Molecular Brain Connectivity

A mini review -- Cyril Pernet, PhD

References

- Yakushev I, Drzezga A, Habeck C. (2017). Metabolic connectivity: methods and applications. Curr Opin Neurol.
- Veronese et al. (2019). Covariance statistics and network analysis of brain PET imaging studies. Sci Report https://www.nature.com/articles/s41598-019-39005-8
- Sala et al. (2023). Brain connectomics: time for a molecular imaging perspective? TICS, in press

Brain Connectomic

Sporns O, Tononi G, Kötter R (2005). "The human connectome: A structural description of the human brain". *PLOS Computational Biology*. **1** (4): e42

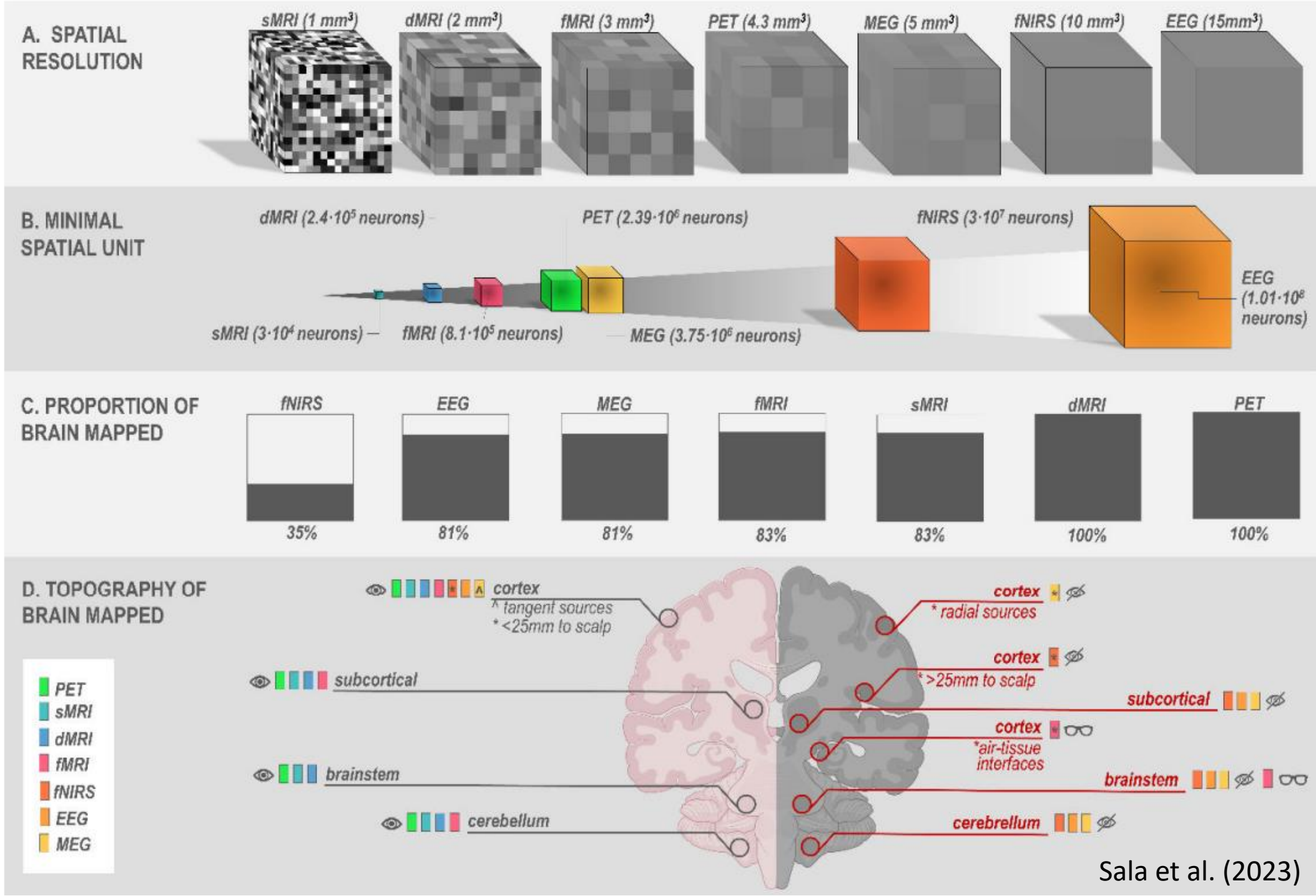
First connectivity study used PET !

Journal of Cerebral Blood Flow and Metabolism
4:484–499 © 1984 Raven Press, New York

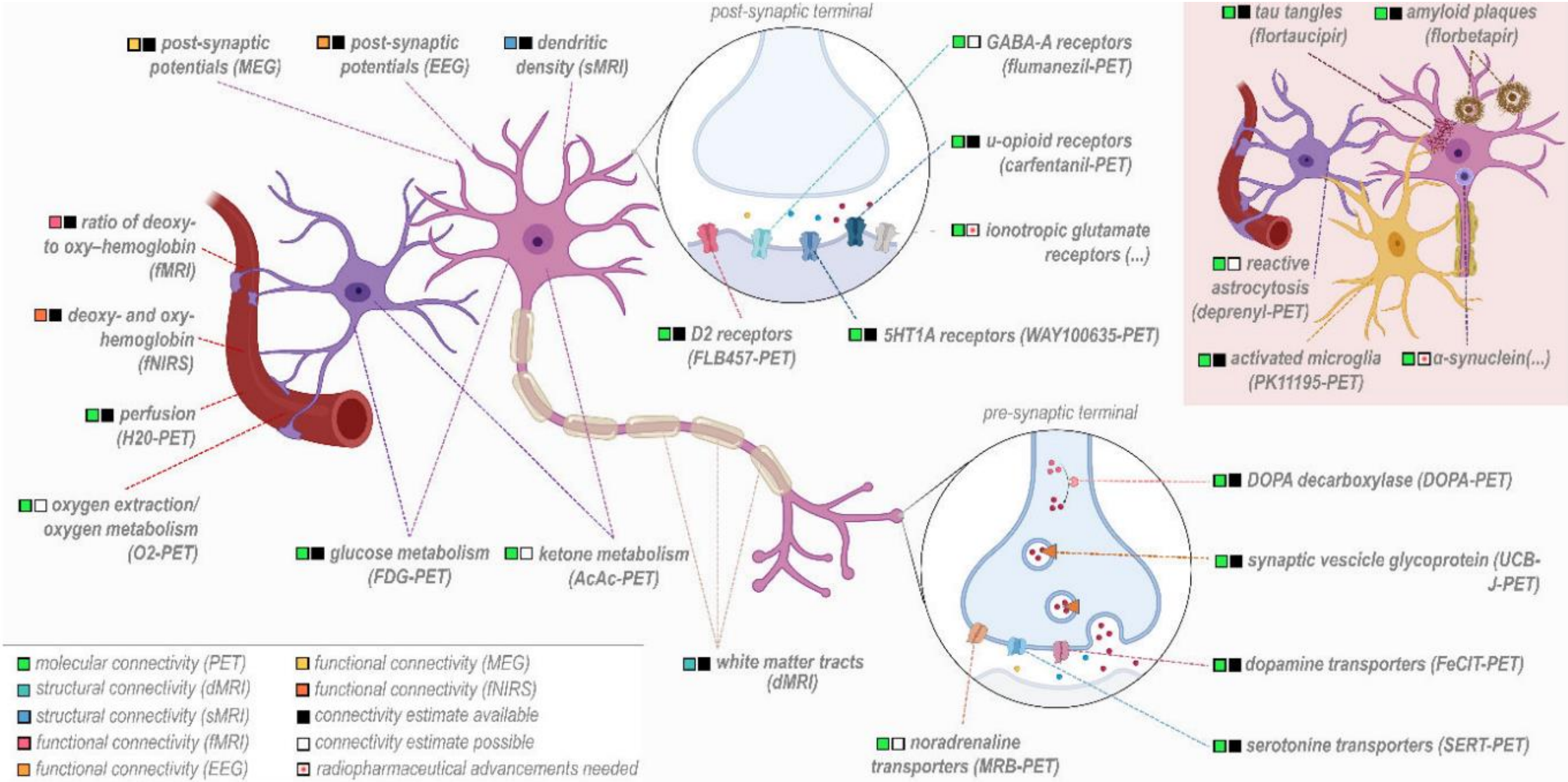
Intercorrelations of Glucose Metabolic Rates Between Brain Regions: Application to Healthy Males in a State of Reduced Sensory Input

Barry Horwitz, Ranjan Duara, and Stanley I. Rapoport

Laboratory of Neurosciences, National Institute on Aging, National Institutes of Health, Bethesda, Maryland, U.S.A.



Sala et al. (2023)



Sala et al. (2023)

Analysis framework

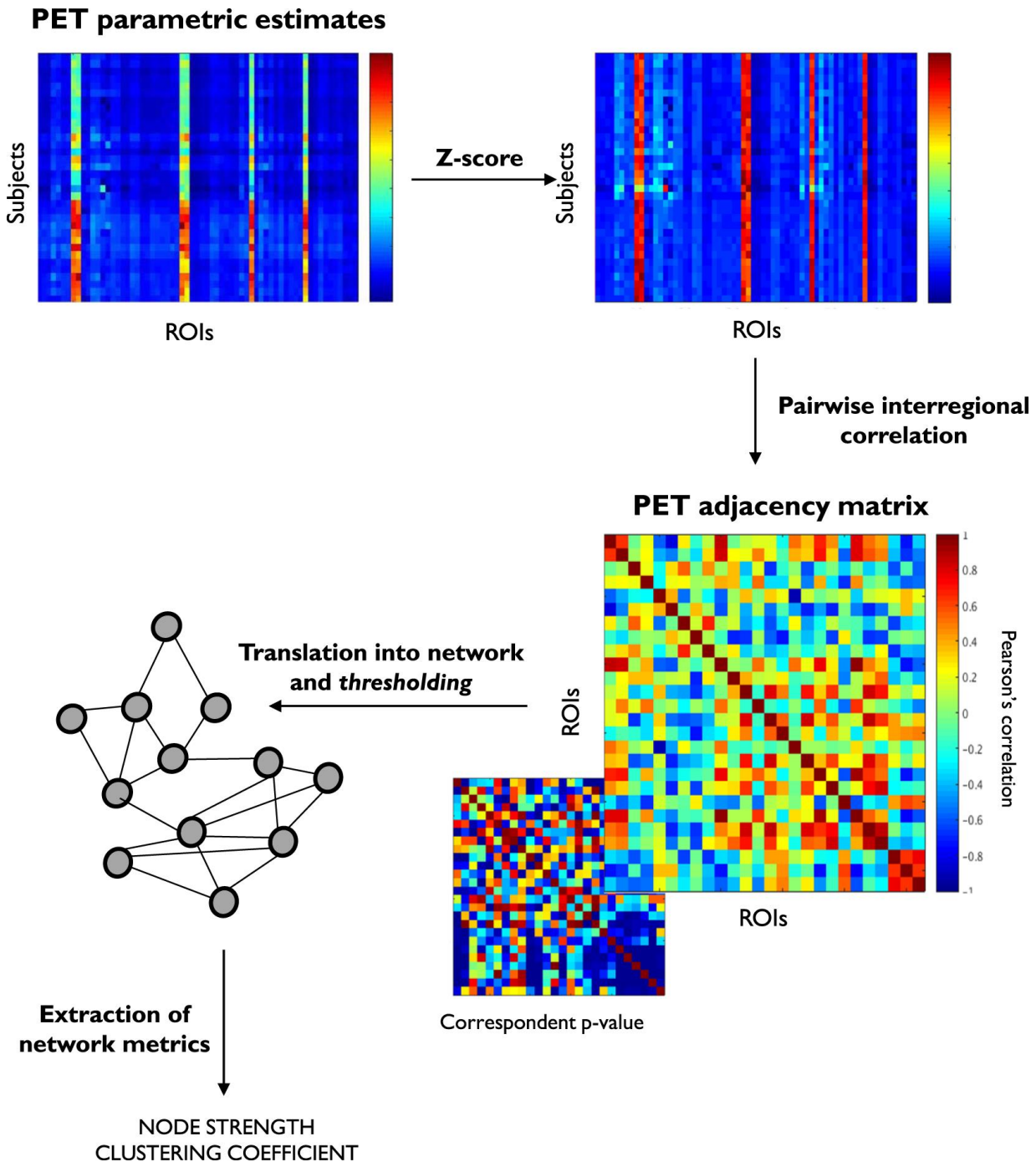
Correlations

Between-subject interregional correlation analysis

→Seed region (GLM)

→Covariance decomposition (PCA, ICA)

→Pair-wise correlation matrix using Graph Theory



Homogeneity of PET maps

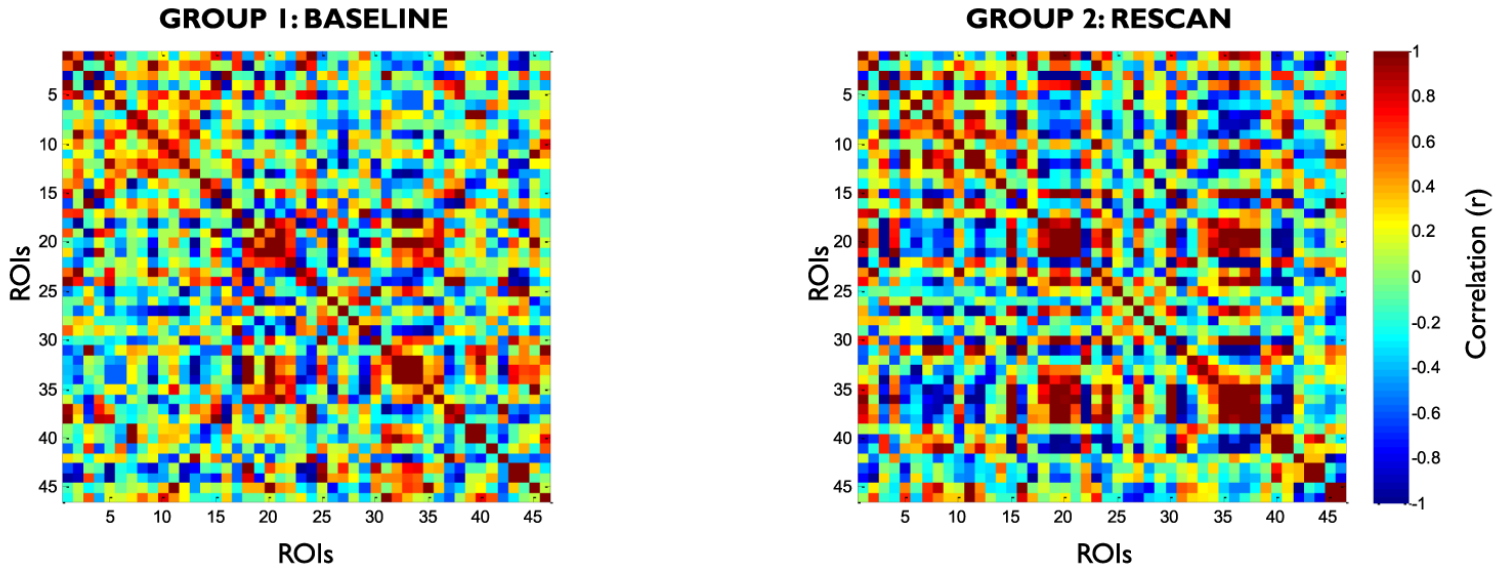
- Tracer
- Model
- subjects

•*Node strength* is the average connectivity of a node and is defined as the sum of all neighbouring link weights.

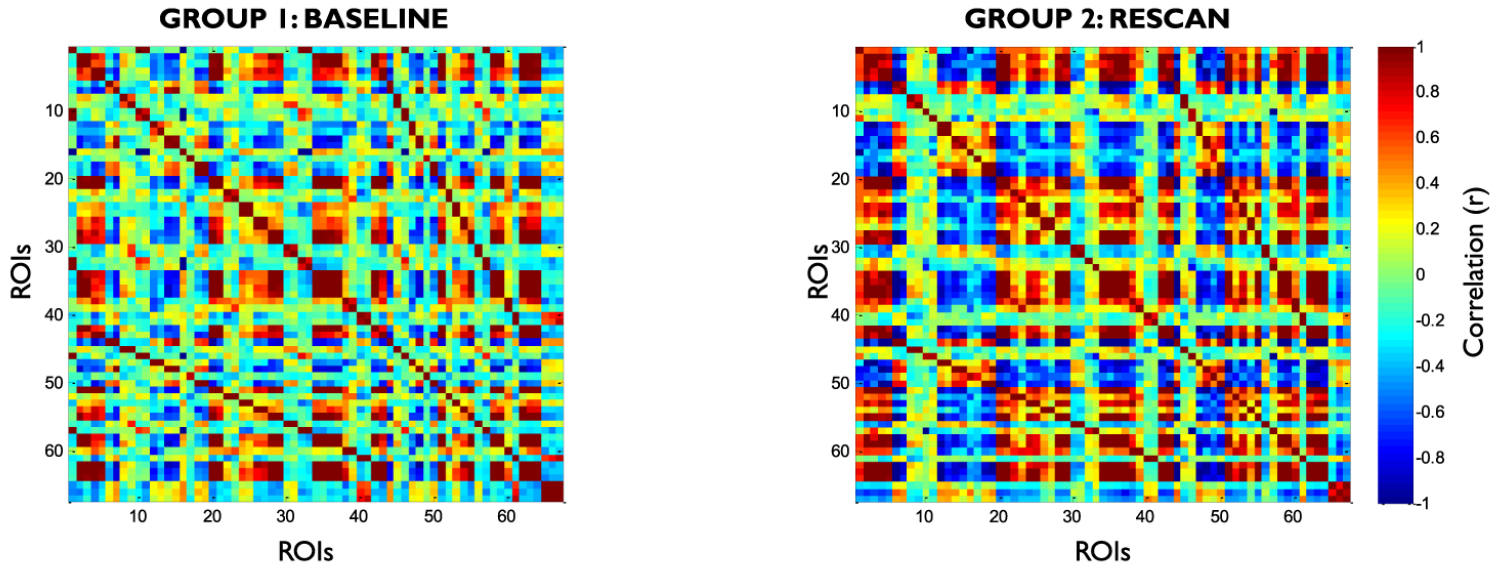
•*Clustering coefficient* is a measure of functional segregation and quantifies the number of connections that exist between the nearest neighbours of a node as a proportion of the maximum number of possible connections. It accounts for the number of triangles in the network, with a high number of triangles implying segregation.

Veronese et al. (2019)

A) [^{18}F]FDOPA test-retest

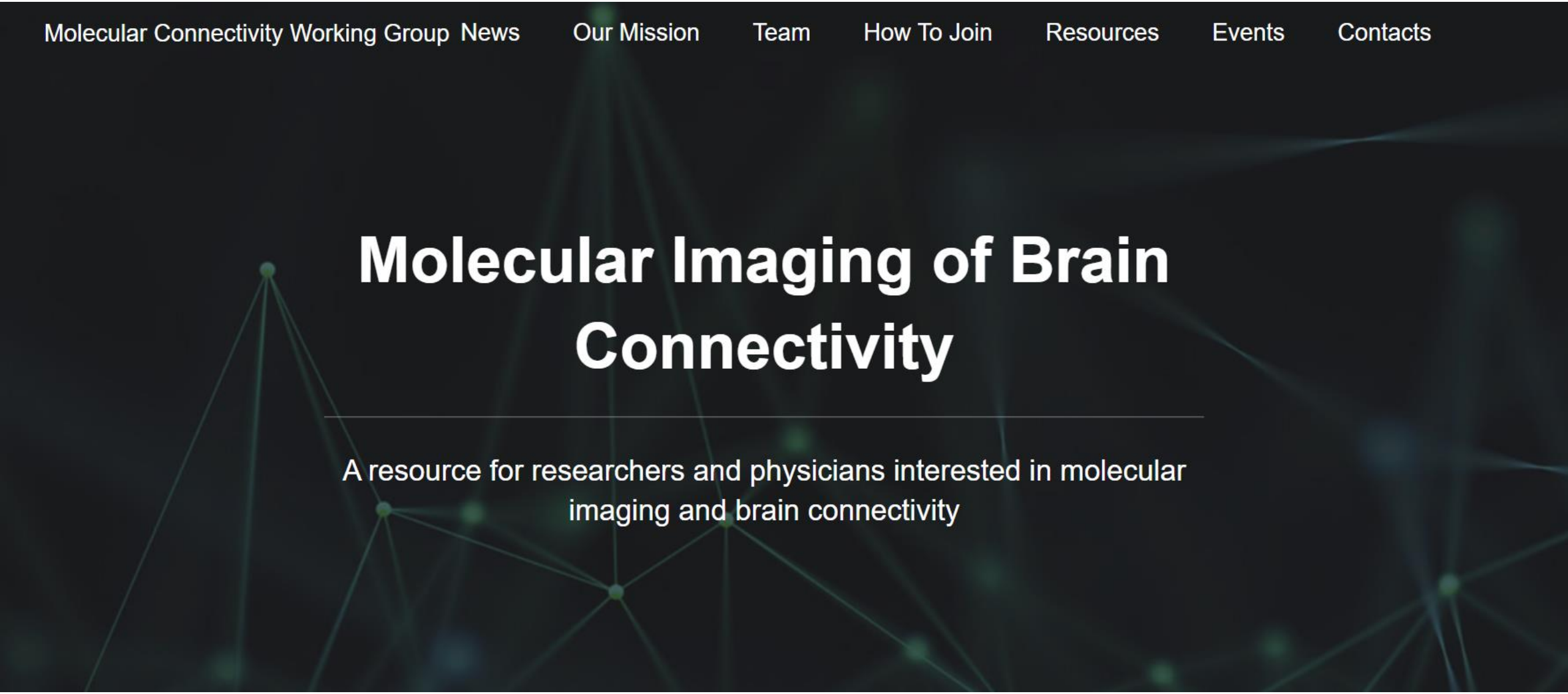


B) [^{11}C]SB207145 test-retest



the quality and resolution of the PET images returned by the scanners consistently affect the characteristics of the PET matrices. Both HRRT and partial-volume corrected data provided a more refined description of interregional correlation compared to the correspondent GE-Advance scans and partial-volume incorrected data,

Veronese et al. (2019)

What’s next

https://molecularconnectivity.com/