Broadband shifts in EEG power spectra are correlated with single-neuron activity in humans

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1 Introduction

- We studied the relationship between the EEG power spectrum and the firing rates (FR) of individual neurons in the human brain
- Other researchers[1,2] have noted high correlations between the power of high frequency (γ) oscillations and FR
- We developed a statistical framework to distinguish between broadband shifts in the EEG power spectrum[3] and band-specific peaks
- We also examined the correlation between FR and EEG power at narrow frequency bands, including γ

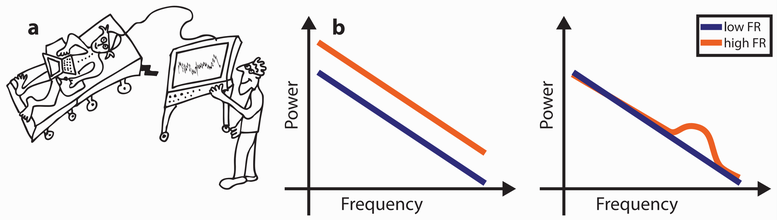

Figure 1. a. Experimental setup. **b.** Two explanations for γ/FR correlation.

2 Methods

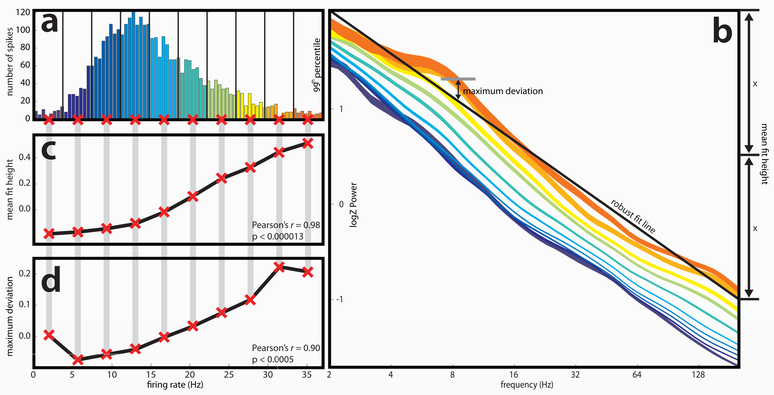

Figure 2. *Statistical framework.* **a.** The distribution of firing rates is divided into ten equally spaced bins. **b.** A power spectrum is created for each bin. These are used to compute mean fit height and maximum deviation. We then compute the correlation between firing rate and mean fit height (**c**) and maximum deviation (**d**).

3 Results

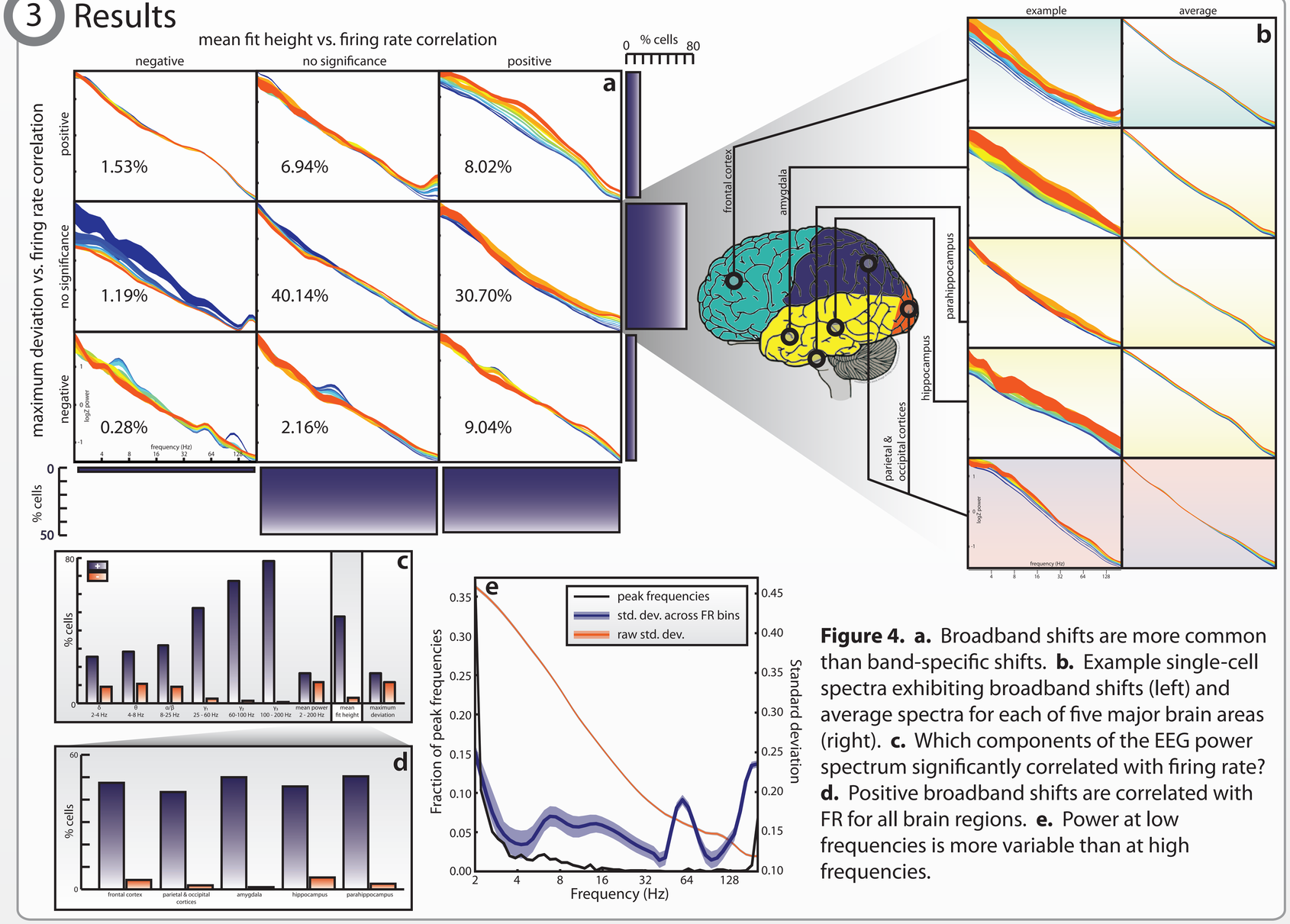

Figure 4. a. Broadband shifts are more common than band-specific shifts. **b.** Example single-cell spectra exhibiting broadband shifts (left) and average spectra for each of five major brain areas (right). **c.** Which components of the EEG power spectrum significantly correlated with firing rate? **d.** Positive broadband shifts are correlated with FR for all brain regions. **e.** Power at low frequencies is more variable than at high frequencies.

4 Conclusions

- EEG power spectra exhibit broadband shifts when FR changes
- Power at low frequencies is more variable than power at high frequencies
- This explains why γ oscillations are the best predictor of FR

5 Bibliography

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