Can We Decode An Empty Mind?
Predicting Mind Blanking From fMRI Functional Connectivity

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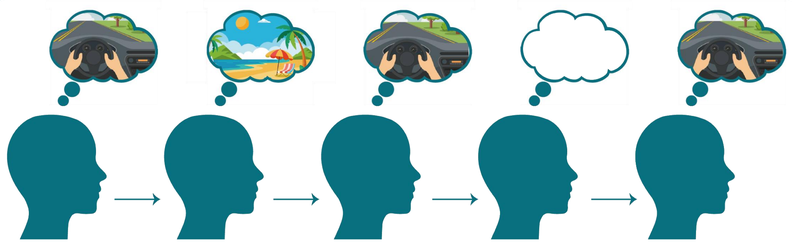
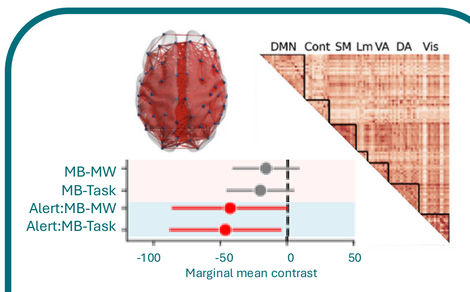
Introduction



Mind-blanking (MB) is a mental state where the mind feels empty or with no reportable content [1].

Self-report

Not all spontaneous MB[2] might be detected and could therefore be missed by self-reports.



MB is associated with a hyperconnected brain state[2,3].

Objective

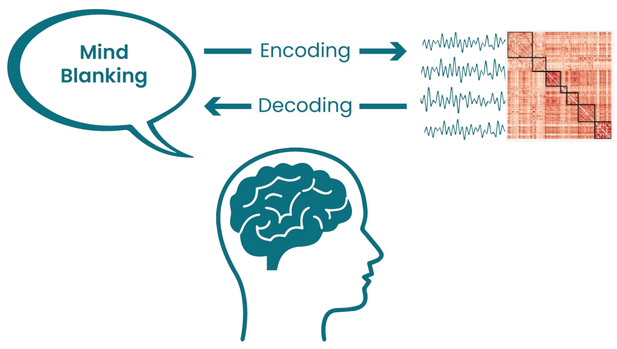
Decode MB episodes directly from brain activity in the absence of self-reports.

Methods

Model Development

Model
Machine learning model trained on fMRI functional connectivity (FC, features) to predict MB episodes (target)

Model(s)
- SVM
- Random Forests
- XGBoost
- Gaussian Processes
- Connectome-Based Predictive Modelling



Performance metrics
Balanced accuracy and F1-score (CV)

Data Acquisition: Stablishing a Ground-Truth for MB

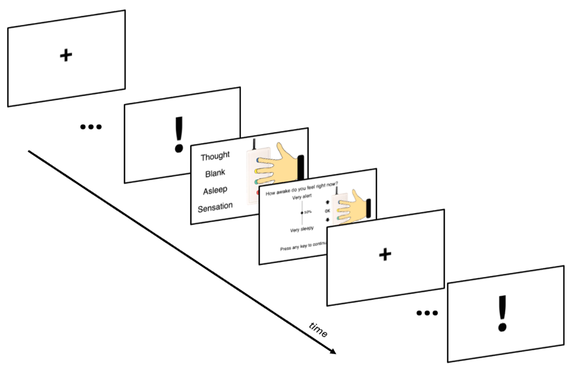
Sample

N=40 (>18yo, gender balance)

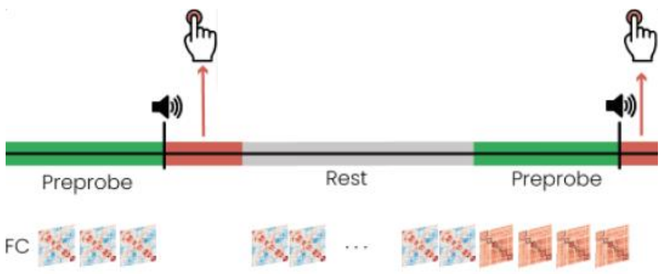
Inclusion criteria:
- > 18 years old
- Right-handed

Exclusion criteria:
- MRI contraindication
- History of neurological or psychiatric disorders

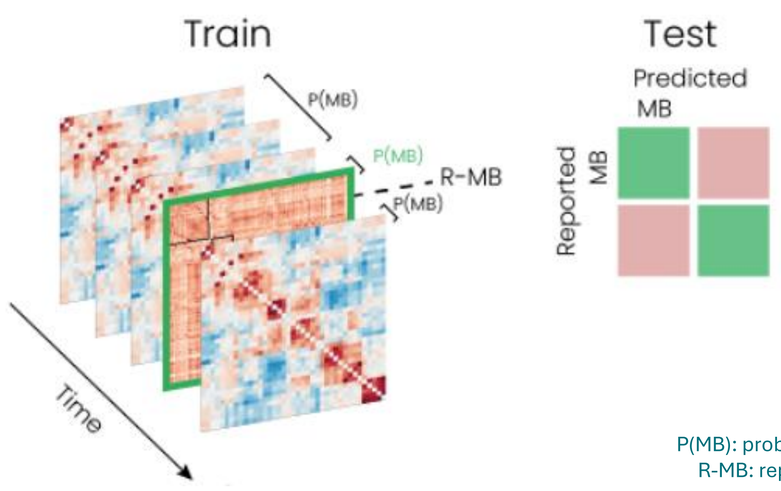
1. Resting State
2. Experience sampling Task



Analysis



- **Features**: dynamic FC per timepoint (Hilbert Transform)
- **Target**: mental state report (MB)
- **Testing**: k-fold & Leave-One-Subject-Out Cross-Validation



P(MB): probability Mind Blanking
R-MB: reported-Mind Blanking

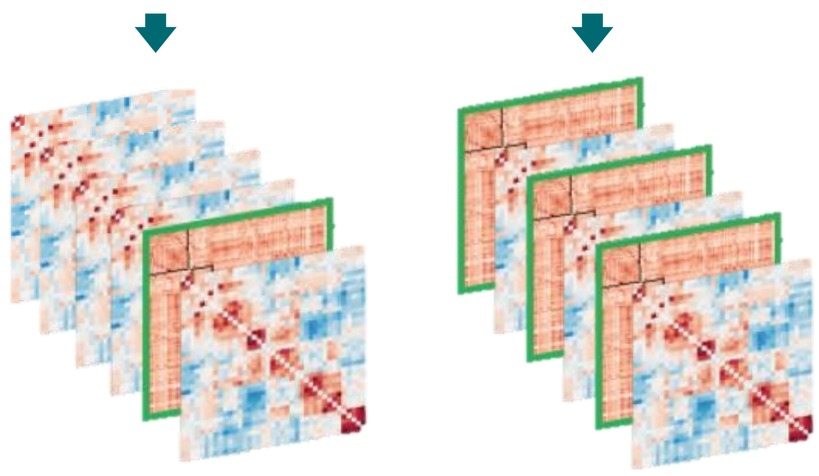
Model Validation

Objective
To test model performance in resting state data of populations with increased MB propensity.

Hypothesis
The model will detect more instances of MB after sleep deprivation[4], in ADHD[5], and dementia[6]*.

Dataset	Control	Population with high MB propensity
Stockholm Sleepy Brain [7]	Before sleep deprivation	After sleep deprivation
Oregon ADHD-1000 [8]	No ADHD	ADHD
ADNI [9]	No dementia	Dementia*

FC patterns classified as MB or not



* exploratory

Expected Results

This project is expected to:

1. Establish a reproducible, brain-based signature of MB
2. Provide insights into the so-called stream of thought
3. Offer clinical applications for conditions where MB is prevalent and self-reporting is unreliable or impossible

We are recruiting!

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References

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