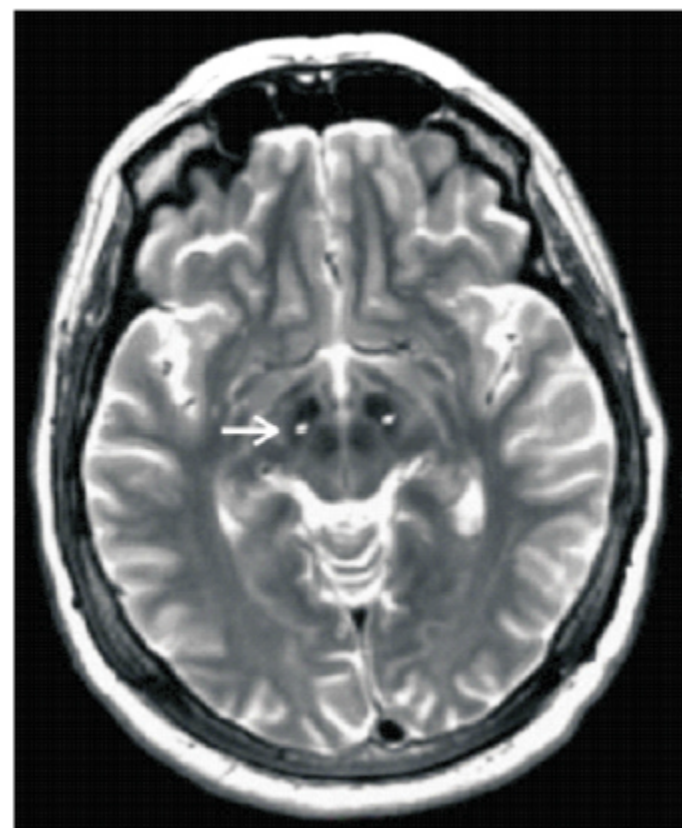
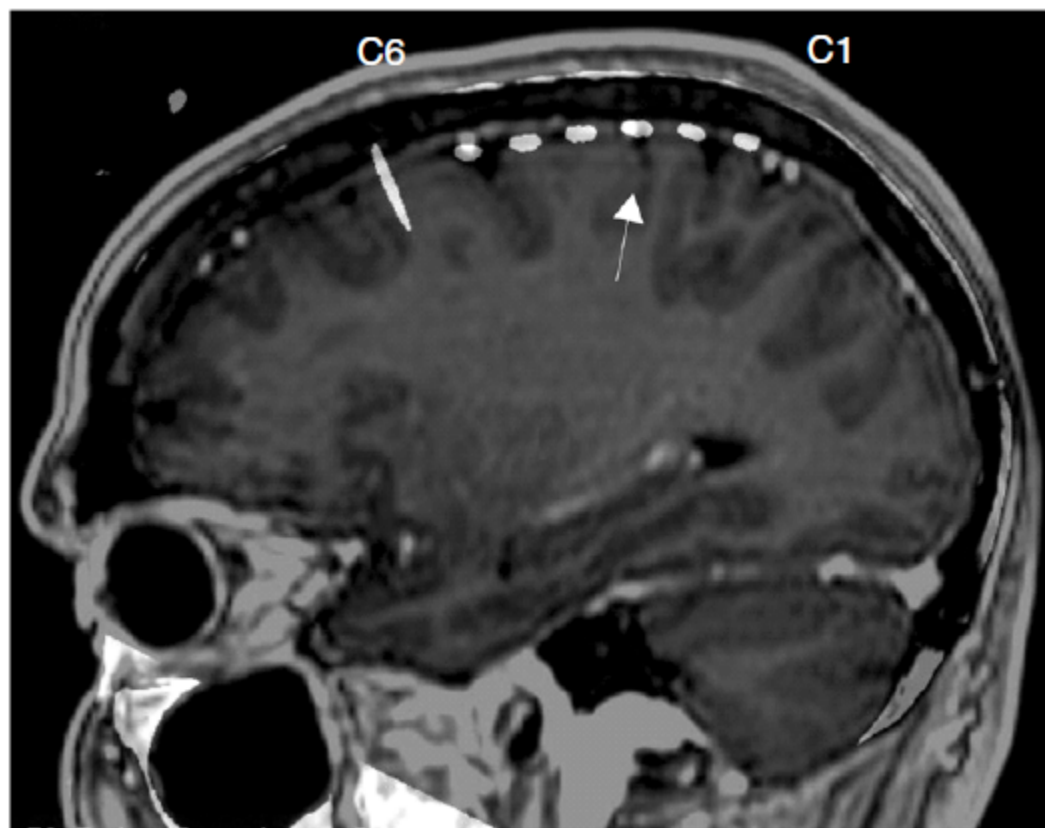


Deep Brain stimulation changes shape of motor cortical beta oscillations in Parkinson's Disease

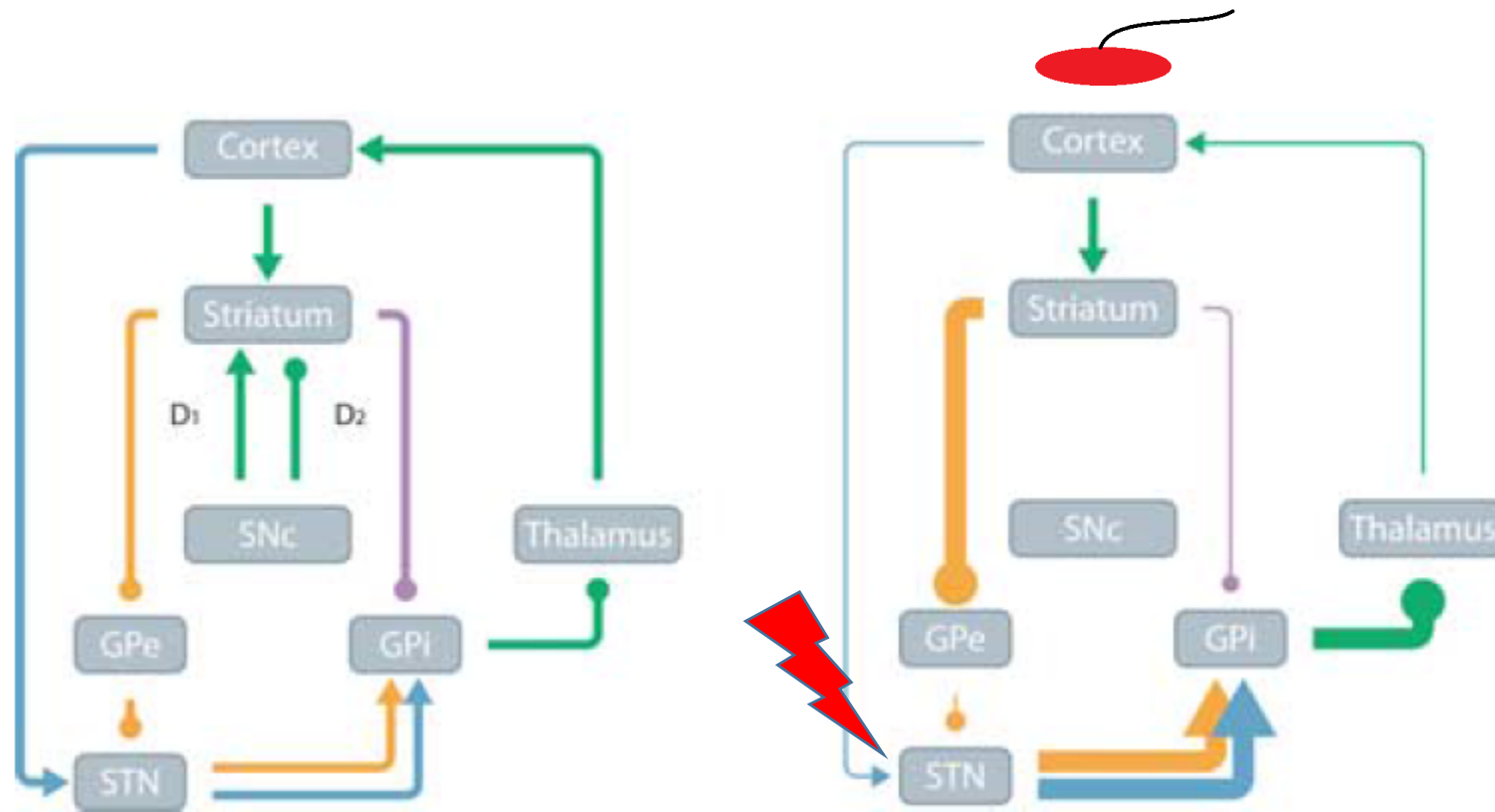
Scott Cole

Voytek Lab

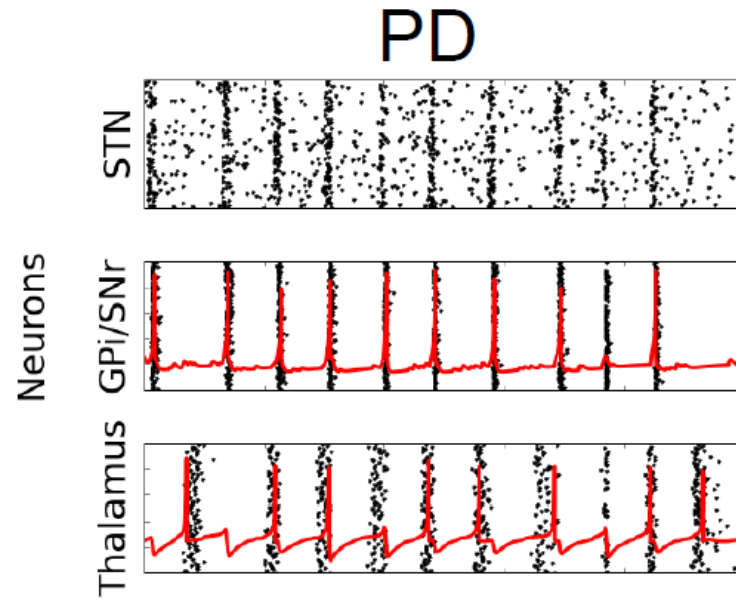
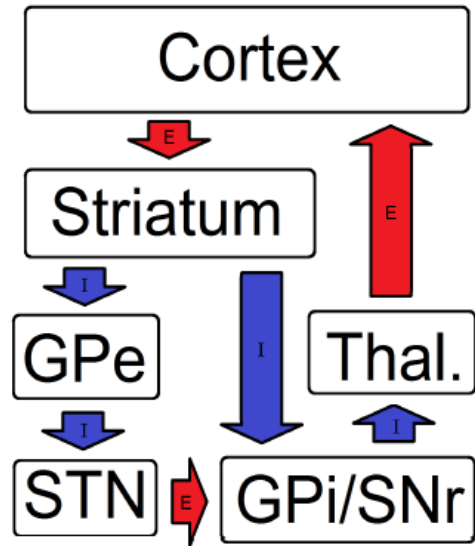
3 Nov 2015



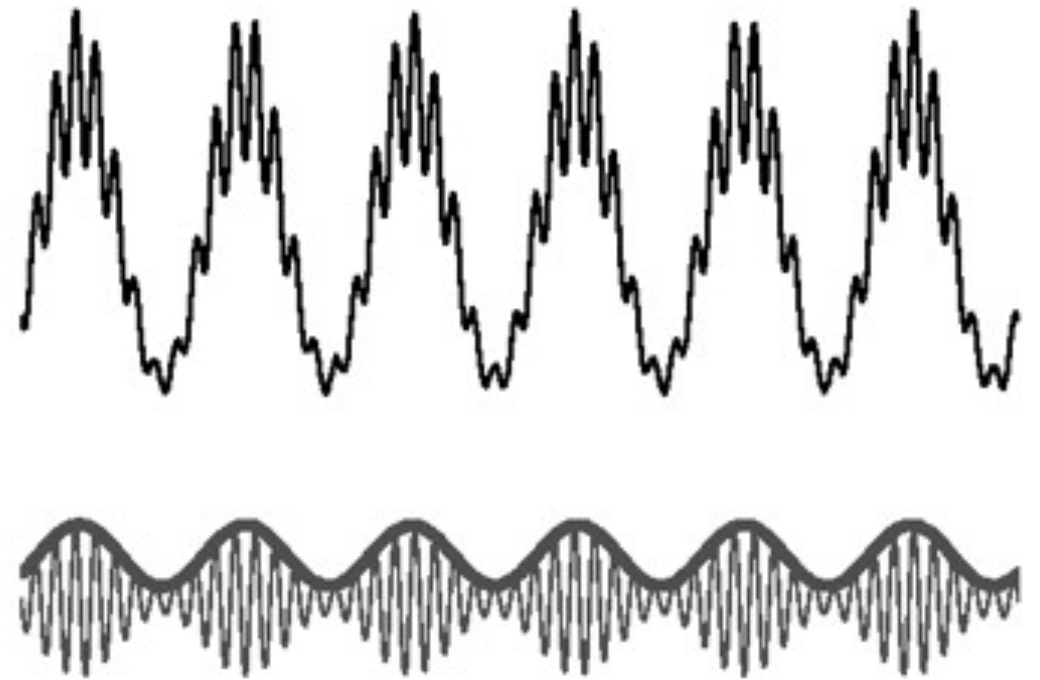
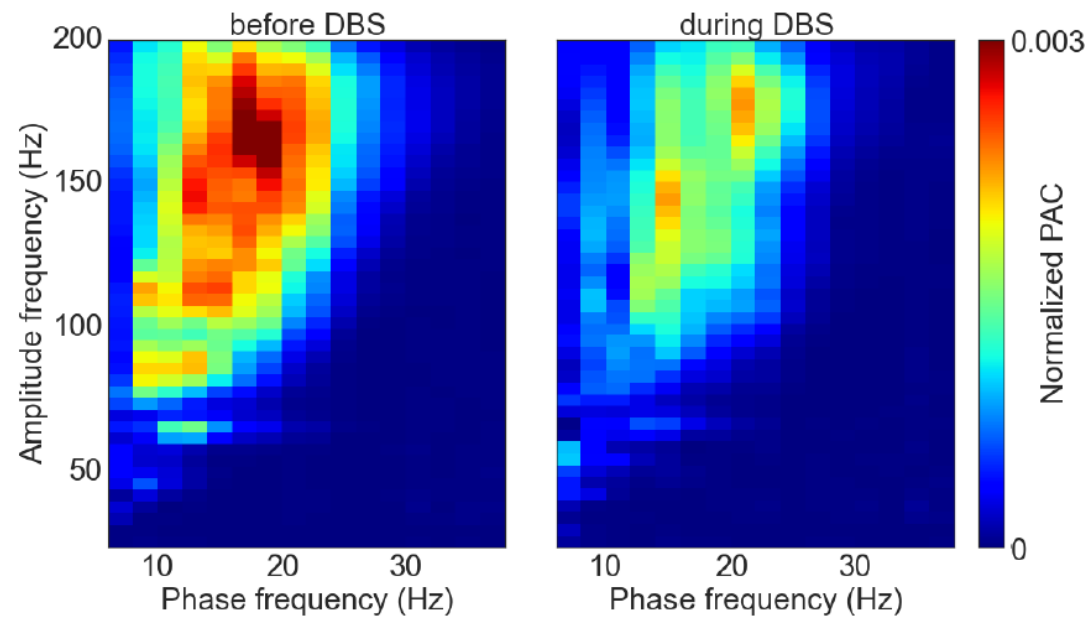
Basal Ganglia – Thalamo – Cortical Loop



Oscillations in basal ganglia



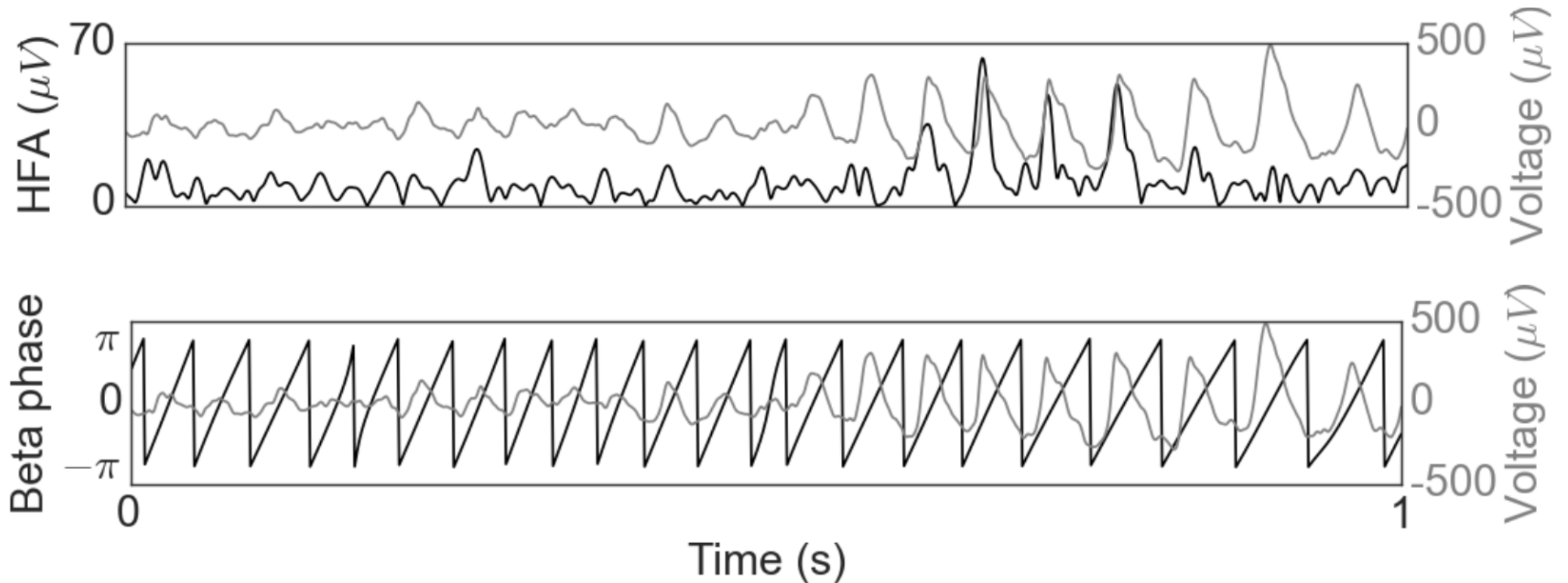
Phase-amplitude coupling



de Hemptinne, 2015, Nature Neuroscience

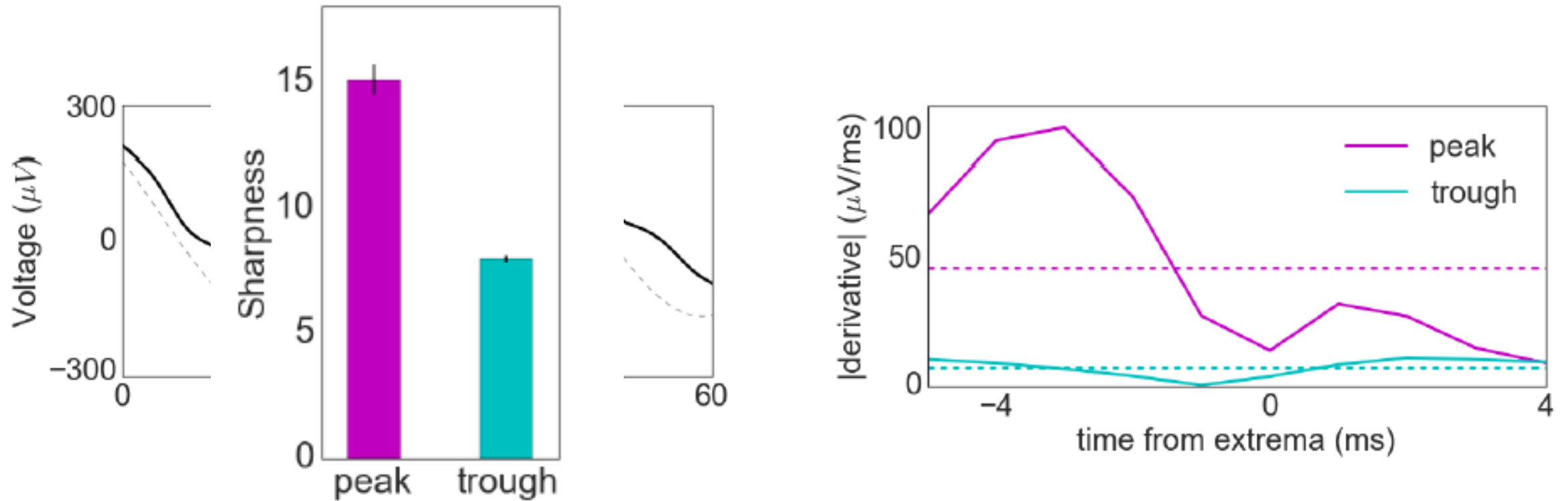
High frequency activity (HFA) proportional to population spiking (Manning, 2009)

But if you look at the raw data...

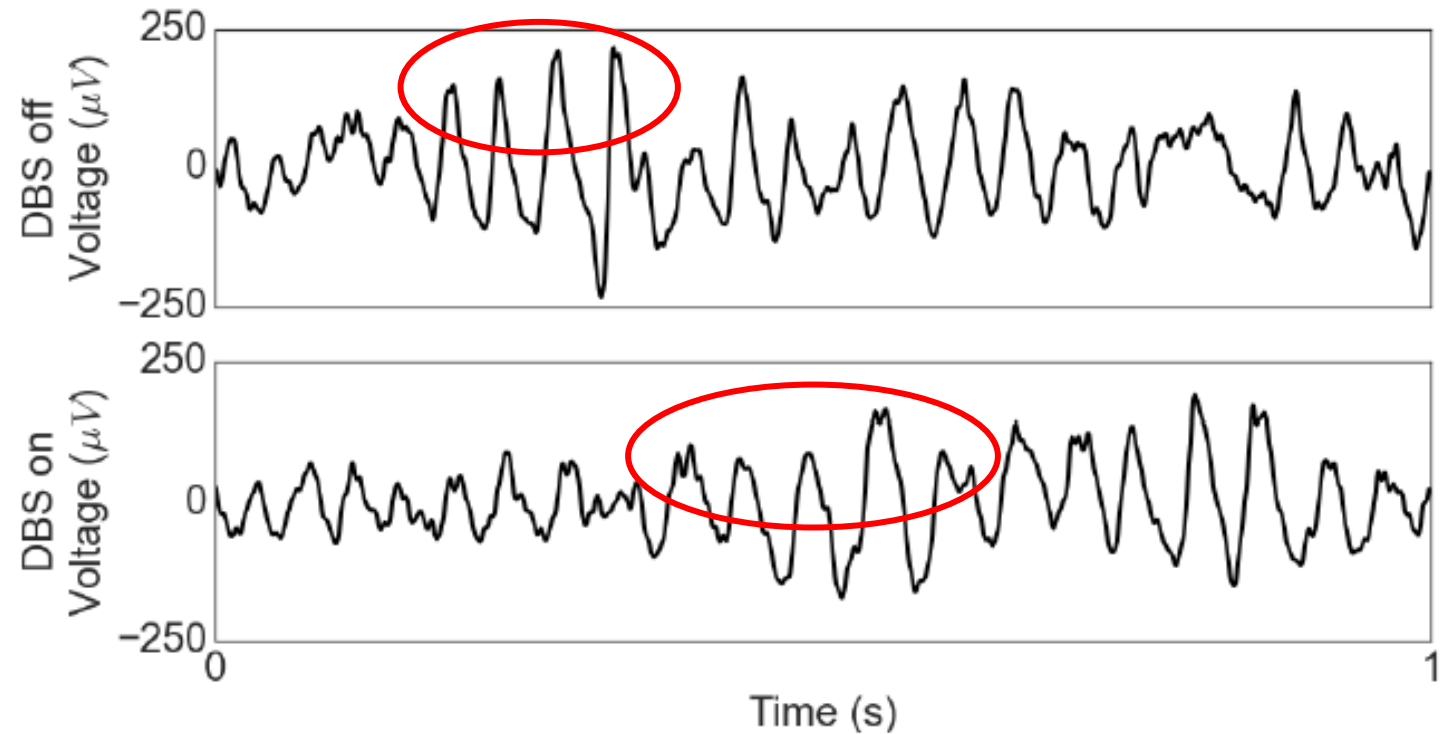
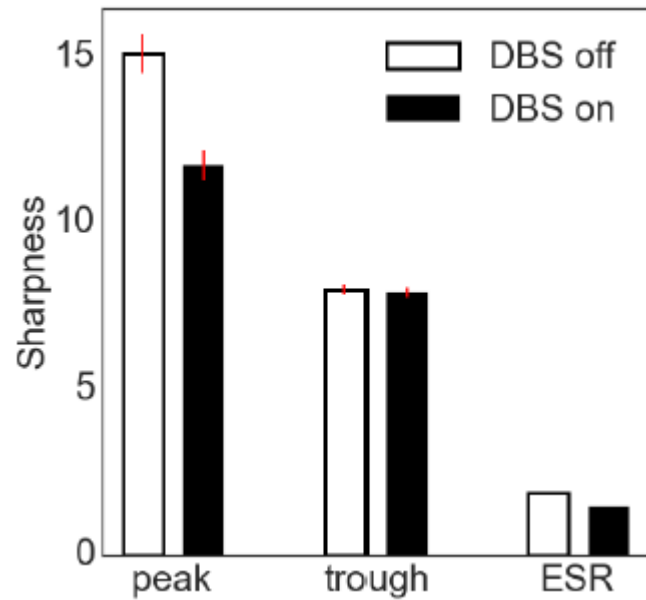


- 1 or 2 oscillations?
- HFA = population spiking, synchronized synaptic activity, other?

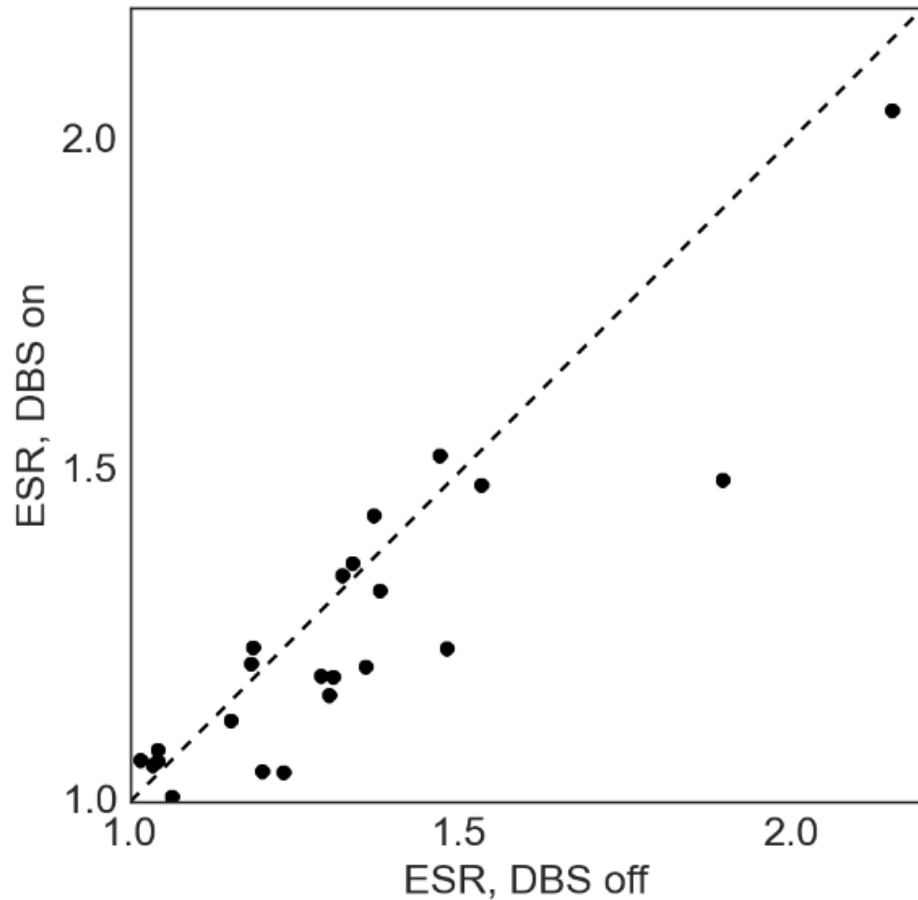
Maybe we can characterize this better



DBS decreases extrema sharpness for Subject 1

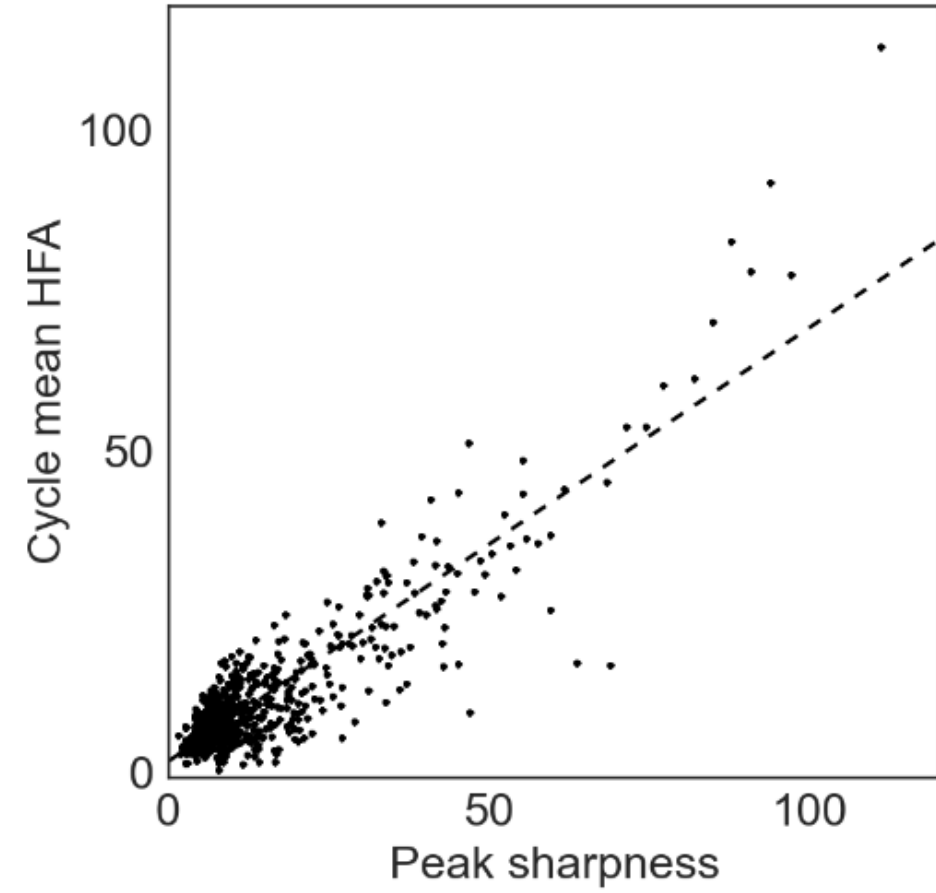
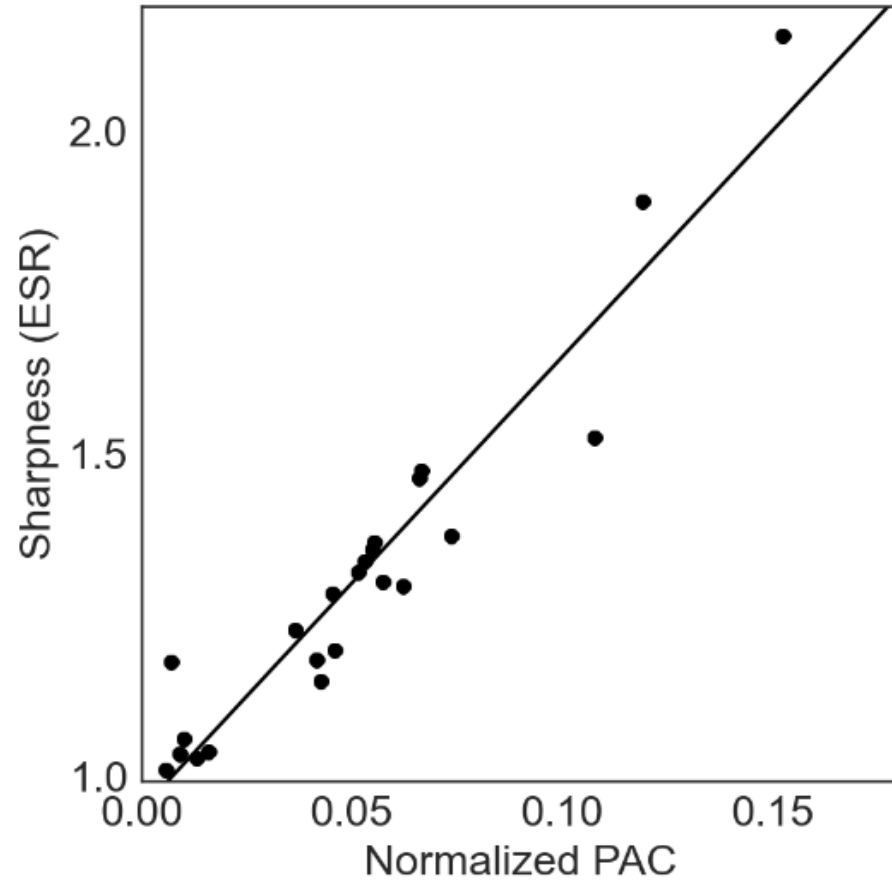


DBS decreases extrema sharpness

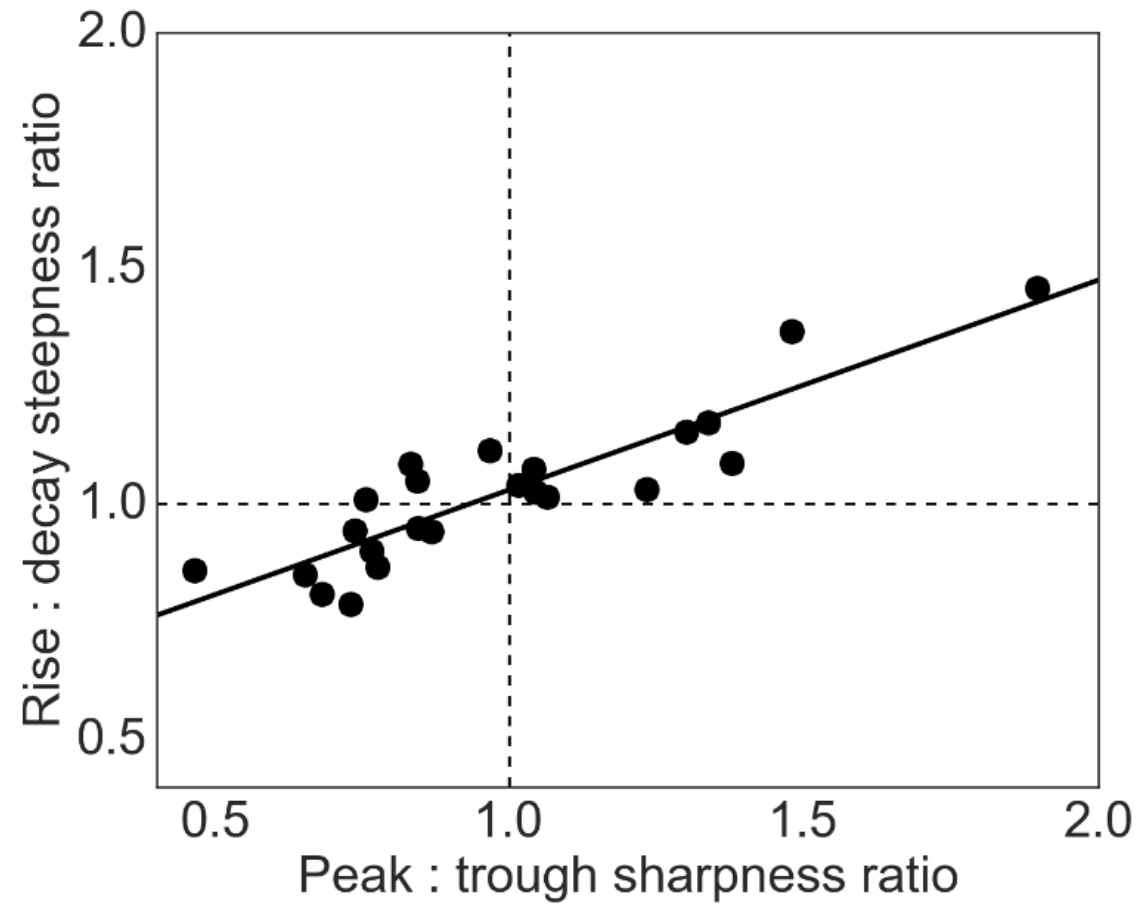


- $p=0.015$
- 9/9 subjects whose ESR changed most decreased with DBS

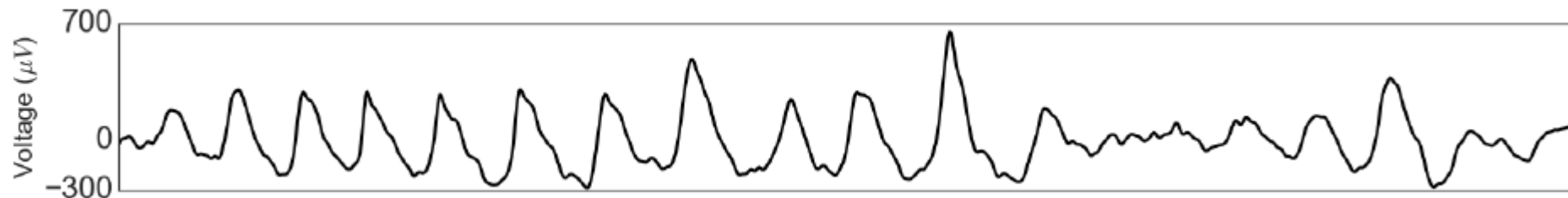
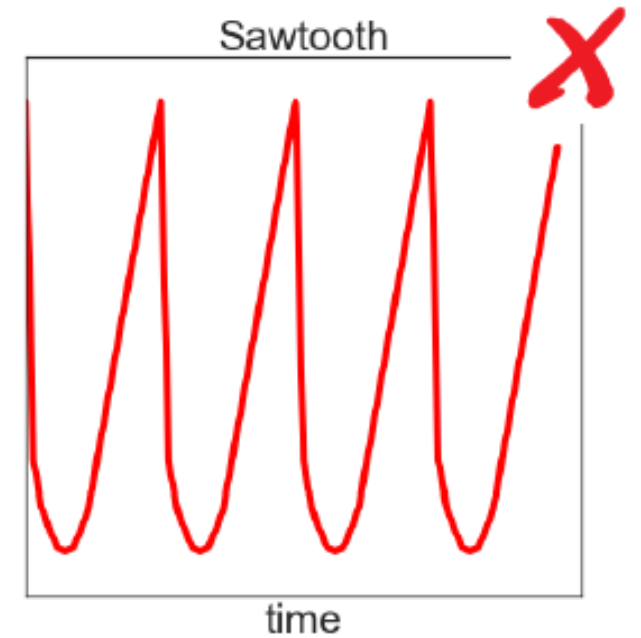
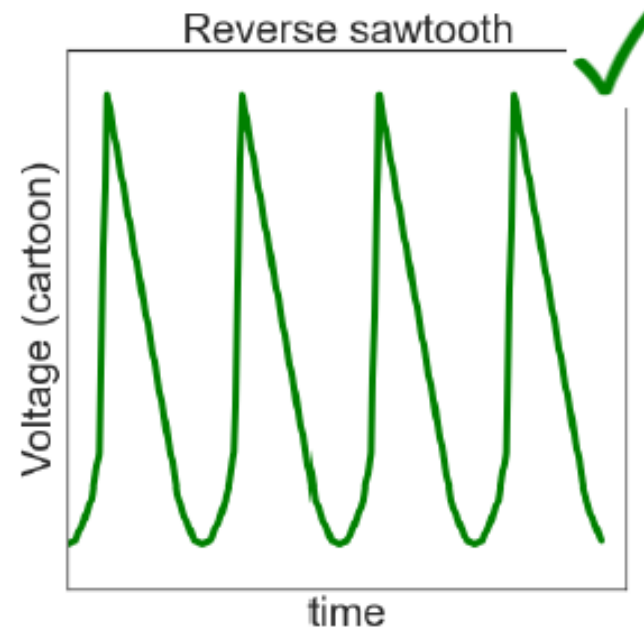
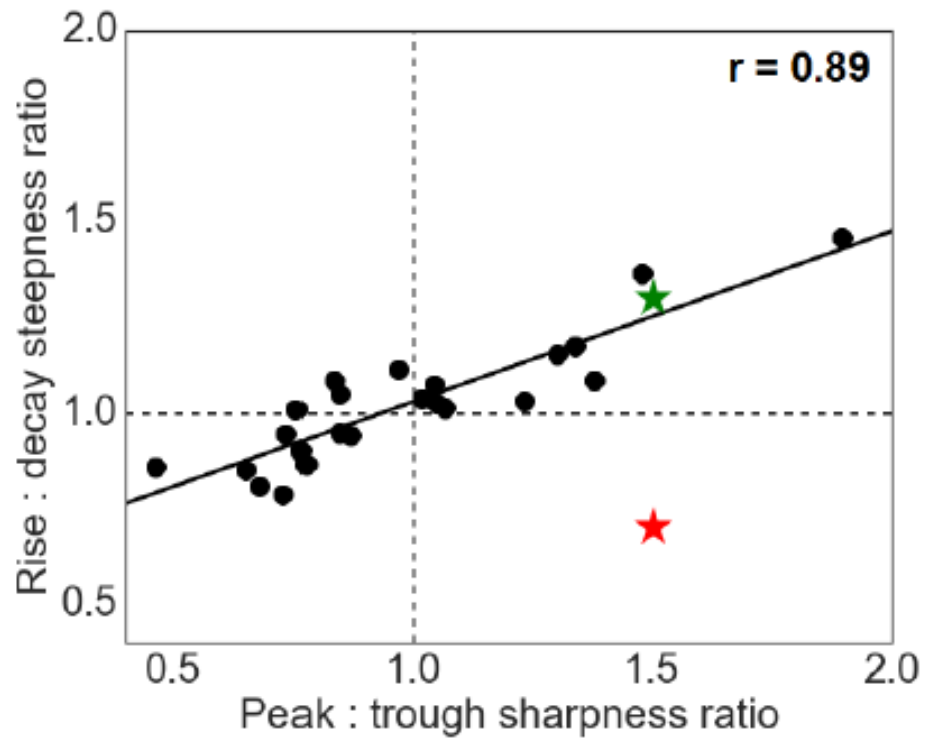
PAC = extrema sharpness



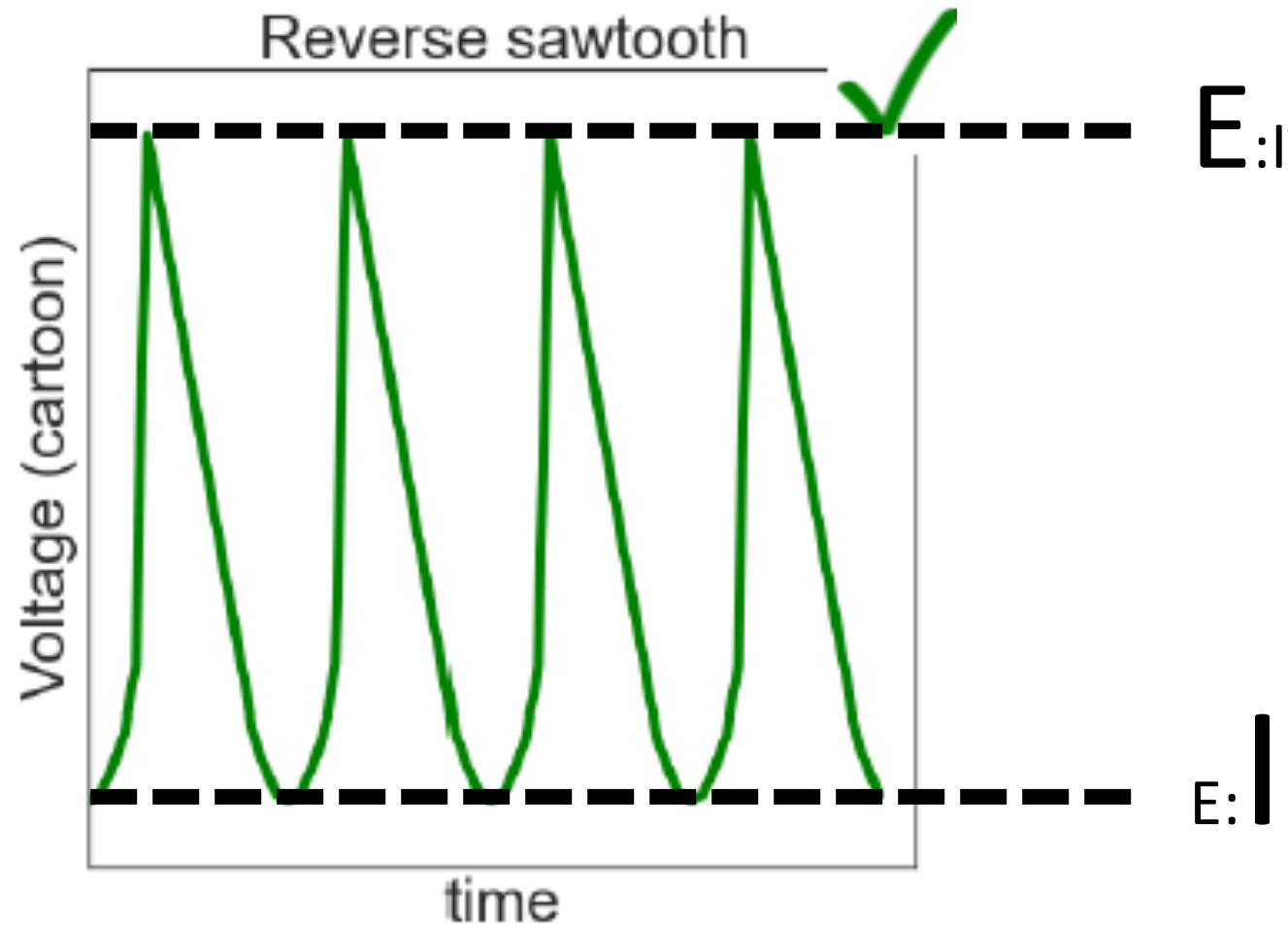
2-D characterization of shape



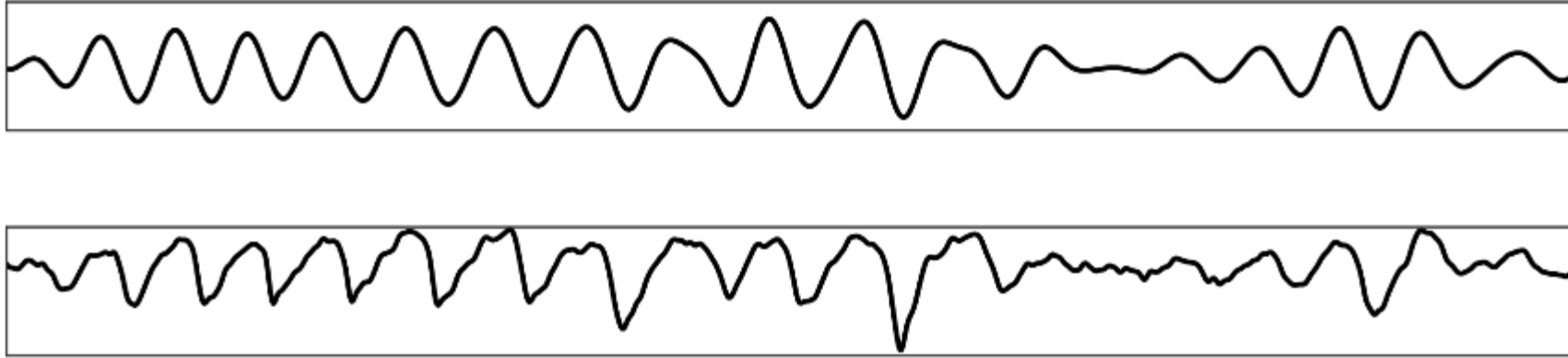
Pathological beta is reverse sawtooth



Neural computation and oscillation shape

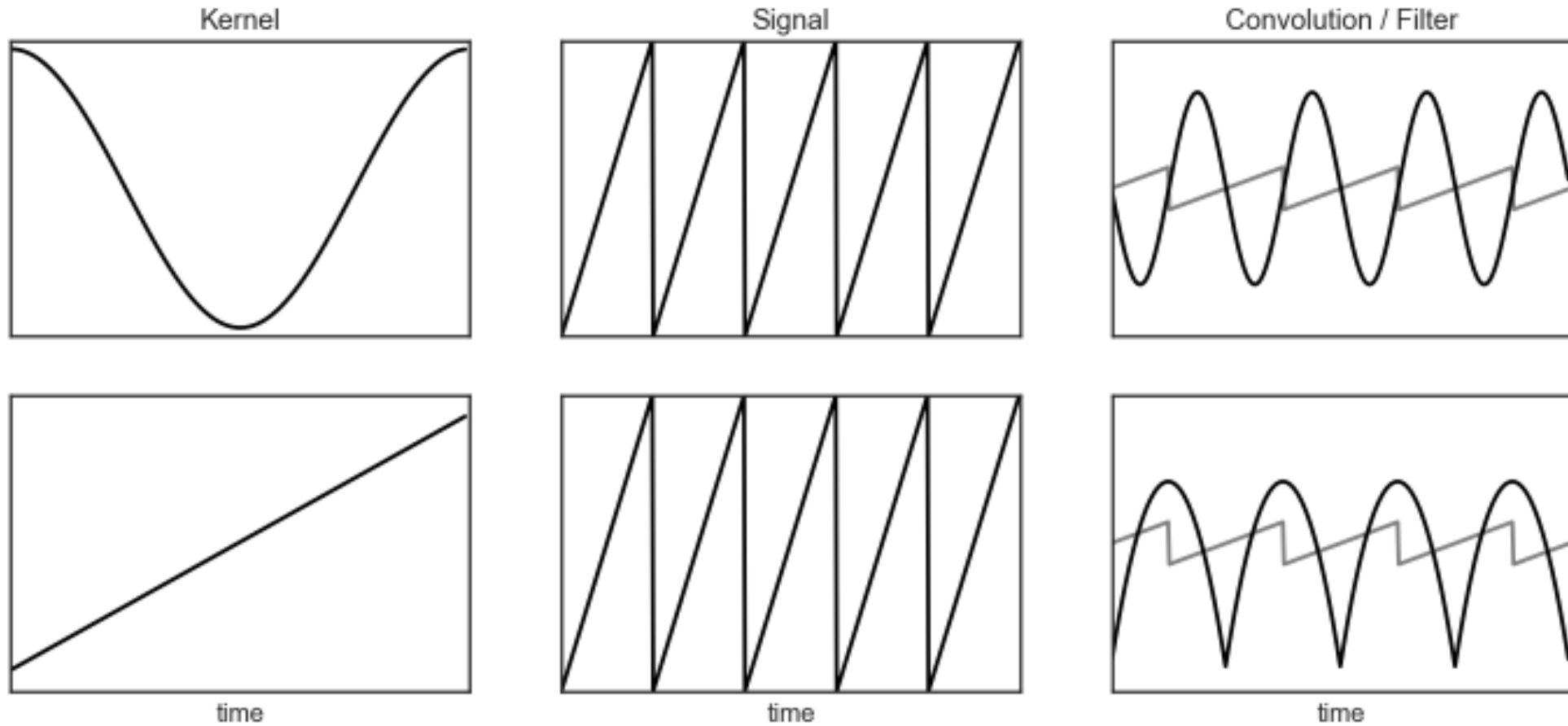


Summary



- DBS decreases sharpness of beta oscillations
 - Decreases PAC
- Pathological beta shape is reverse sawtooth
 - Implications for neural computation

Future work: Template matching



"Math is giving us the middle finger"

Acknowledgments

UCSF
Phil Starr
Cora de Hemptinne

