Individual neural dynamics of successful Gamma neuromodulation through EEG-neurofeedback in the aging brain

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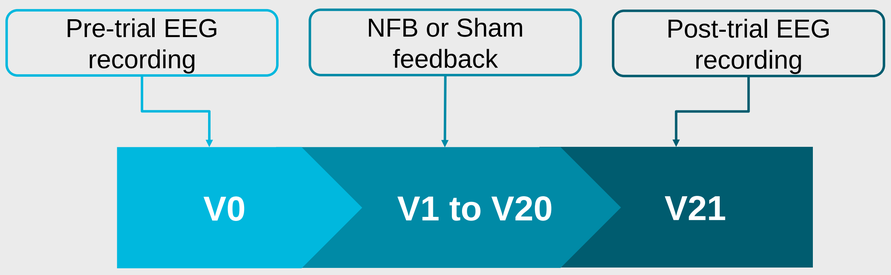
A promising preventive therapy for those at risk of Alzheimer's ?

- EEG-Neurofeedback **(EEG-NF)** helps to **modulate brain activity non-invasively**.
- EEG-NF already used to treat anxiety disorders, ADHD, depression, and sleep issues by training brain activity to improve overall well-being.
- **However**,
  - **results** on neurofeedback interventions remain largely **heterogeneous,**
  - **actual impact** of neurofeedback training on human neural dynamics at an individual level is **far from being understood**.

→ We seek to investigate the **neural dynamics** underlying such a **successful modulation.**

Data collection

- **31 individuals** older than 55 years, presenting **subjective memory complaints** for at least 6 months, albeit **normal cognition**
- **Double-blind study :** subjects randomly assigned either to the real EEG-NF group (**17 NEURO** subjects) or to the sham feedback group (**14 BIO** subjects)



- **32 EEG-epochs** retrieved in V0 and V21 using **19-electrodes EEG cap**

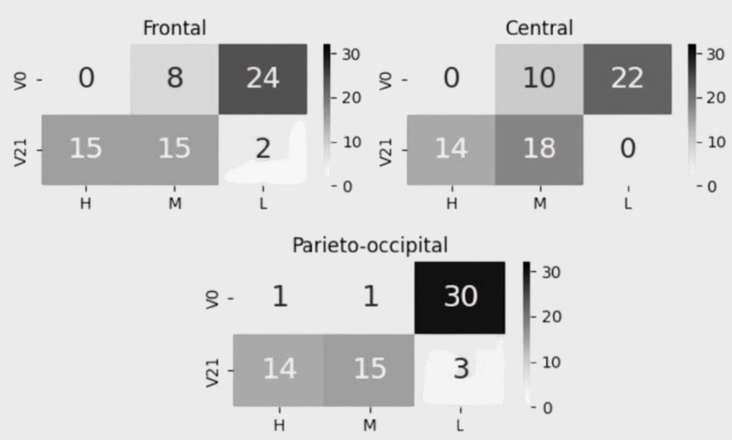
Methods

- **3 regions** (frontal, central and parieto-occipital) and **5 frequency bands** (delta, theta, alpha, beta and gamma) defined

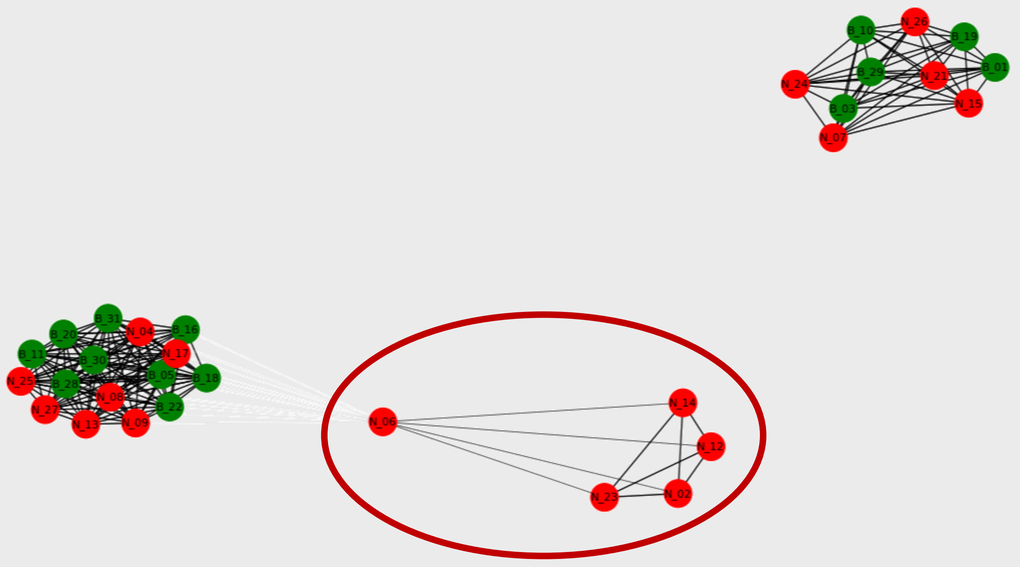
- **Individual characterization of synchrony changes** : clustering of the 64 epochs (V0 and V21) in 3 clusters leading to a 3-D pattern (ΔH, ΔM, ΔL) per subject
- **Bi-clustering** of the patients across **all regions and frequency bands**

Results

Individual characterization of synchrony changes



- 3-D pattern **(ΔH, ΔM, ΔL)** retrieved in a specific **brain region** and a **frequency band**



- Identification of individuals for whom the **EEG-NF** training was **successful** : **enhanced synchrony across all regions and all frequency bands**

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