

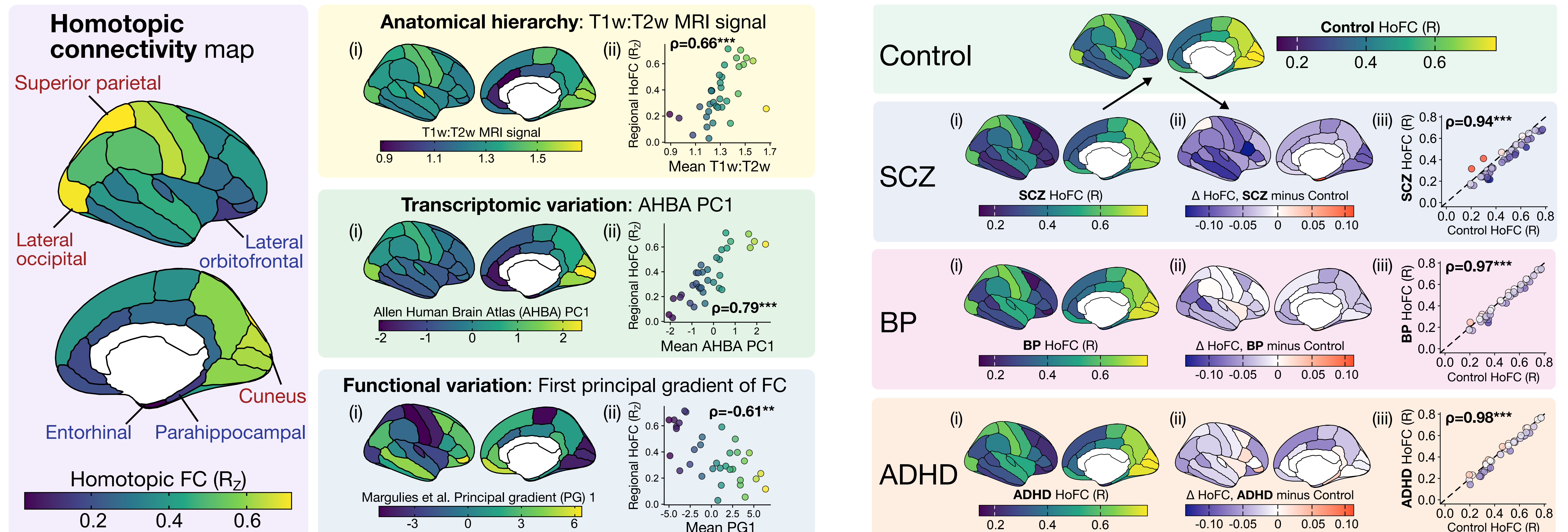
Mapping functional, structural, and molecular correlates of homotopic connectivity

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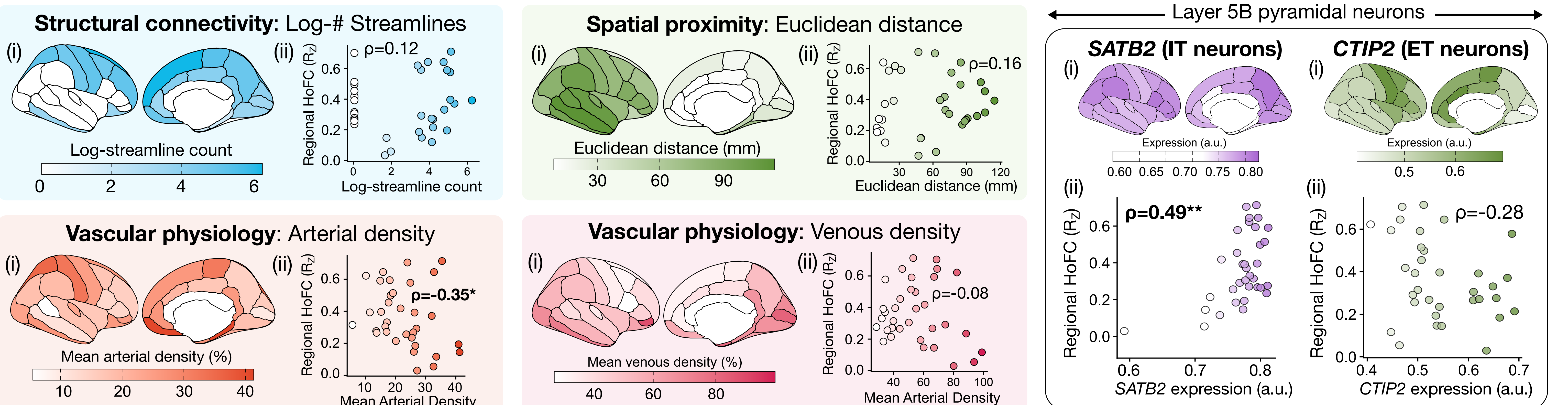
Cortical HoFC displays a hierarchical spatial variation from transmodal to unimodal that is preserved across neuropsychiatric disorders



Homotopic functional connectivity (HoFC) is the **synchronous activity between homologous regions** of the left and right hemispheres. Using preprocessed structural and functional connectome data from $N=207$ participants in the Human Connectome Project, from [1], we show that the **spatial variation in cortical HoFC** is strongly correlated with **anatomical, transcriptomic, and functional variation** [2].

Despite **heterogeneous HoFC decreases** in three neuropsychiatric disorders [3]—schizophrenia (SCZ), bipolar I disorder (BP), and attention-deficit hyperactivity disorder (ADHD)—the **relative gradient of HoFC is preserved**, with lowest magnitudes in **transmodal/associative** regions and highest values in **primary sensorimotor** regions.

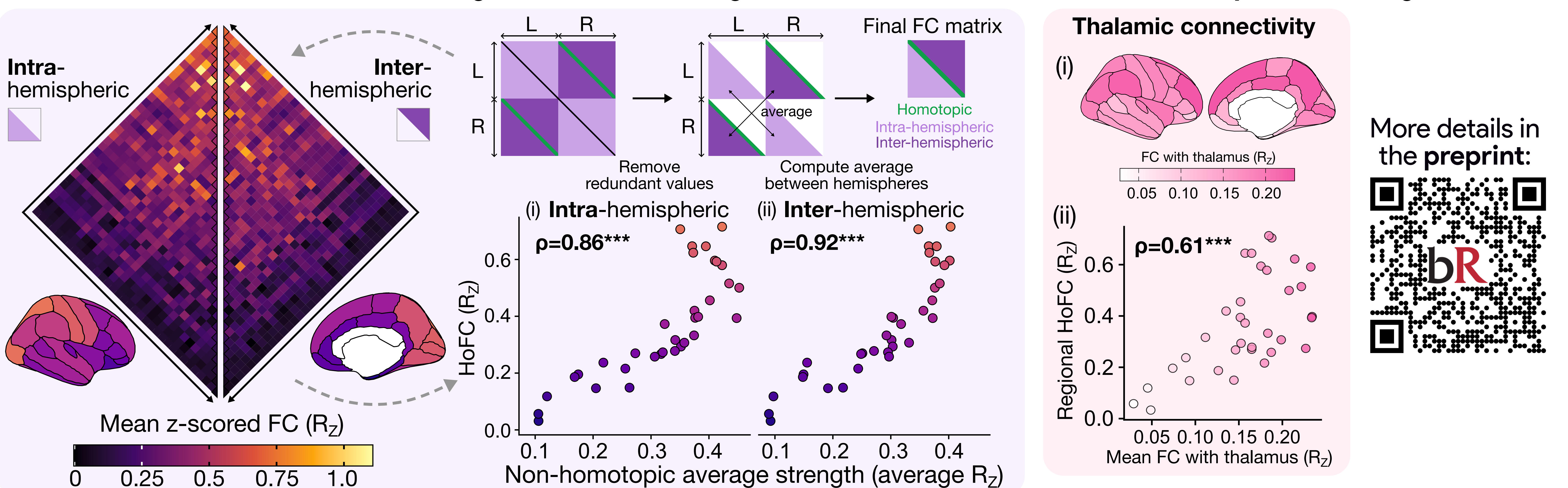
Cortical HoFC is associated with regional arterial density and expression of an intra-telencephalic (IT) layer 5B pyramidal neuron gene, SATB2



The HoFC gradient is **inversely associated with arterial density** estimated in [4], but it is **not associated structural connectivity or spatial proximity** estimated from the same dataset as the resting-state fMRI in [1]. This suggests that regional variation in HoFC strength arises from factors that are (at least partly) **dissociable from direct structural connectivity or geometric embedding**.

The HoFC spatial gradient is positively associated with regional expression of **SATB2**, a **marker of intra-telencephalic (IT) layer 5B pyramidal neurons** [5] estimated from data in [6].

Cortical HoFC is associated with strength of functional integration and bilateral thalamic connectivity in the resting-state brain



Regional HoFC magnitude is **tightly correlated with the average strength** (i.e., mean z-scored FC, or R_z , with all other regions) both **within (intra-) and across (inter-) hemispheres**. This suggests that regions which are **more functionally integrated with the rest of the brain** (in a resting state) also tend to exhibit greater HoFC.

Regional HoFC magnitude is also positively correlated with **resting-state connectivity with the bilateral thalamus**, laying the foundation for follow-up work examining potential **upstream regulators of HoFC**—including shared subcortical drive.

References

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More details in the preprint:

