



increases as expected; also, the variance decreases for stronger correlation coefficients. The behaviors of the correlation between stationary signals were similar to in vivo monkey data when using smaller window sizes, such as 45 s.

For example, figure 1 shows the probability density functions (pdf) of the cross-correlations between two sub-regions of SI for fMRI data obtained from one monkey, along with the pdf of two stationary simulated signals with the same mean correlation, for window sizes 45 s and 180 s, respectively. For statistical comparison, the Kolmogorov-Smirnov (K-S) test shows that correlations between functionally related regions 3a and 3b in the monkey data are distributed similarly to the correlations derived from simulated stationary data at short window sizes (smaller k-s value indicates less difference), but depart substantially at larger window sizes. The correlations between functionally unrelated regions 3a and control are distributed similarly to the stationary data from the simulation at all window sizes (Fig 2).

Conclusions: Sliding window estimates of variations in correlation between non-stationary signals may reveal dynamic changes but also may be confounded by statistical variations. Whether there are additional features within the real monkey fMRI data that are not present in simulated stationary data remains unclear, but exploration of additional statistical metrics is underway.

P47B Lesion to left hippocampus changes functional connectivity according to changes in structure

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Background: Resting-state functional connectivity (rsFC) not only reflects structural connectivity in default mode network (Greicius et al 2009), but also allows exploring interactions between remote regions. For this, several recent fMRI studies both

in animals and in humans used it as a convenient and non-invasive tool to systematically investigate the connective architecture of selected brain networks (Zhang et al 2010). The purpose of this study is to trace changes in rsFC after inducing a unilateral hippocampal lesion in rats.

Methods: Male Sprague Dawley rats (n=20, 250–275 g) were anesthetized (induction 5% isoflurane, s.c. bolus medetomidine (0.05 mg/kg), followed by continuous s.c. infusion medetomidine (0.1 mg/kg/h)) and were inserted into the MR scanner (7T Bruker Pharmascan, Ettlingen, Germany). Anatomical (voxel size 0.156 × 0.156 × 0.156 mm³) and resting state fMRI (voxel size 0.375 × 0.375 × 1.1 mm³) data were acquired. Afterwards, kainic acid (0.4 μg/0.1 μl) was injected into the right hippocampus under isoflurane anesthesia (5% induction, 2% sustenance). This resulted in lesions to ipsilateral or bilateral hippocampus, and other cortexes. Four days and three months after the injection animals were scanned again using the protocol described above.

Results: The rsFC analysis found generally reduced functional connectivity between different areas, ipsilateral but also contralateral to the lesion. It is worth to mention that the connectivity pattern varied across rats based on structural changes due to the lesion.

Conclusions: We conclude that functional networks in resting state are a valuable tool to map brain dynamics when we act on some specific nodes via targeted lesions.

P48B Phase-amplitude coupling indicates independence of infraslow versus high frequency neural electrical activity regarding their relationship to resting state fMRI in rats

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Background: Fluctuations in the resting state functional magnetic resonance imaging (fMRI) signal have been linked to electrical potential changes in the brain, both band-limited power of high frequency activity (> 1 Hz) but also to local field potentials (LFPs) in infraslow (< 1 Hz) frequencies. One testable hypothesis for the neural basis of resting state fMRI is that power fluctuations in higher frequency neural activity correspond to the phase of the infraslow neural activity, and this relates directly to the infraslow changes seen in resting state fMRI. To test this hypothesis, we used an invasive LFP/fMRI rat model and quantified coupling between infraslow phases and high frequency amplitudes.

Methods: Data were recorded from 10 anesthetized Sprague-Dawley rats under a simultaneous infraslow LFP/fMRI protocol, and from 10 different rats under similar conditions except on the bench without fMRI scanning performed. The anesthesia used was either ~2.0% isoflurane (iso, 8 rats in total) or subcutaneous dexmedetomidine infusion (dex, 11 rats in total) or both in series (1 rat). Infraslow (0–1 Hz) phases from LFP and fMRI were compared to amplitude changes in simultaneously recorded high frequency (1–50 Hz) LFP power. Correlation between fMRI and LFP was also calculated.

Results: The only consistent phase-amplitude coupling was seen under iso and was due to the neural suppression burst condition that existed (Figure 1). No consistent phase-amplitude coupling was seen under dex. In addition, while both infraslow and high frequency power from the LFP correlated with the fMRI, these correlations were statistically independent, indicating that the high and low frequencies had independent relationships with resting state fMRI.