

Shared and specific macro- and microscale brain abnormalities across four sleep disorders

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Background

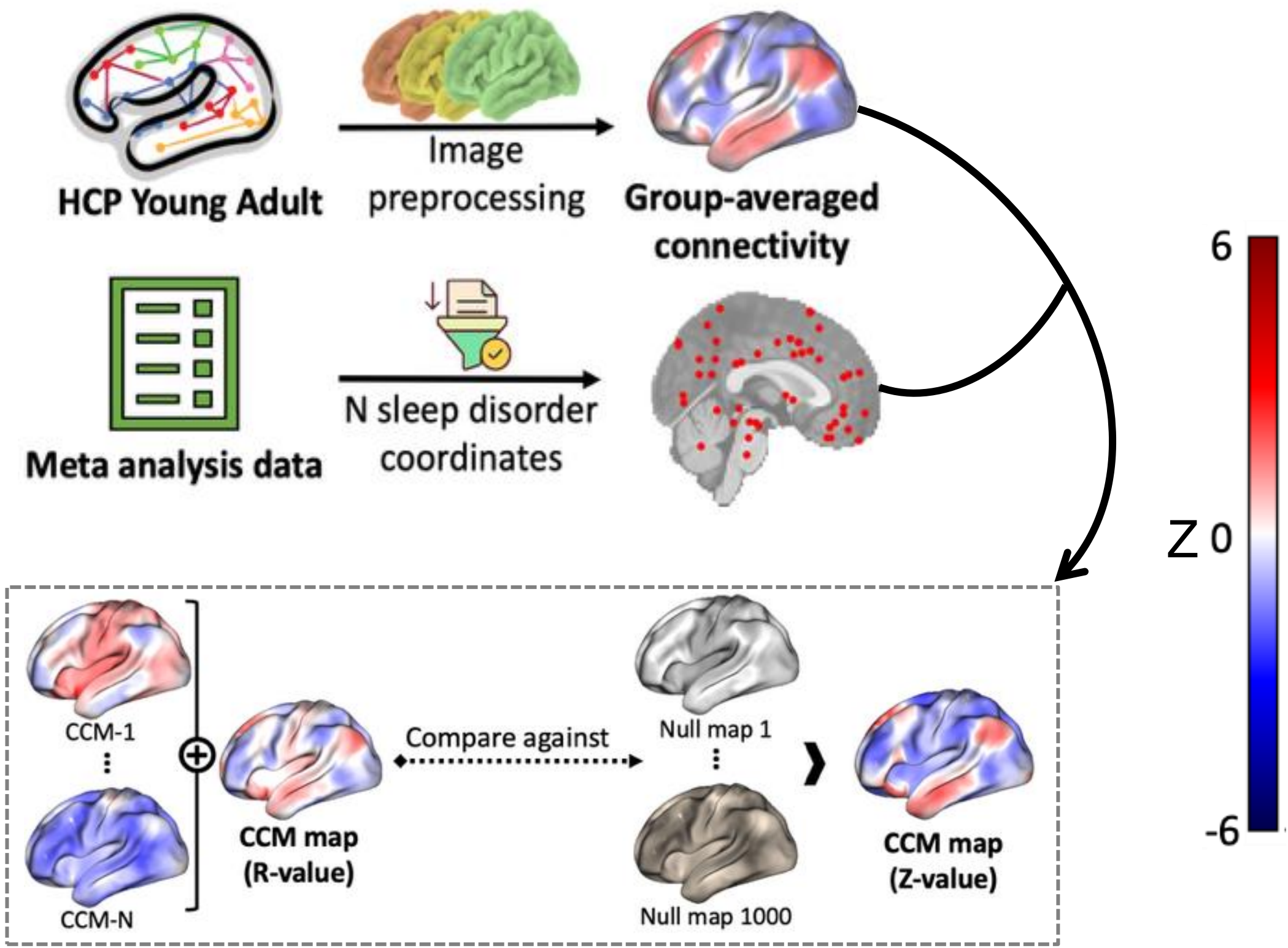
- Sleep disorders represent a significant public health challenge, characterized by high prevalence and profound mental and socioeconomic impacts.
- Sleep disorders share common nocturnal and daytime symptoms, suggesting **transdiagnostic** patterns.
- Advancing personalized therapies requires moving beyond single-disorder silos to uncover the shared and distinct brain mechanisms underlying these disorders.

Disorders	Experiments	Subjects	Coordinates
Transdiagnostic	80	1937	1146
Insomnia (ID)	26	794	284
Obstructive sleep apnea (OSA)	25	583	485
REM behavioral disorders (RBD)	16	325	199
Narcolepsy	13	235	178

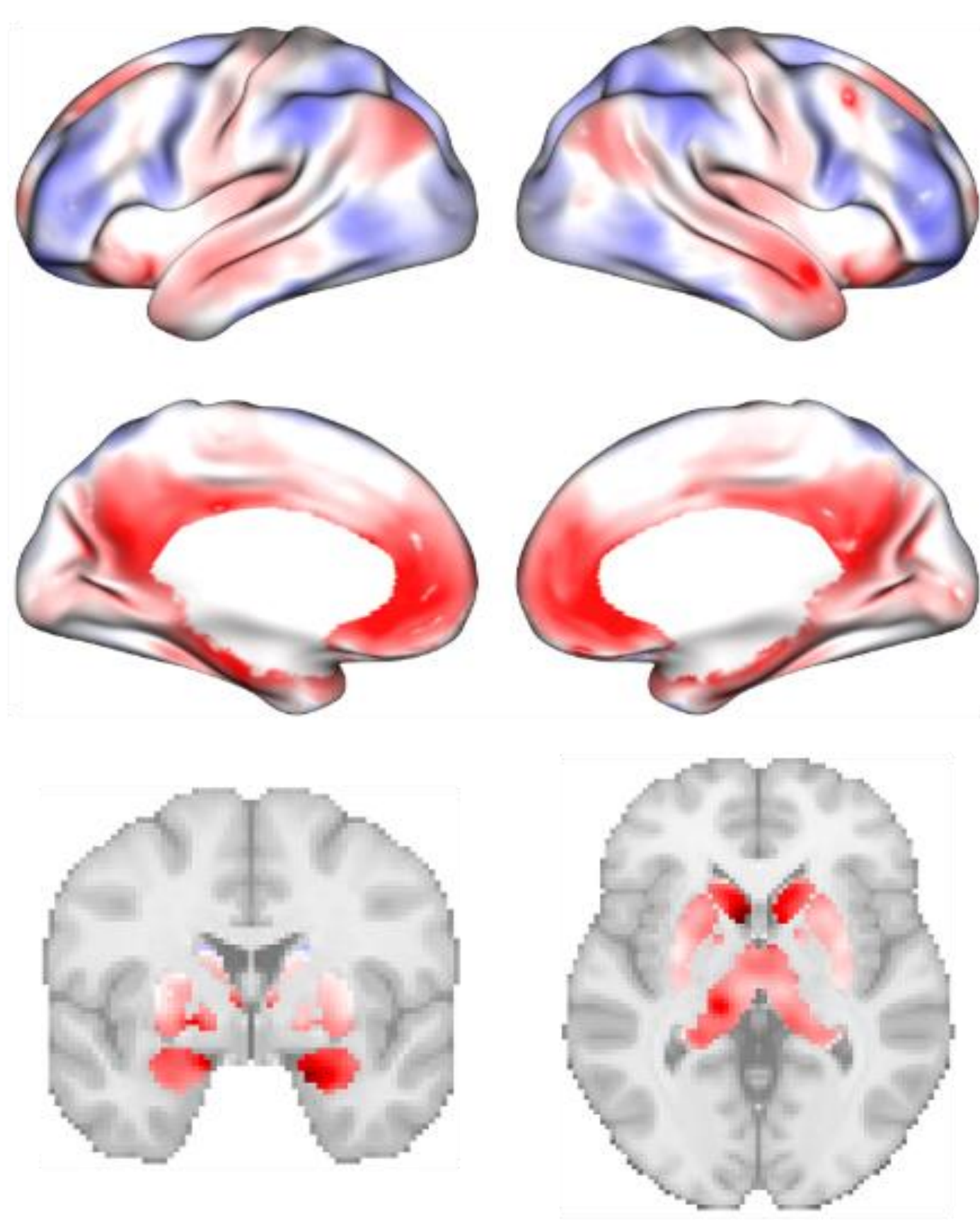
Research aims

- We applied **Convergent Connectivity Mapping (CCM)** [1] to compute normative functional connectivity from spatial coordinates of sleep disorders [2]. By projecting localized peak coordinates of brain alterations from independent studies onto the HCP-Young healthy reference connectome, we aimed to identify shared and specific system-level circuit disruptions.
- Integrating **multi-tracer PET neurotransmitter maps** to evaluate the chemical architecture underlying identified CCM maps.

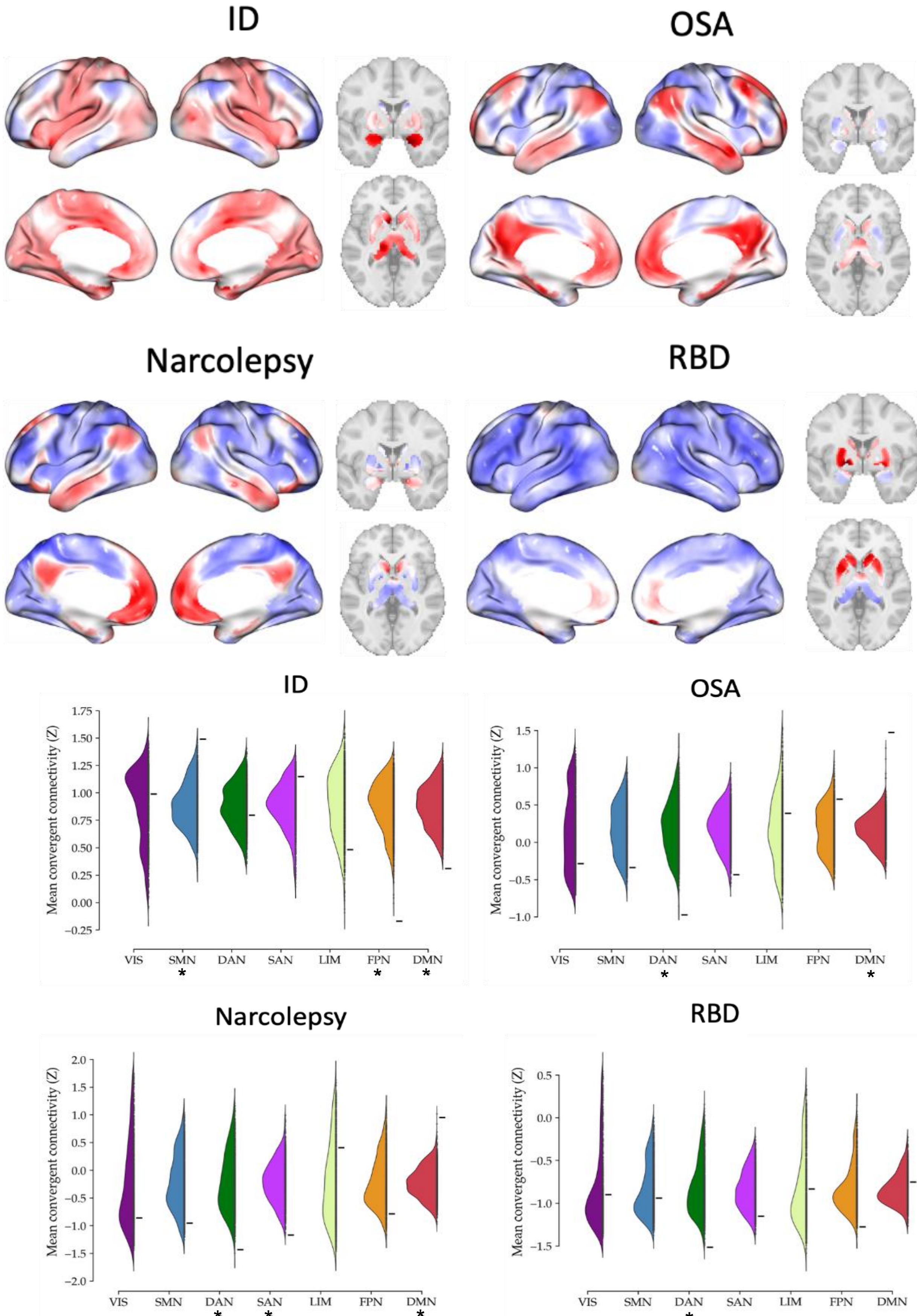
Convergent connectivity mapping



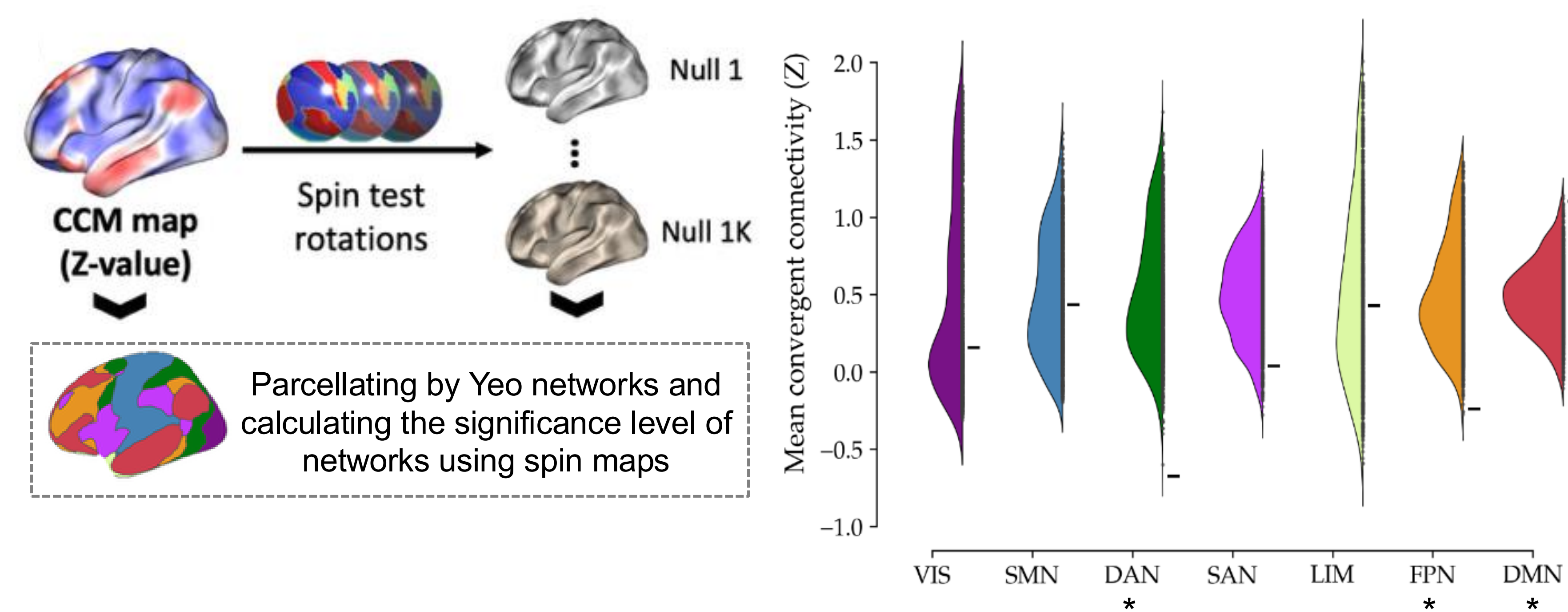
Shared normative patterns



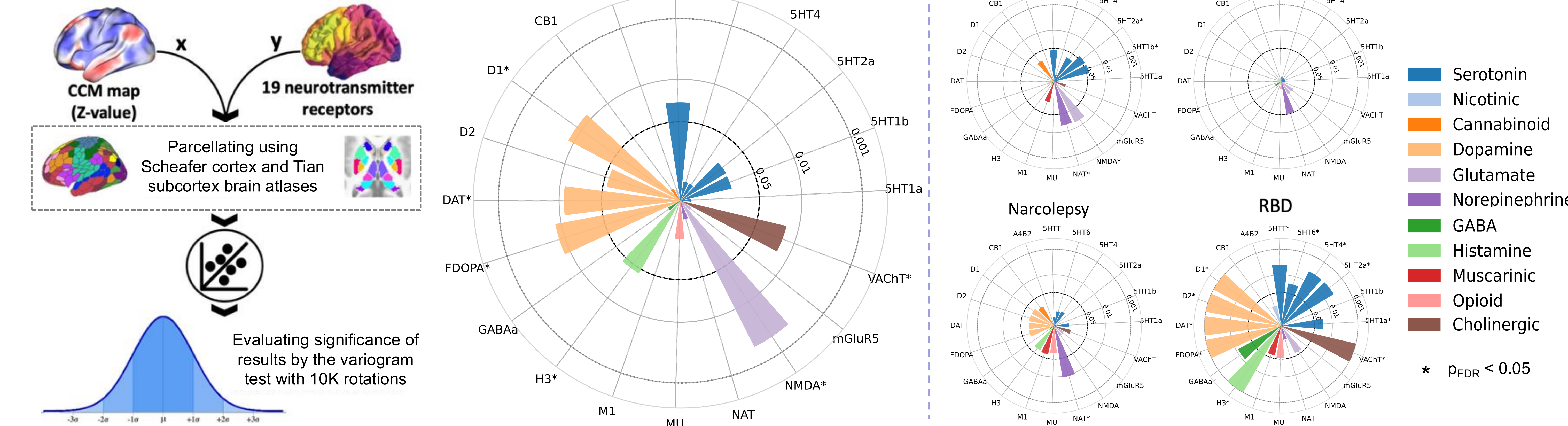
Disorder-specific normative patterns



Network-level convergent connectivity



Neurotransmitter colocalization



Conclusion

- Transdiagnostic:** convergent pattern across 4 sleep disorders within the Default Mode, Frontoparietal, and Dorsal Attention networks.
- Disorder-specific:** divergent patterns across key canonical systems. While ID, OSA, and narcolepsy showed widespread involvement across the DMN, FPN, and SAN, RBD was uniquely localized, showing significant involvement exclusively within the DAN.
- Transdiagnostic:** co-localized pattern of serotonin, cholinergic, dopamine, histamine, and glutamate PET profiles.
- Disorder-specific:** molecular profiles varied—showing strong monoaminergic and transport links mainly in ID, narcolepsy, and RBD.



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