

A 2-Hz hippocampal rhythm scaffolds human memory

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Summary

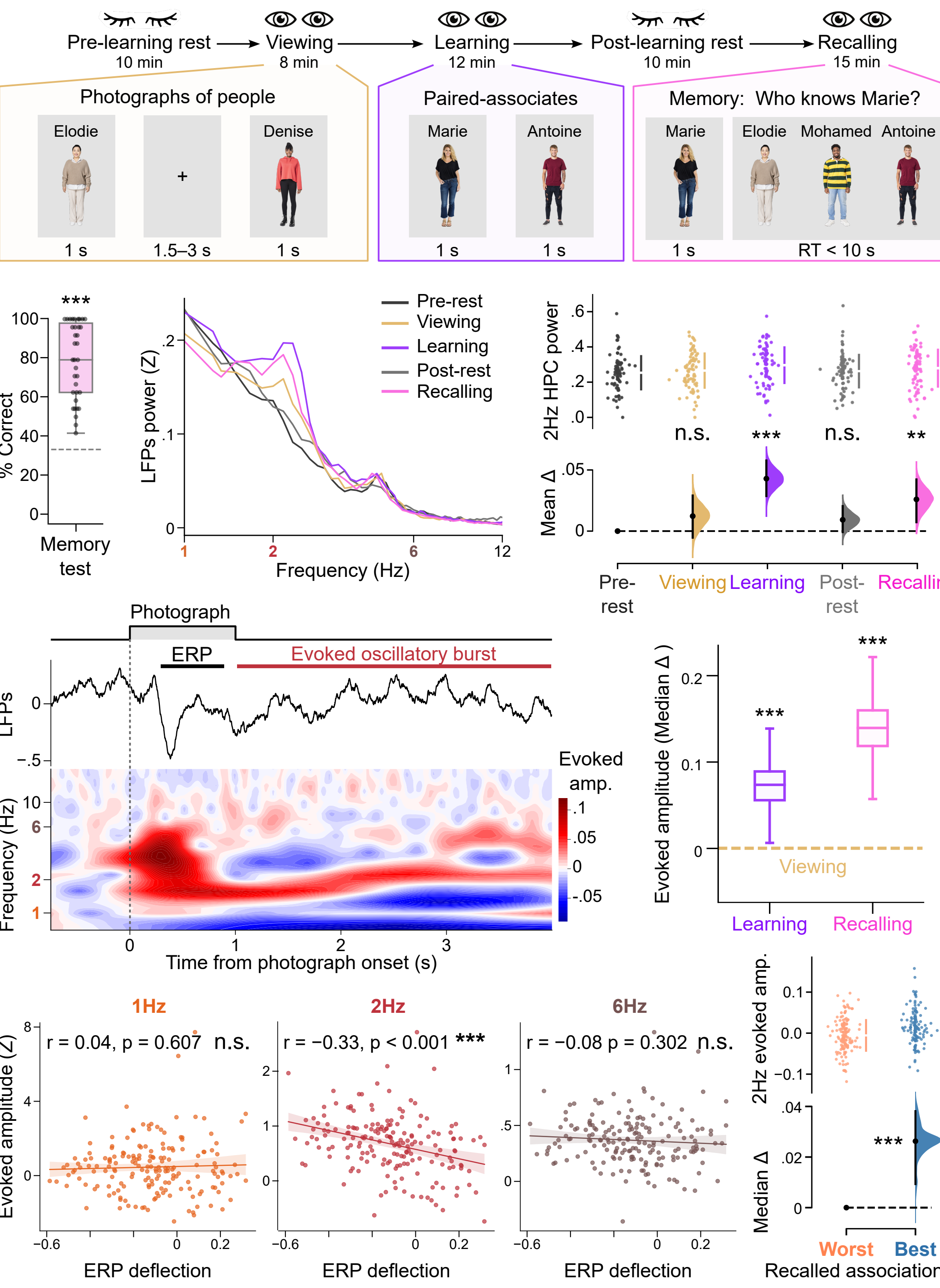
Hippocampal network rhythms orchestrate memory processing in rodents, from acquisition through consolidation to recall. **Does the human brain employ a comparable oscillatory framework?**

Using intracranial recordings from participants implanted with hybrid depth electrodes, we identified prominent 2-Hz oscillations in the human hippocampus during both learning and recall of a relational memory. Evoked by mnemonic cues, these slow oscillatory bursts organized neuronal ensemble spiking across the medial temporal lobe and phase-synchronized distributed gamma activity patterns. Cross-regional coactivity motifs structured by this 2-Hz rhythm during wakefulness subsequently reactivated within hippocampal ripples during post-learning rest, supporting offline consolidation.

These findings reveal a **slow-frequency architecture** in the human hippocampus that parallels the organizational role of rodent theta, providing a scalable scaffold for distributed neural dynamics underlying memory processing.

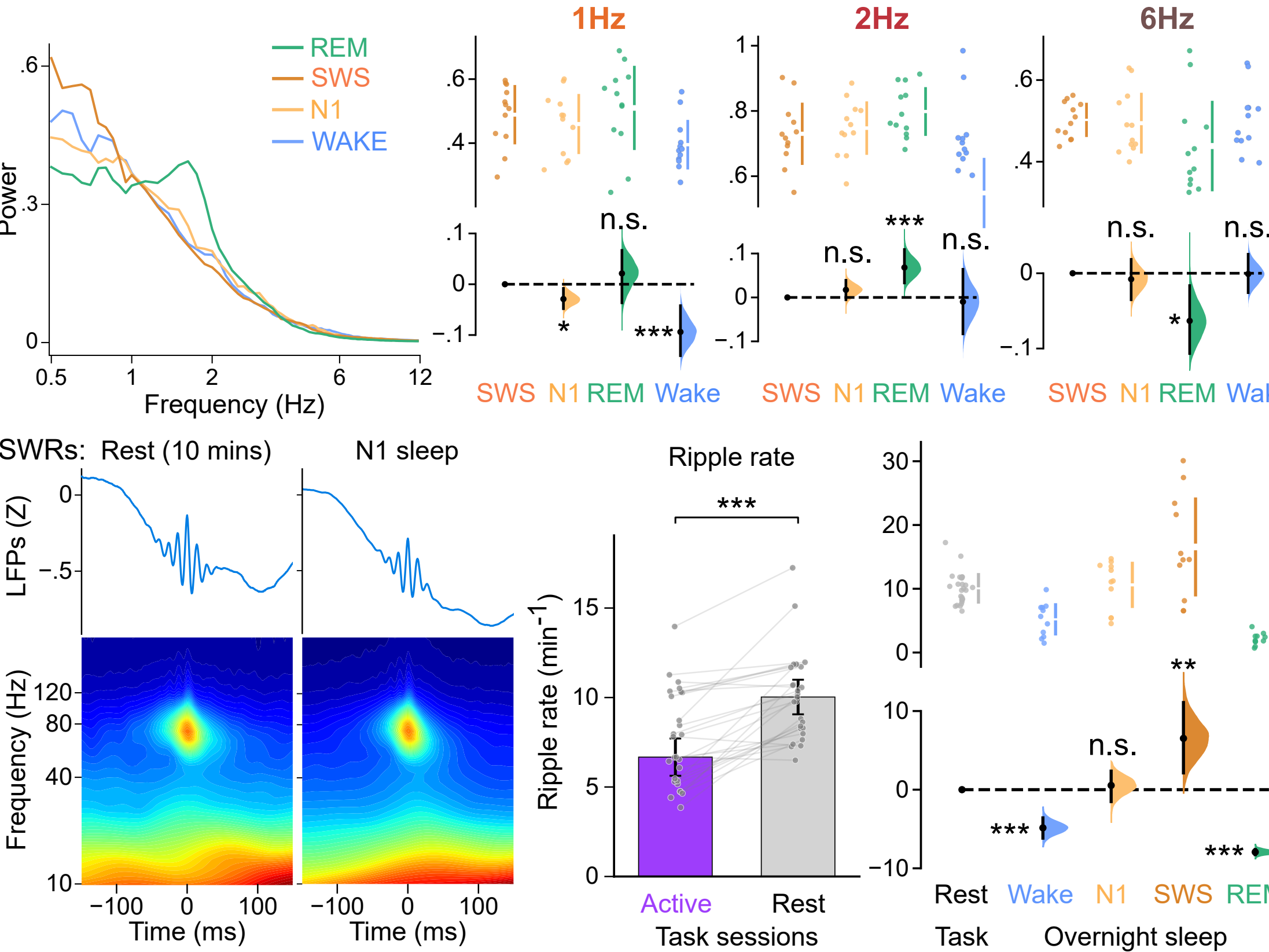
2-Hz is evoked by mnemonic cues

Memory task in 27 participants, 34 recording days



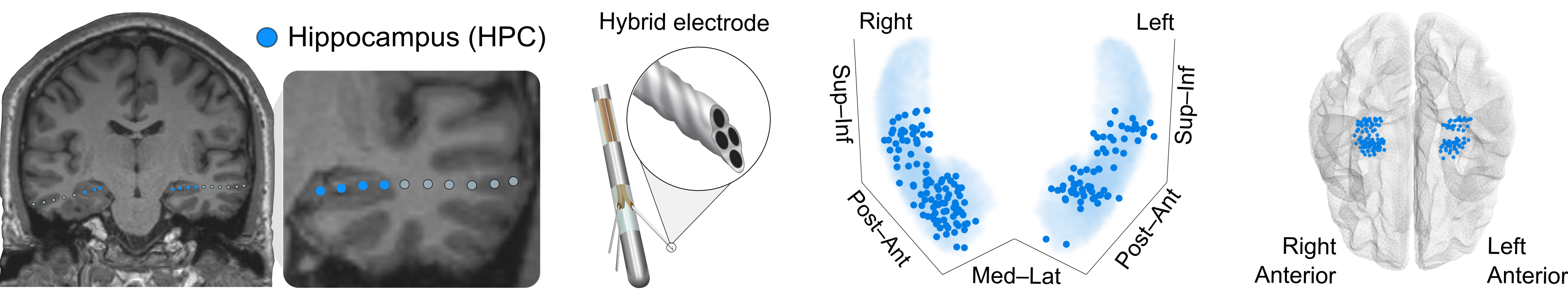
2-Hz features REM sleep

Overnight polysomnography in 6 participants, 12 nights

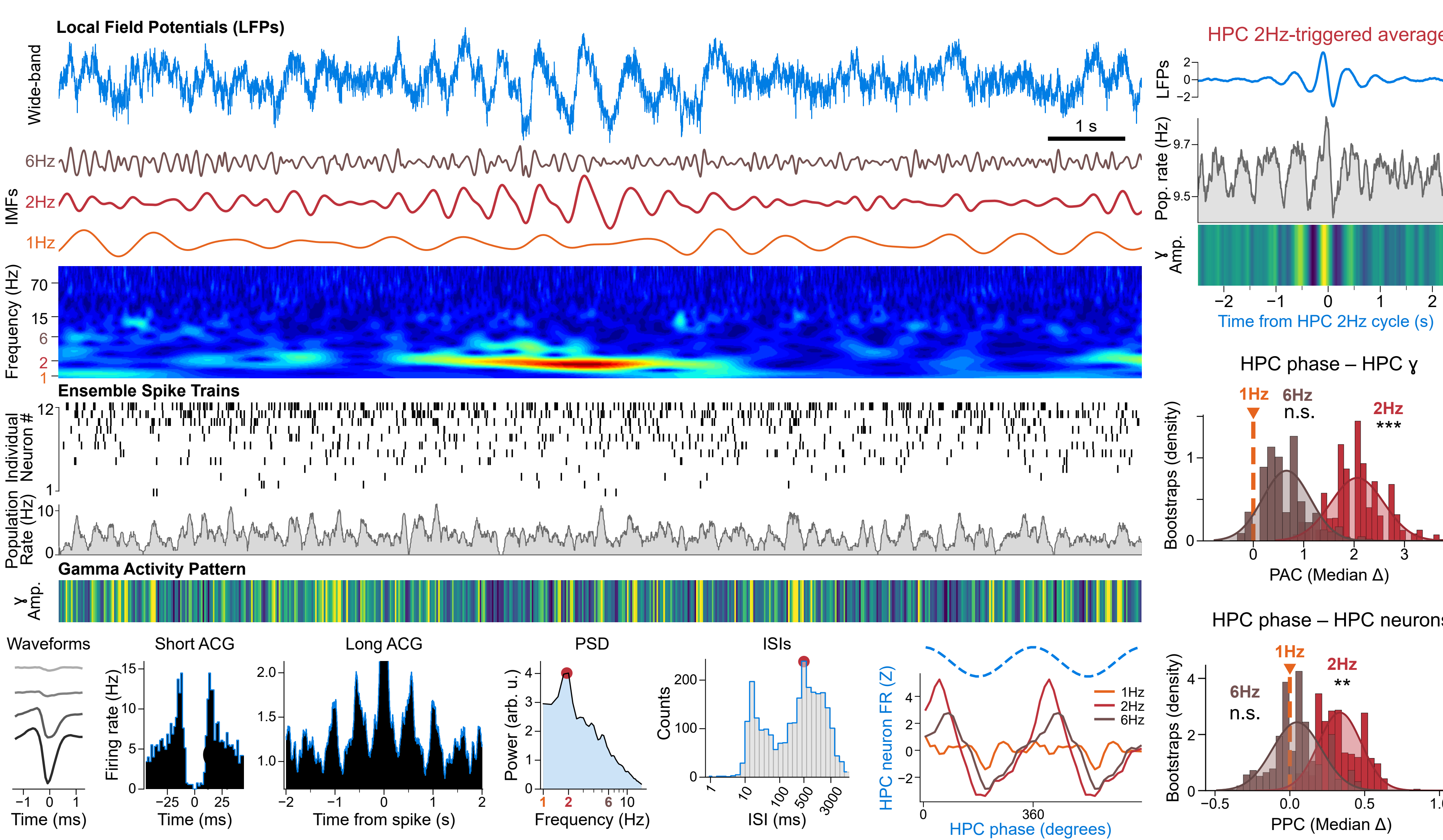


Subjects and intracranial hybrid electrodes

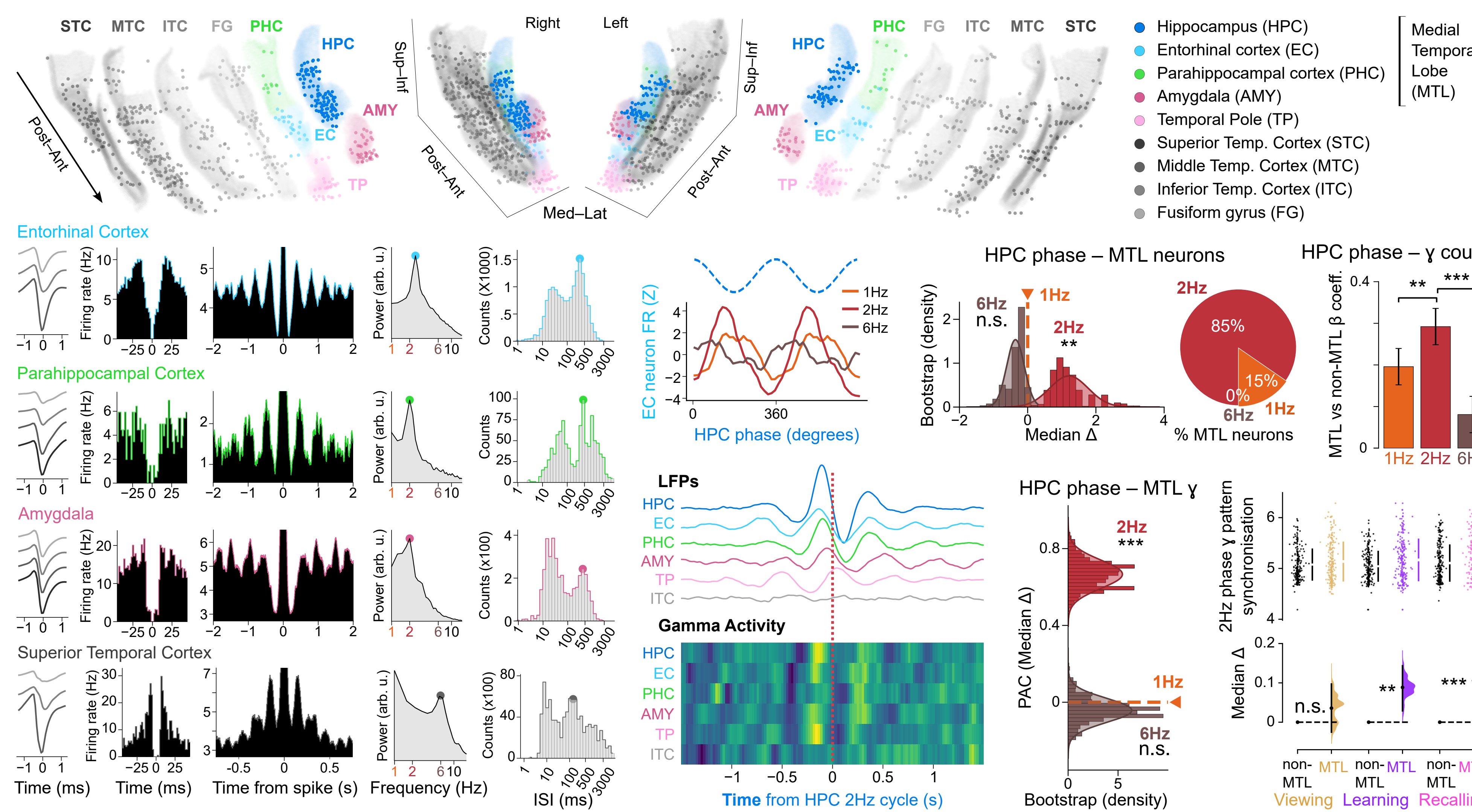
35 drug-refractory epileptic participants, 68 recording days, 257 MTL neurons, 211 HPC neurons



Human hippocampus is paced by a 2-Hz rhythm



2-Hz synchronizes distributed MTL neuronal activity



2-Hz cross-regional coactivity motifs reactivate in offline HPC ripples

Reactivation analyses in 6 participants, 8 recording days, 603 pairs

