‘What’ and ‘Where’ pathways within prefrontal cortex govern top-down attentional control through their differential connectivity fingerprints

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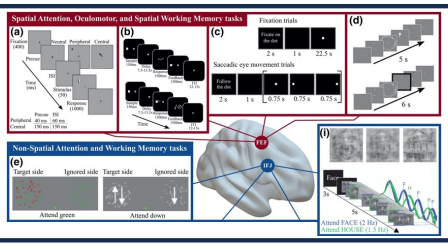
Introduction

- The frontal eye field (FEF) and the inferior frontal junction (IFJ) are differentially selective to spatial vs non-spatial information, respectively, and are involved in the control of visual attention, working memory and other top-down processes [1, 2, 6]
- The divergence in the connectivity patterns of the FEF and IFJ may underlie their specialized roles [2]
- Here, we combined a coordinate-based meta-analysis, to first localize these regions in standard space and map their coactivation patterns, with probabilistic tractography, to infer their structural connectivity fingerprints [10]



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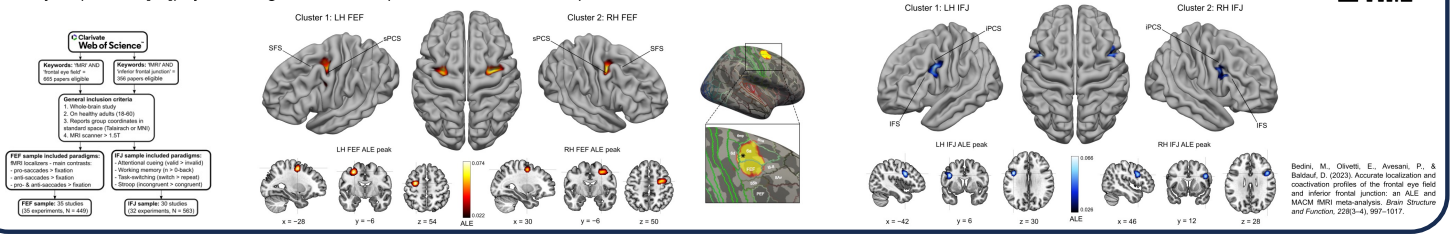
ALE fMRI meta-analysis

- We performed an activation likelihood estimation (ALE; [5]) to accurately infer the localization of FEF and IFJ in MNI152 space using GingerALE (voxel-level FWE = 0.01, permutations = 5000)
- Using the coordinates of the main FEF and IFJ clusters, we ran a meta-analytic connectivity modeling analysis (MACM; [11]) by retrieving all relevant experiments in the Brainmap database

ALE results available in NEUROVAULT



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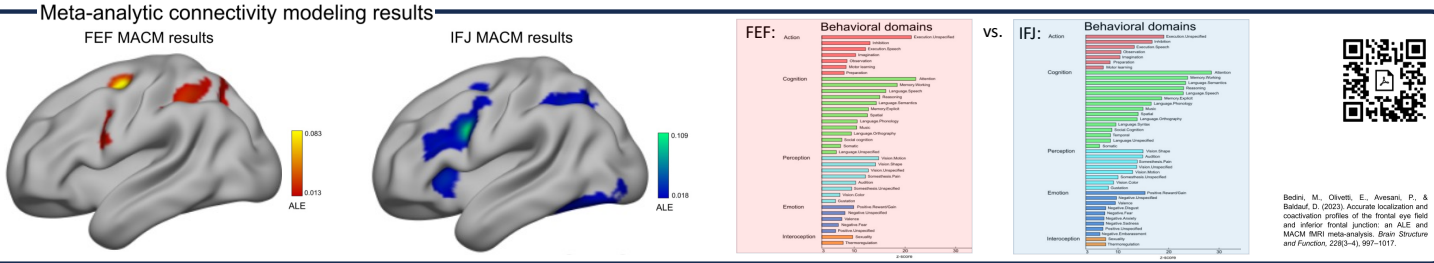
Meta-analytic connectivity modeling results



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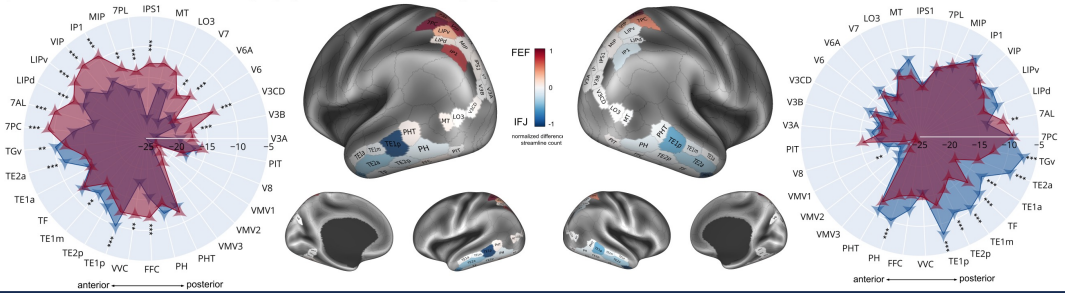
Surface-based probabilistic tractography

- We analyzed 3T diffusion MRI data from 56 unrelated subjects of the HCP MEG sample [11]
- The ALE peaks and the multimodal parcellation (MMP1; [6]) were mapped onto the native white-matter/grey-matter interface [3, 4]
- The dorsal visual stream and ventral visual stream target regions from the MMP1 were selected based on [7, 9, 12]
- FSL Probtrackx GPU implementation with 50k streamlines propagated from each vertex [4, 8]



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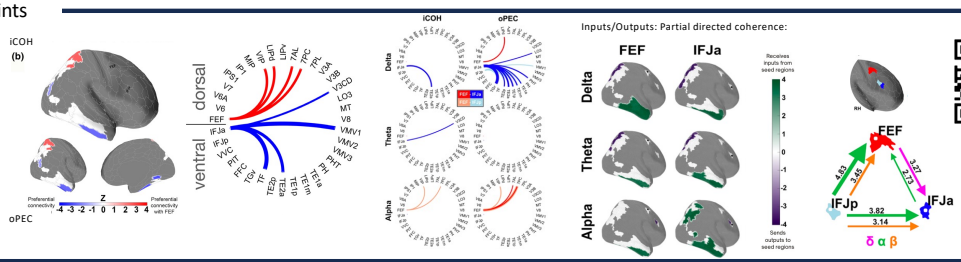
MEG functional connectivity fingerprints

- We applied seed-based functional connectivity analyses to resting-state MEG recordings and tested whether the spontaneous activity of each parcel in the ventral vs dorsal stream has predominant functional connectivity with FEF or IFJ.
- We used both phase- and power-based connectivity metrics: imagery coherence and orthogonalized power envelope correlations.



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