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P8

TOWARDS A CONSENSUS EPILEPSY CONNECTOME FOR STRUCTURE-FUNCTION COUPLING

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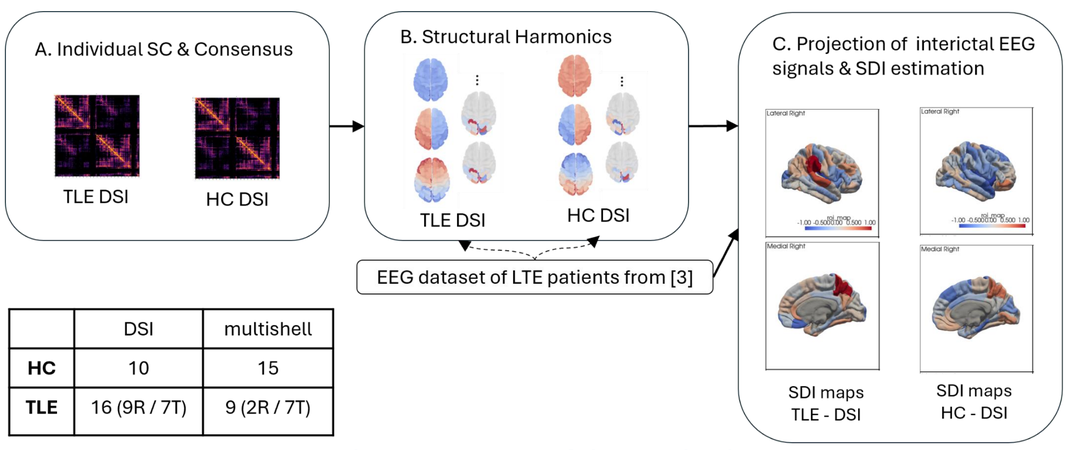
BACKGROUND

Using a consensus structural connectome (SC) is common for graph signal processing (GSP) applications due to the structural similarities between individuals and to reduce false positives. It offers a reliable framework, particularly for structure-function coupling studies, where it serves as a structural filter. However, in conditions such as temporal lobe epilepsy (TLE), it is unclear how accurately a healthy-control (HC)-based consensus captures relevant features, potentially impacting GSP analyses. This project leverages Diffusion-Weighted Imaging (DWI) data from patients with epilepsy to map shared network features and investigate the changes observed in structure-function coupling results using healthy vs patient connectome.

METHODS

DWI collected in Geneva, with 2 protocols (Fig1). Individual SC computed using ConnectomeMapper3 [1] and consensus connectome as in [3]. Structural Decoupling Index (SDI) [2] approach was applied to interictal EEG data of patients with TLE (spikes) [3], using either an HC or TLE consensus connectome (Fig1)



	DSI	multishell
HC	10	15
TLE	16 (9R / 7T)	9 (2R / 7T)

Fig1: Summary of the method

AIMS

- Investigate the effect of a consensus structural connectome built from controls vs patients with TLE on structural harmonics and GSP applications

RESULTS

- Patients with TLE show lower inter-hemispheric similarities than HC (Fig2). Applying a consensus-based connectome derived from different populations leads to observable variations in SDI results (Fig1C), indicating that connectome choice directly impacts SDI metrics.

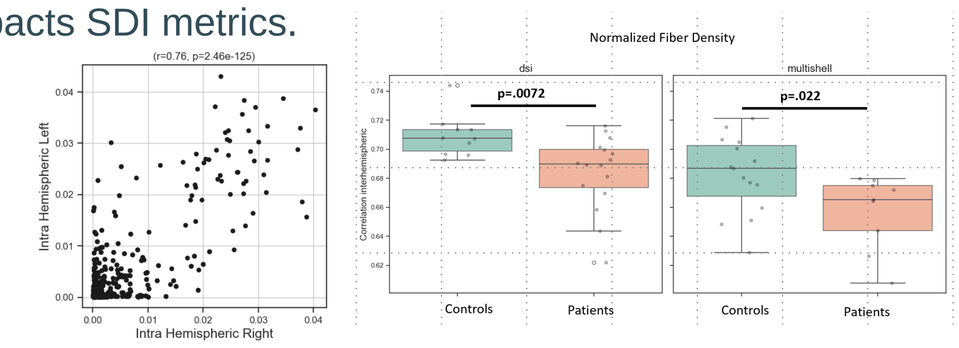


Fig2: Correlation between intra-hemispheric left and right SC in HC and TLE

- At the structural harmonics level, the first harmonics are highly correlated between HC and TLE, but not for the rest of the harmonics (Fig3) (after orthogonal Procrustes alignment).

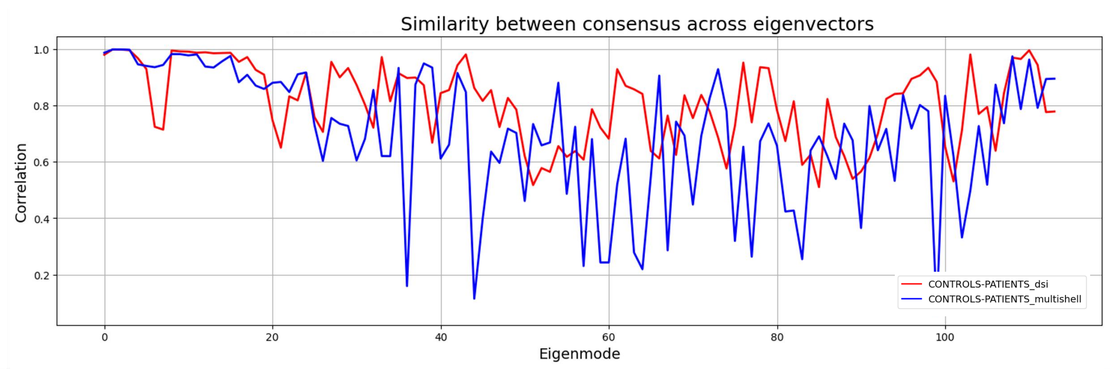


Fig3: Similarity between structural harmonics between HC and TLE

- Using an open SC dataset of 70 HC [3,4], we showed than the number of subjects used to generate the consensus (Fig4) plays a role in the similarities between the structural harmonics.

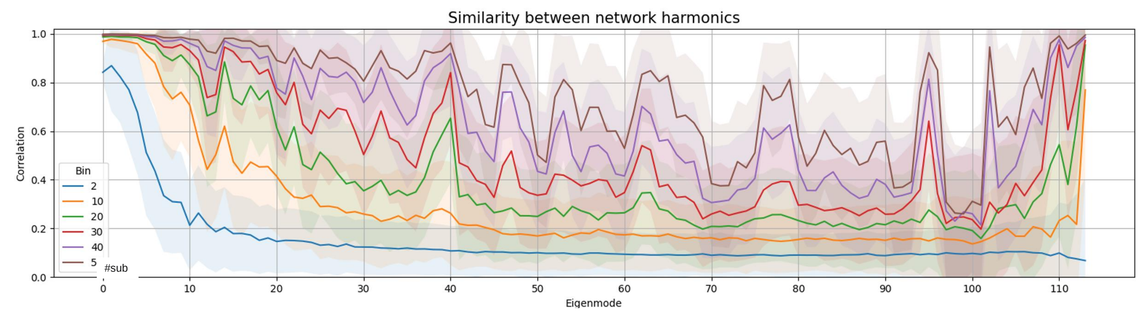


Fig4: Similarity between harmonics of consensus generated from increasing number of subjects

CONCLUSION

- SC in patients with TLE showed alterations compared to HC, suggesting that an epilepsy-specific consensus connectome could provide a more representative structural framework for GSP.
- However, methodological considerations (number of subjects for consensus, harmonics alignment) are essential, along with accounting for the heterogeneity of the disorder.

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[1] (Tourbier, 2022) JOSS, 7(74), 4248, [2] (Preti, 2019) Nature Communications,10,4747, [3] (Rigoni, 2023) Clinical Neurophysiology,153,1-10, [4] https://zenodo.org/records/2872624