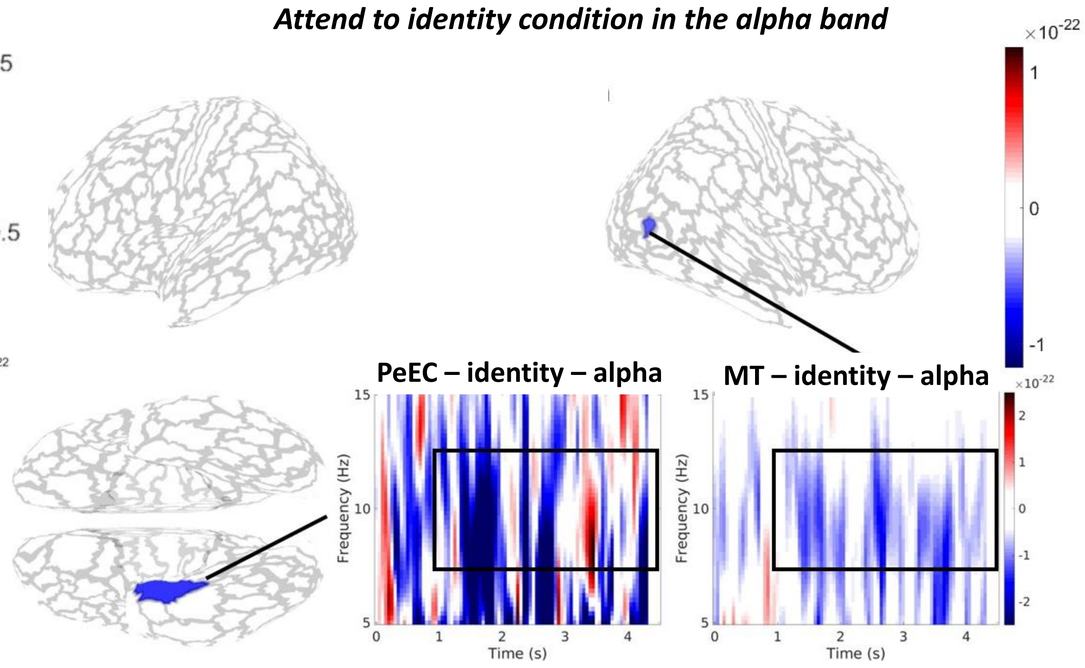
Attend to mouth condition in the theta band



Attend to mouth condition in the beta band



Attend to identity condition in the alpha band

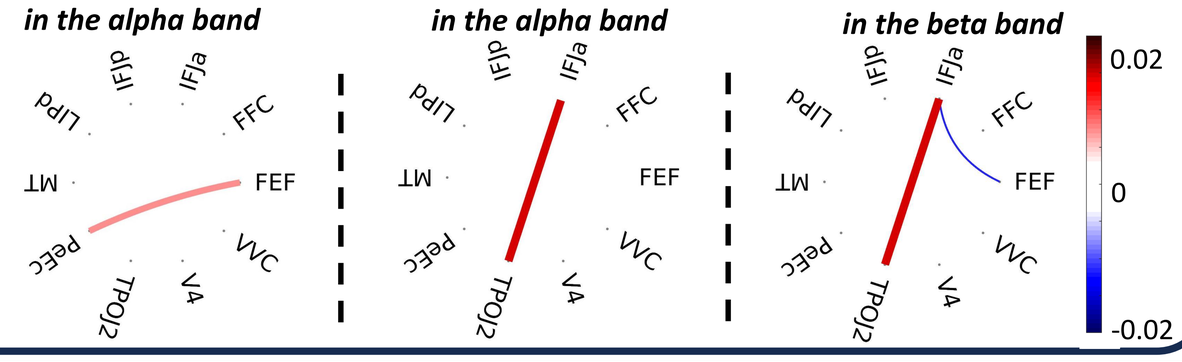


Results – functional connectivity

Attend to identity condition in the alpha band

Attend to eyes condition in the alpha band

Attend to mouth condition in the beta band



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

Discussion

Attend to mouth

- The spectral inhibition and functional connectivity in FEF's theta and beta band suggest lesser effect of spatial attention
- The spectral excitation of MT in theta suggests perception of motion or activity of OFA
- The functional connectivity between IFJa and TPOJ2 in alpha suggests increase feature attention and involvement of STS

Attend to identity

- The spectral excitation of the MT in alpha suggests perception of motion
- The functional connectivity of the FEF suggests an effect of spatial attention
- The spectral excitation and functional connectivity of the PeEC in alpha suggest processing of identity

Attend to eyes

- The functional connectivity between IFJa and TPOJ2 suggests an effect of feature attention and an involvement of the STS

References

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