

Changes in the structure of spontaneous speech predict the disruption of hierarchical brain organization in first-episode psychosis

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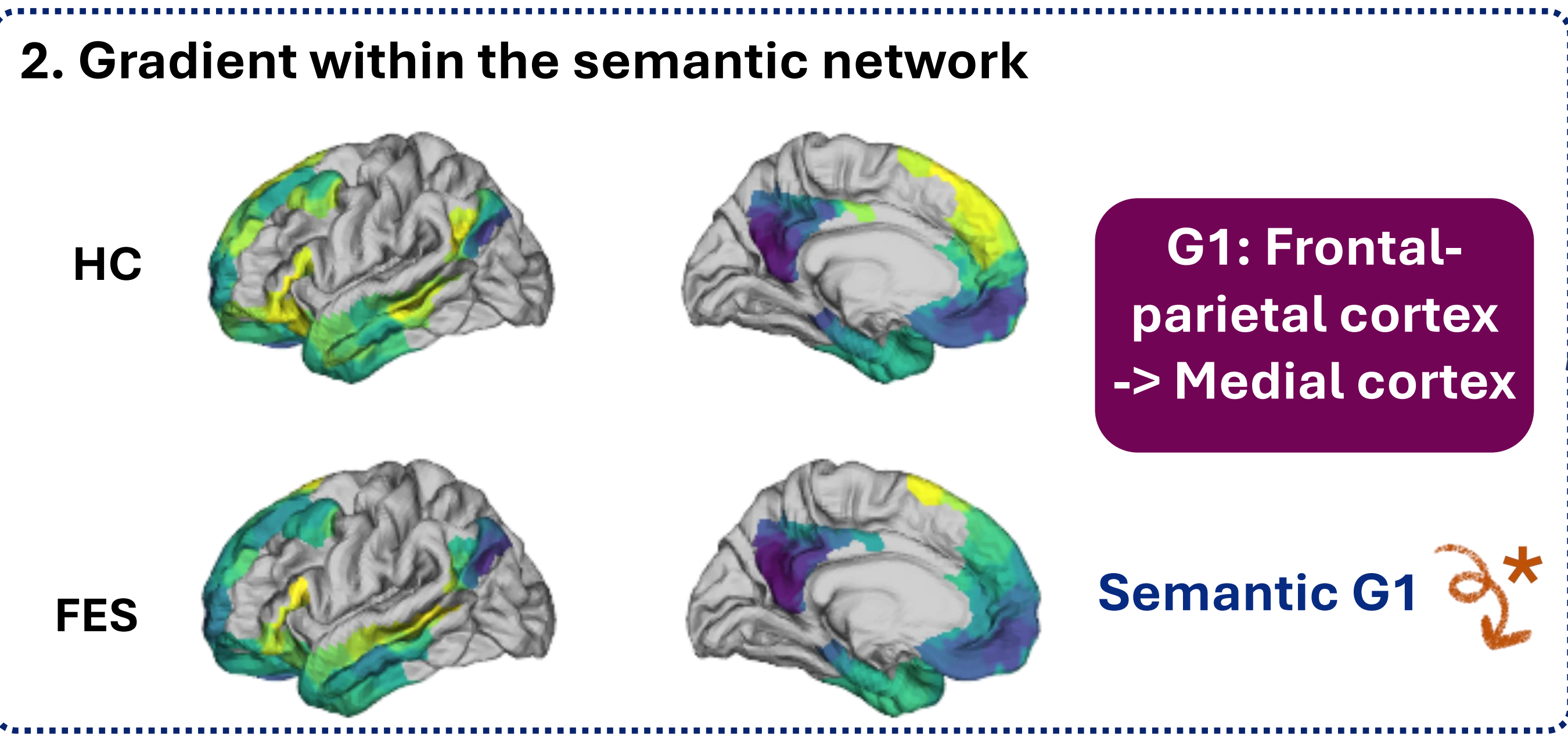
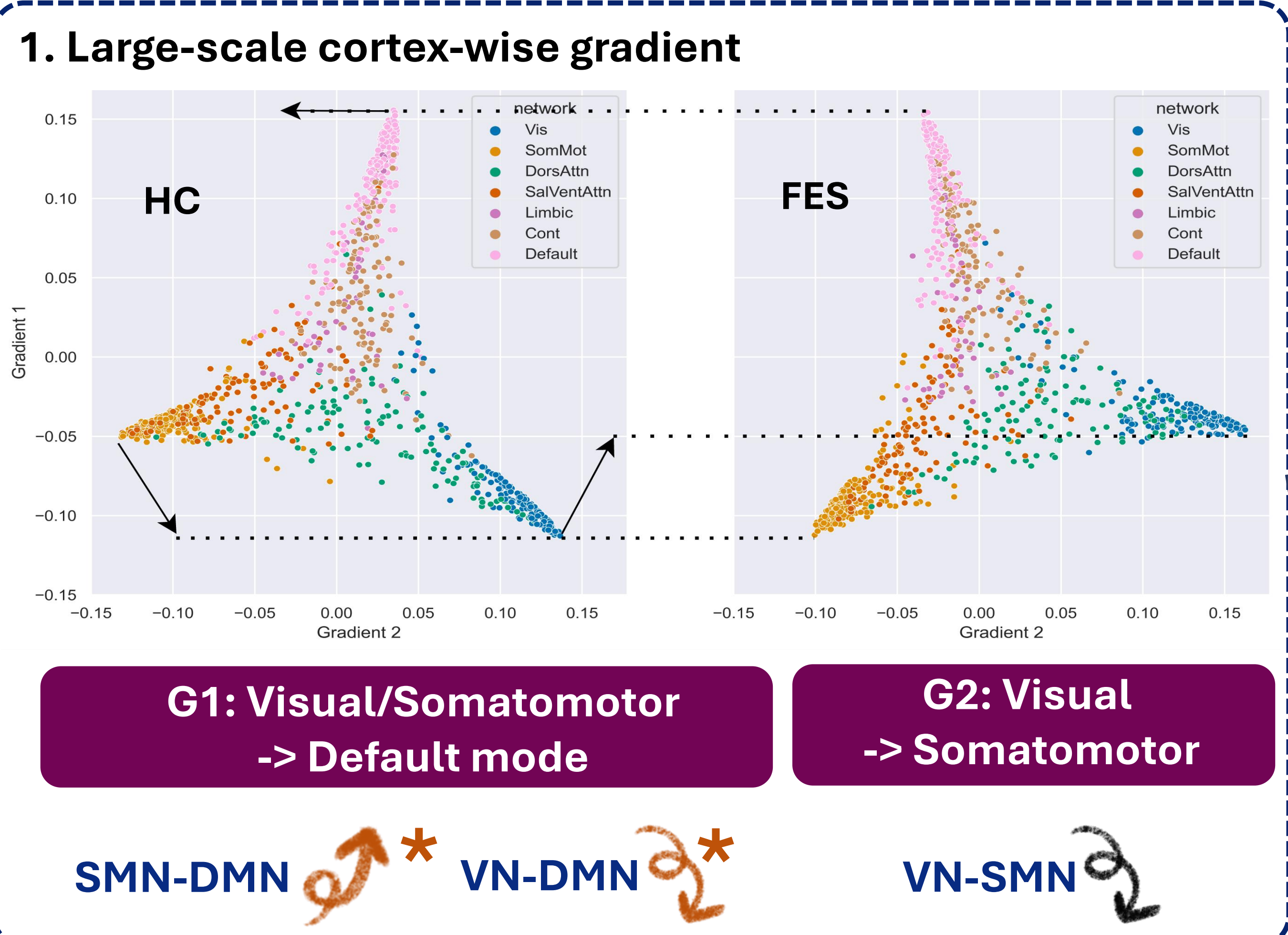
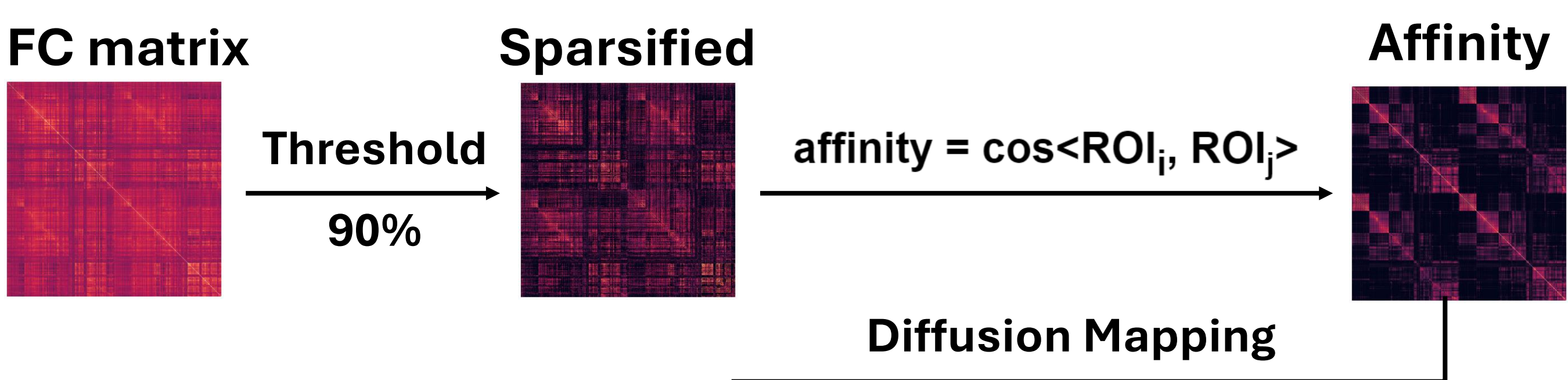
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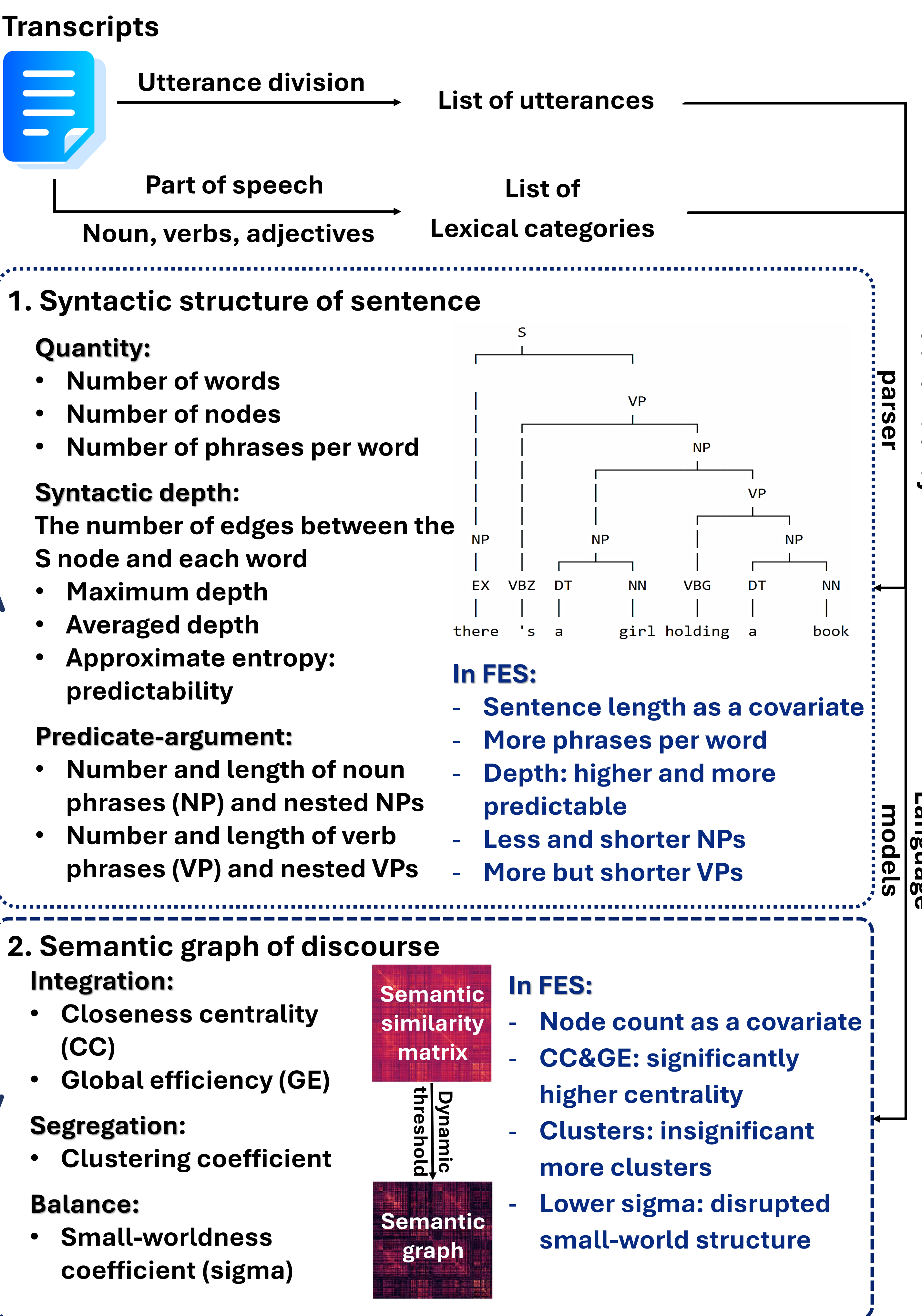
Motivation and materials

Psychosis implicates changes across a broad range of cognitive functions, which are cortically organized in a hierarchy ranging from primary sensorimotor (unimodal) to higher-order association cortices. Language has long been documented as undergoing structural changes in psychosis. We hypothesized that these changes as revealed in spontaneous speech may act as readouts of alterations in the configuration of this unimodal-to-transmodal axis. We employed 7T resting-state fMRI and spontaneous speech elicited by picture description tasks from 29 first-episode schizophrenia (FES) with 29 matched controls to investigate such hypothesis.

Gradient construction



Language structure



Correlation between brain gradient and language structure

	Nodes	Phrase_fraction	Depth	DepthMean	DepthApEn	NP_count	NP_test	NP_length	VP_count	VP_test	VP_length	FT_CC	FT_GE	FT_Clustering	FT_Sigma	ST_CC	ST_GE	ST_Clustering	ST_Sigma
VN_DMN	0.354	-0.523	0.055	0.081	-0.130	0.613	0.797	0.375	0.062	-0.152	0.210	1.600	1.746	0.622	-2.531*	2.393*	2.459*	3.690***	-1.976*
SMN_DMN	0.777	-0.345	0.780	0.892	0.561	1.038	1.252	1.240	0.577	0.776	1.521	0.563	0.650	-0.148	-1.573	1.838	1.994	2.837*	-0.881
VN_SMN	0.063	-0.095	0.036	0.046	-0.305	0.098	0.369	-0.036	-0.210	-0.820	0.203	0.111	0.040	-0.002	-0.471	0.032	0.087	0.613	0.437
SemN_G1	2.358*	1.933	2.296*	2.331*	0.451	1.523	0.350	0.046	2.235*	2.299*	1.809	-0.248	-0.210	-0.230	-0.214	0.799	0.782	0.723	-0.149

- The principal gradient of the whole cortex as indexed by VN-DMN dispersion and SMN-DMN dispersion is related to the topology of semantic graphs.
- The principal gradient of the semantic network is related to the structure of syntactic tree and properties of verb phrases.

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