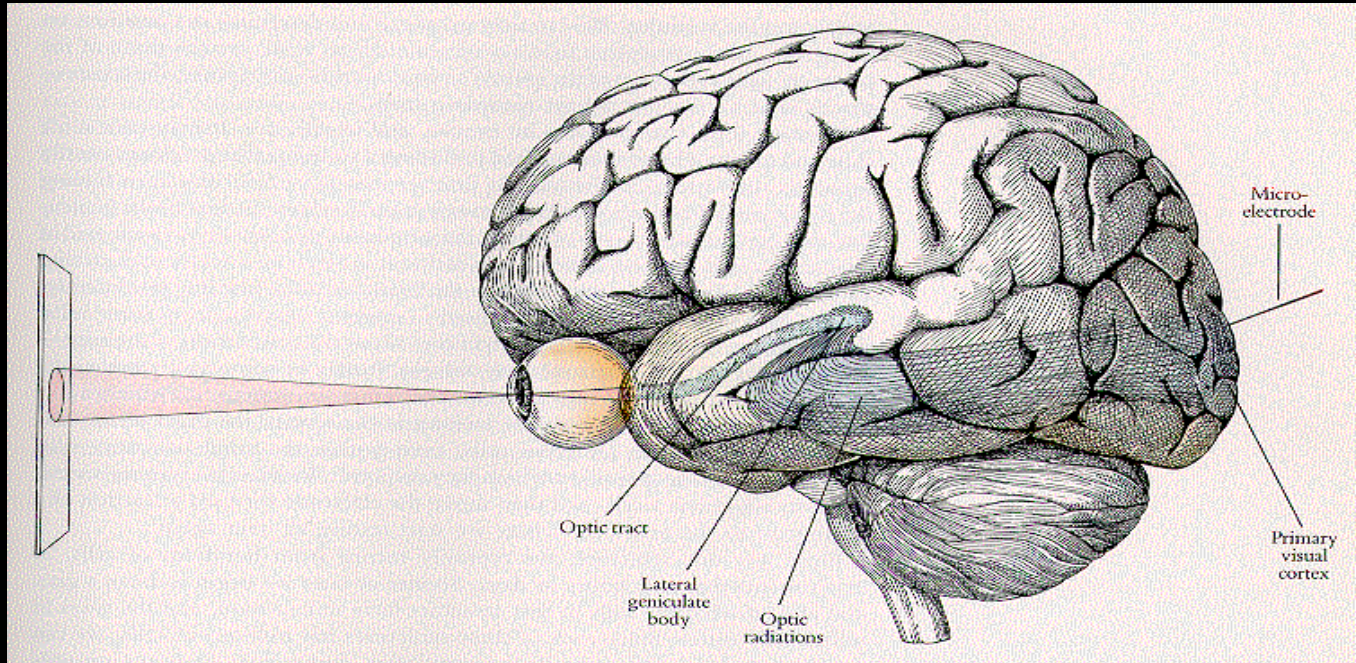
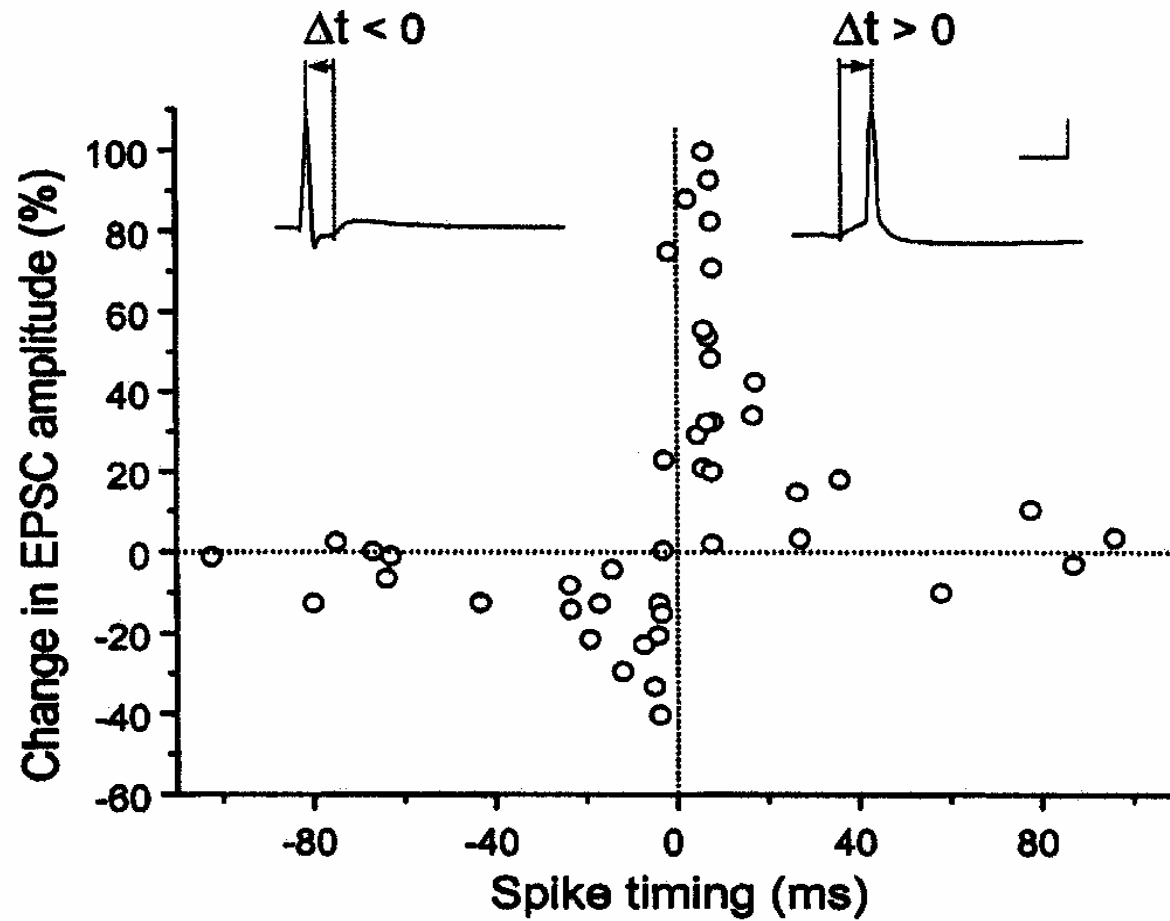
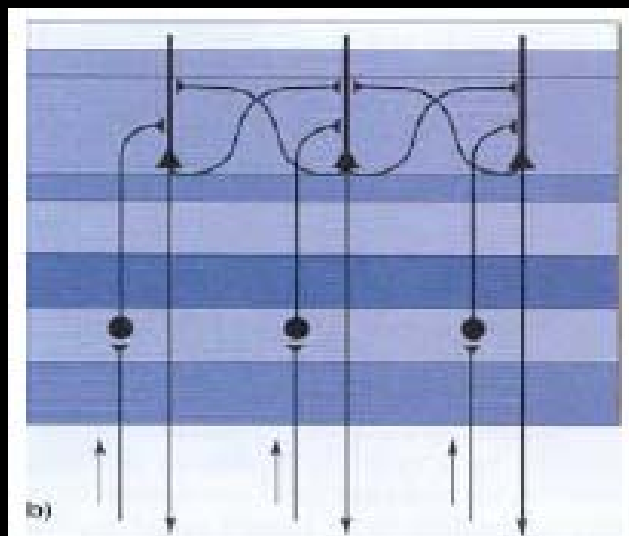


Plasticity in the visual cortex

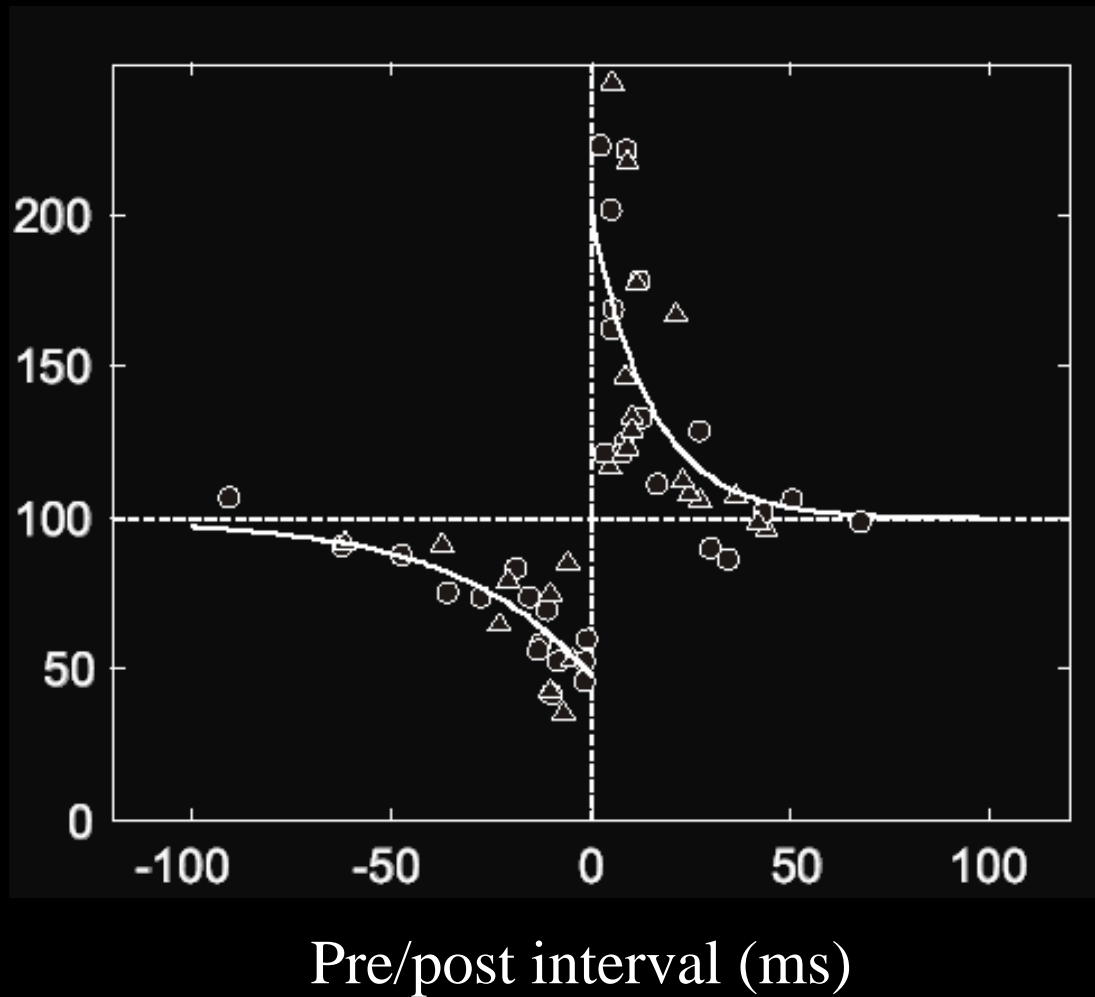
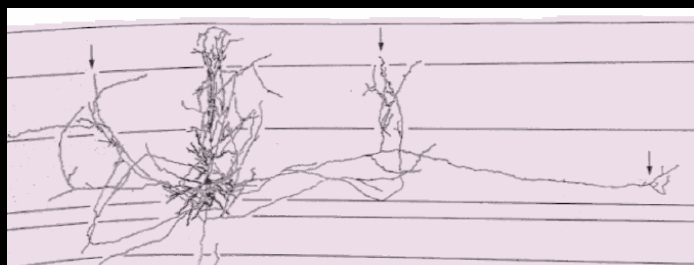


Spike timing-dependent synaptic plasticity (STDP)

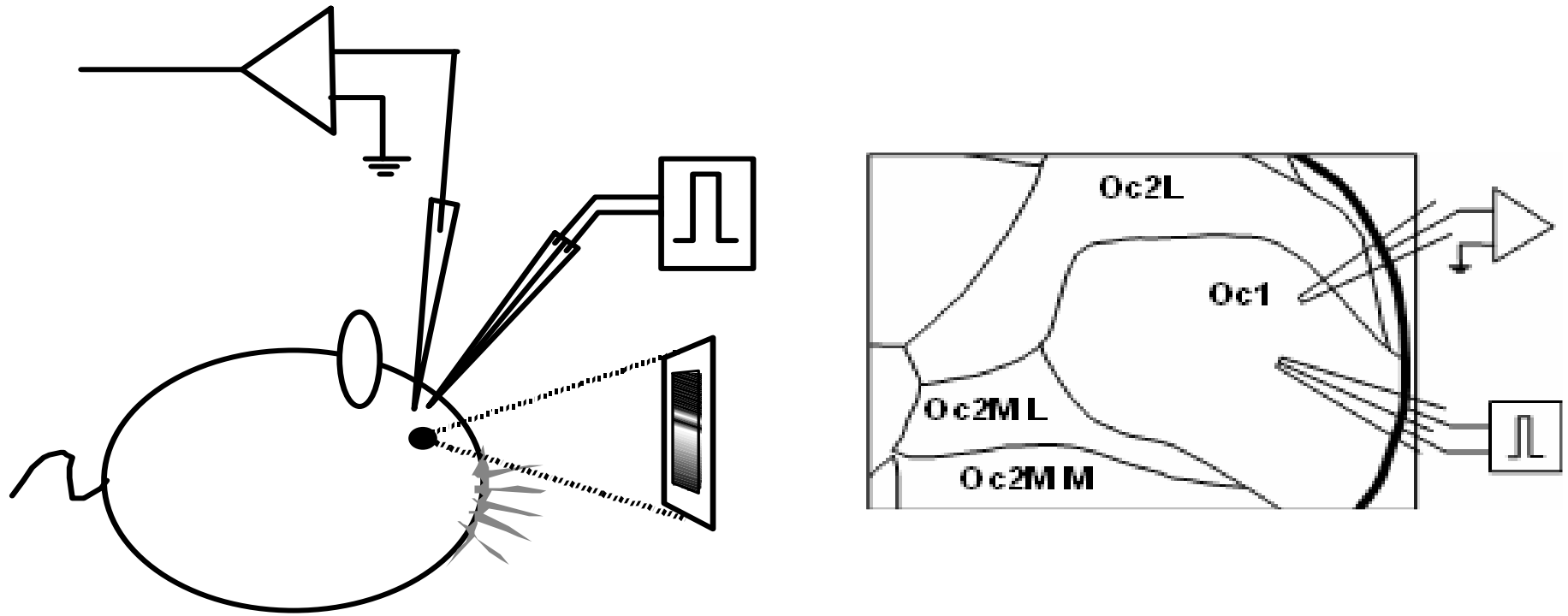




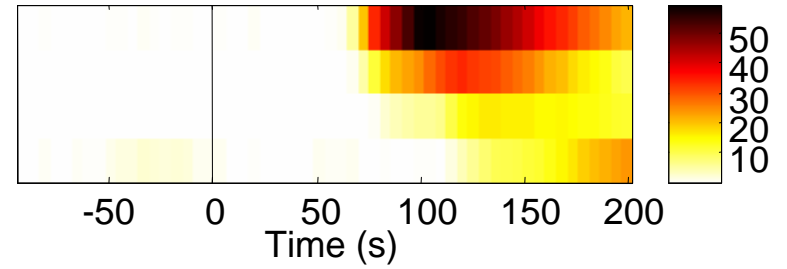
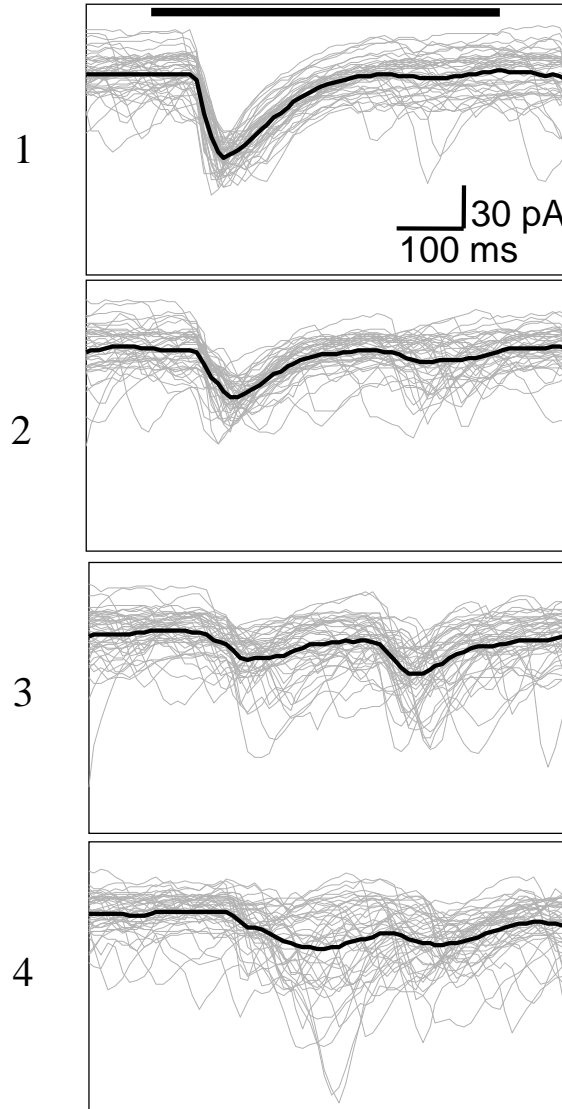
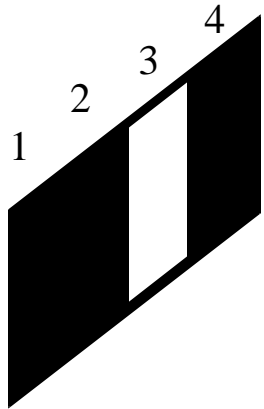
L2/3
 L4
 L5
 L6
 Normalized EPSP slope (%)



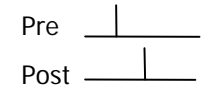
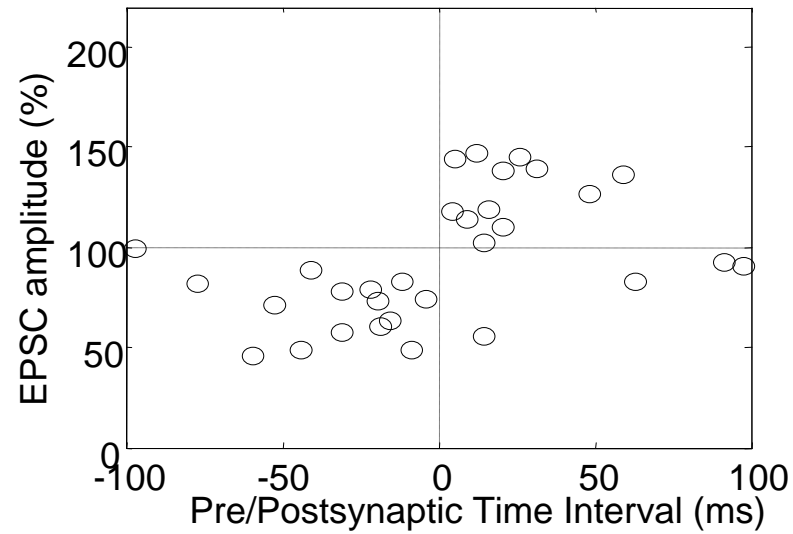
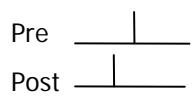
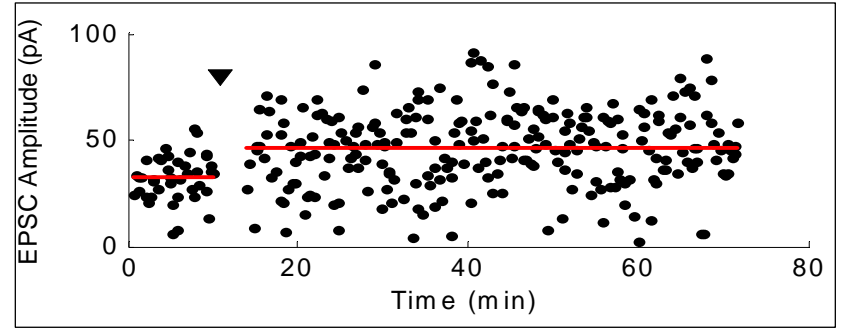
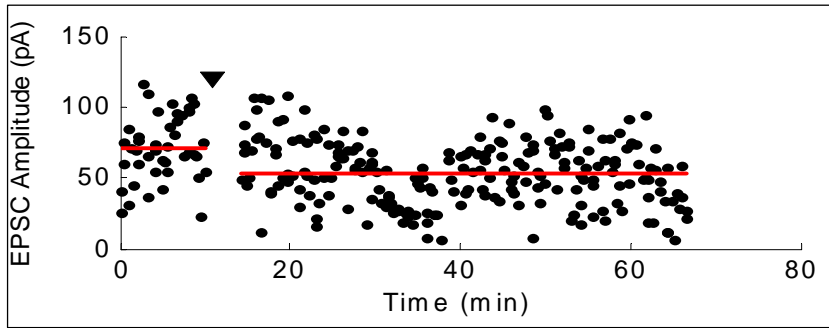
Spike-timing Dependent Plasticity Rat Oc1



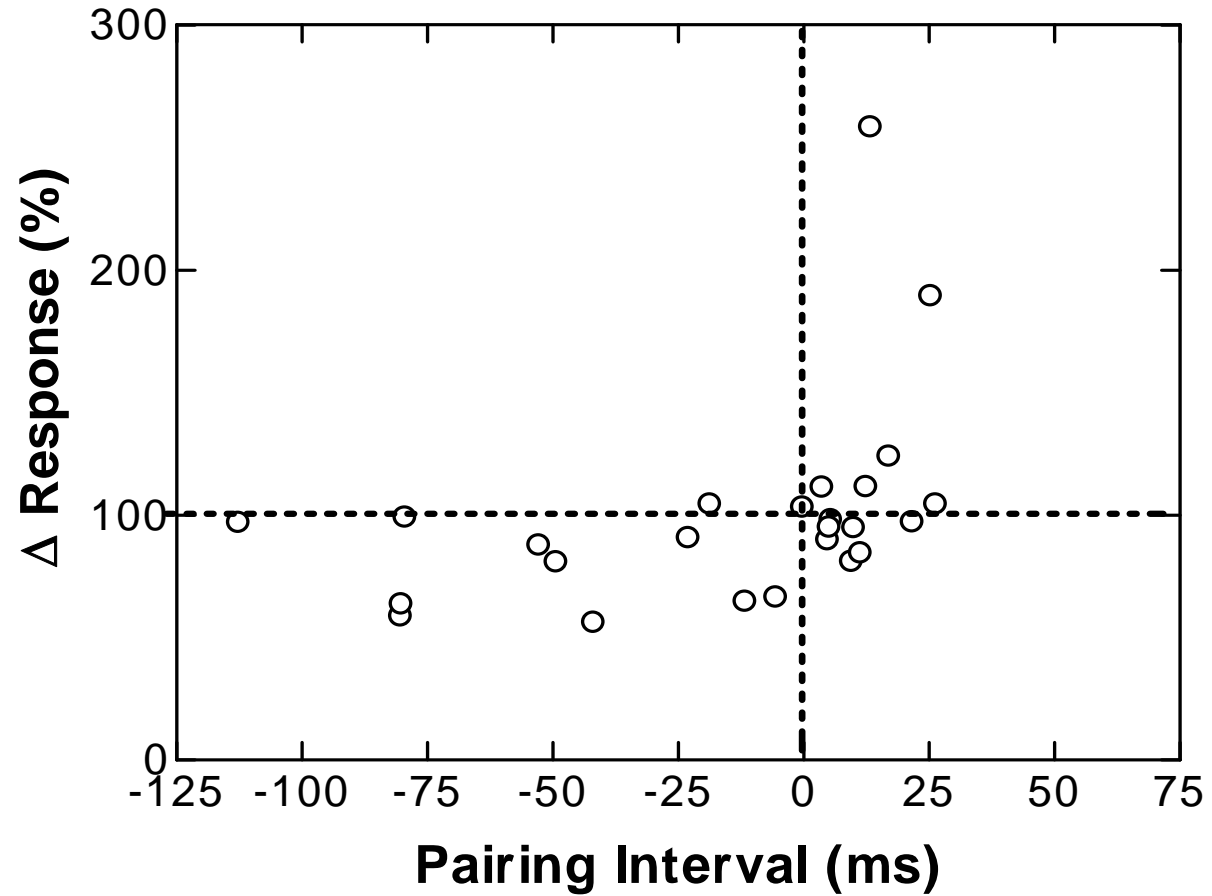
Spatiotemporal Visual Receptive Fields

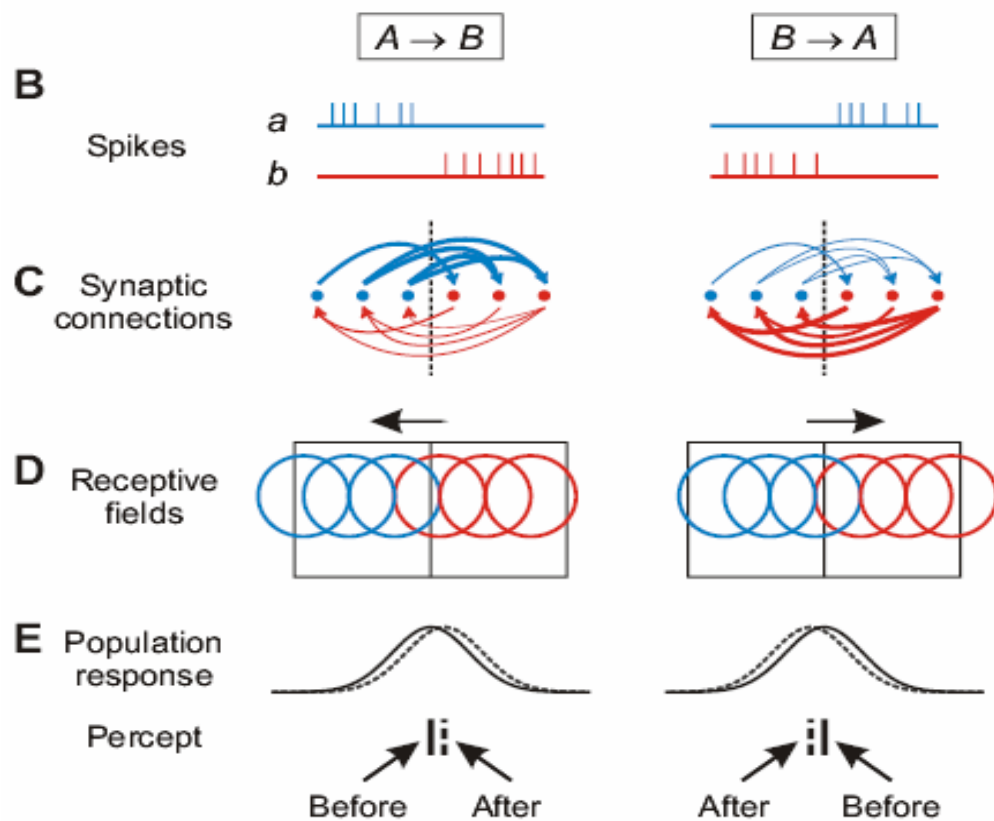
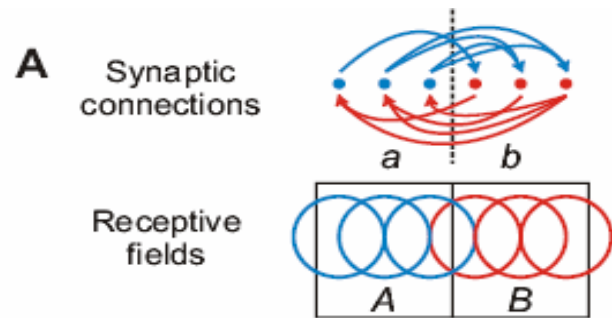


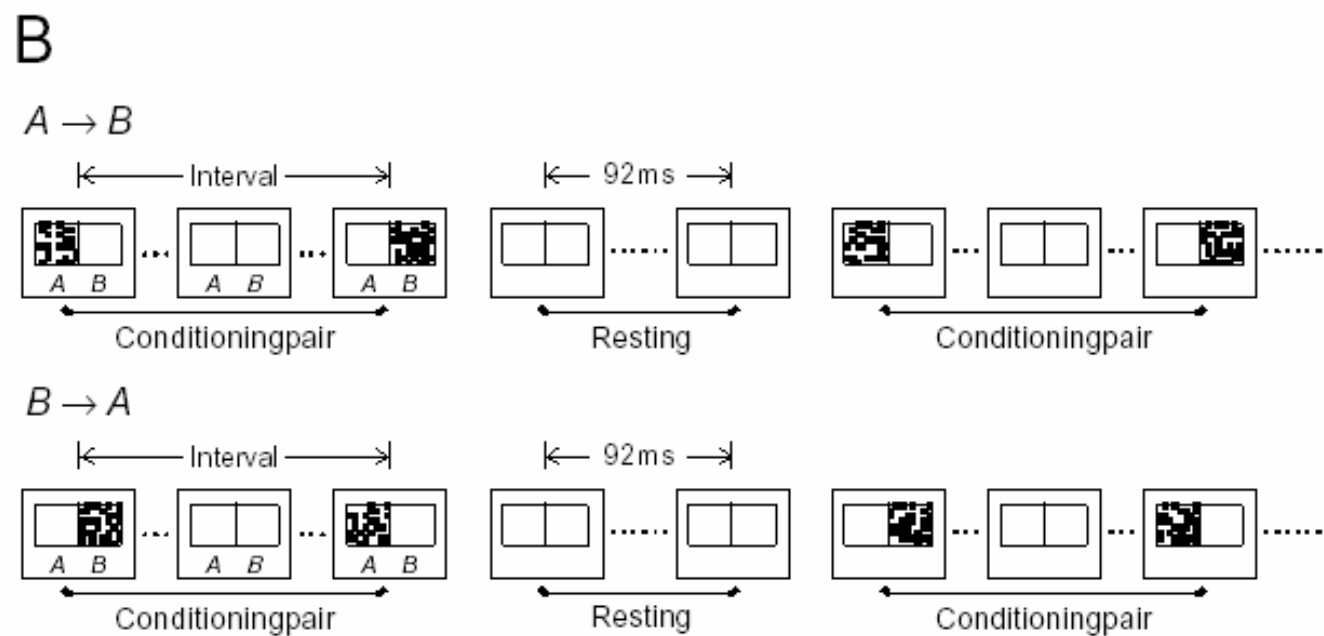
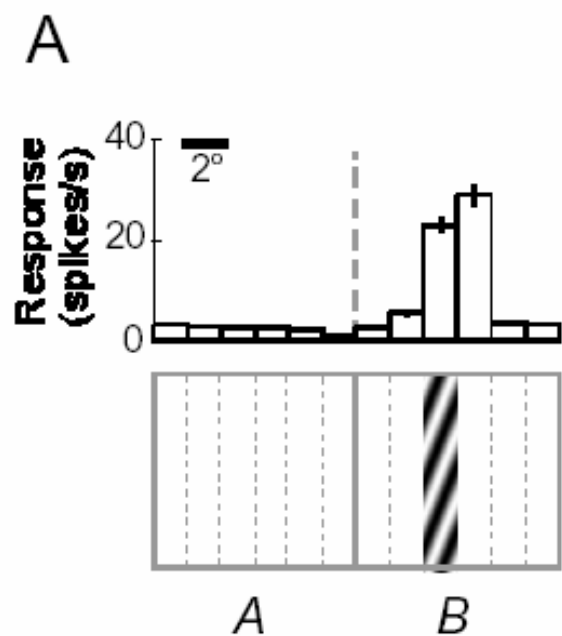
STDP of Visual Responses in 3 wk old rats

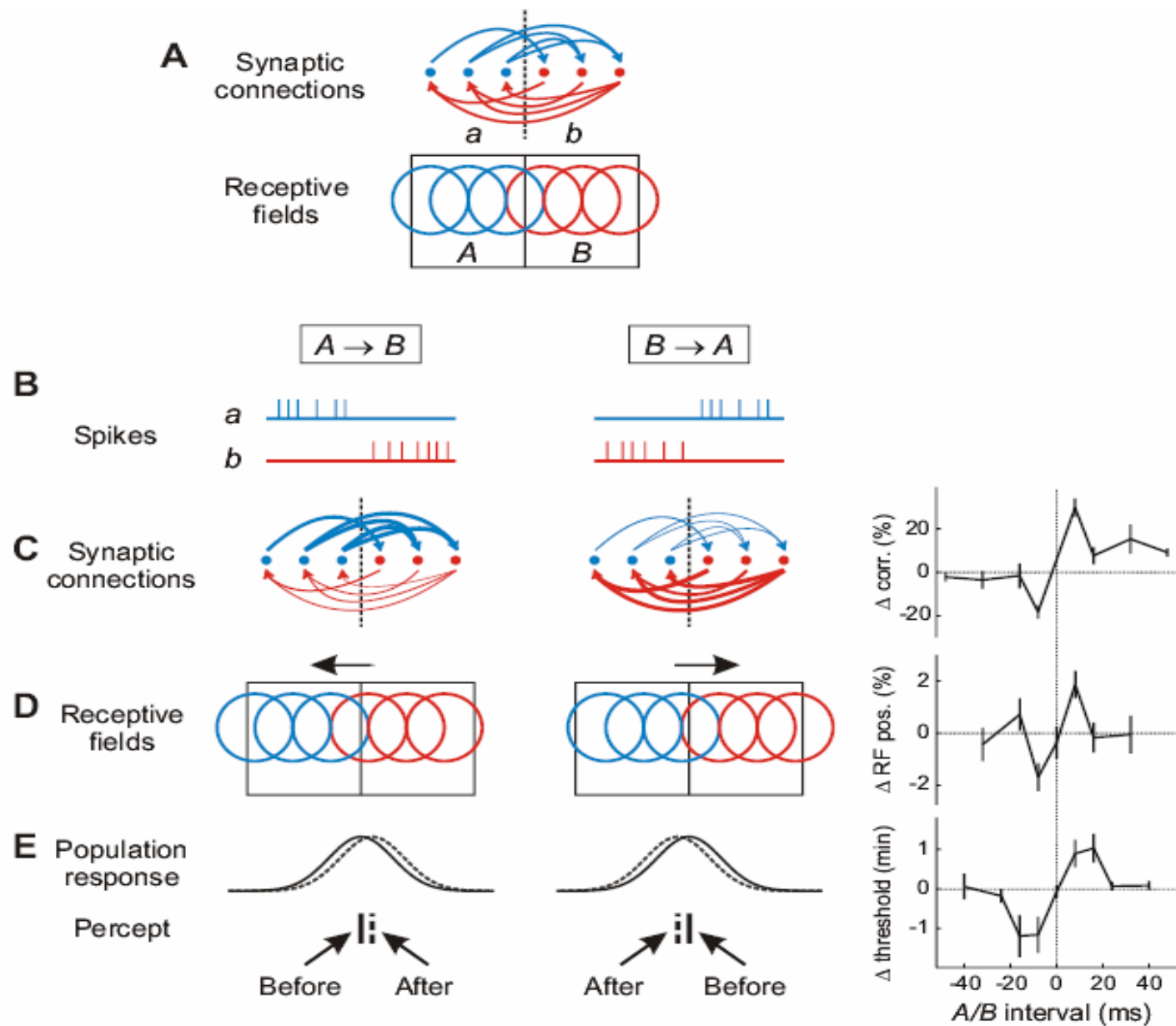


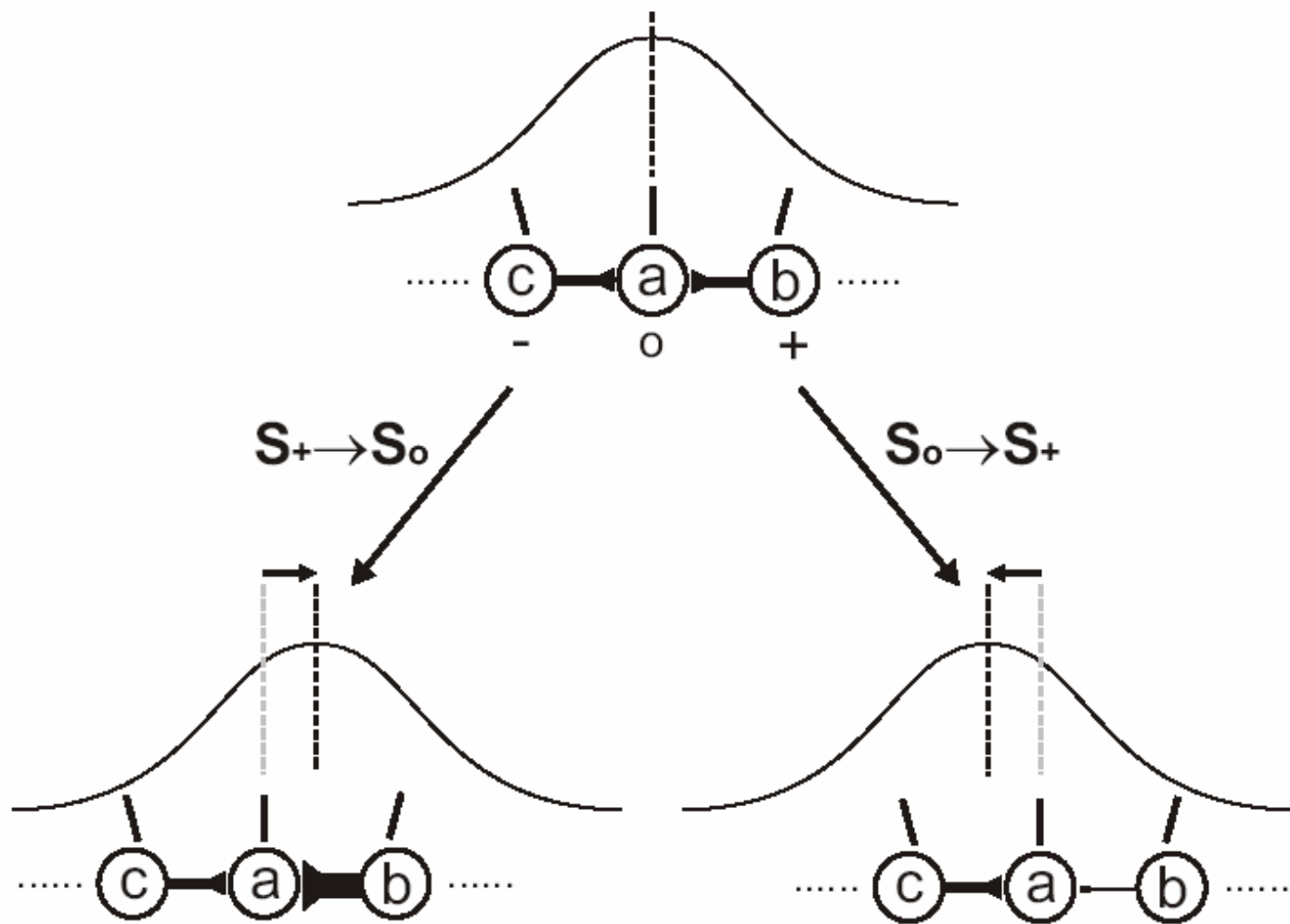
STDP of Visual Responses in adult rats



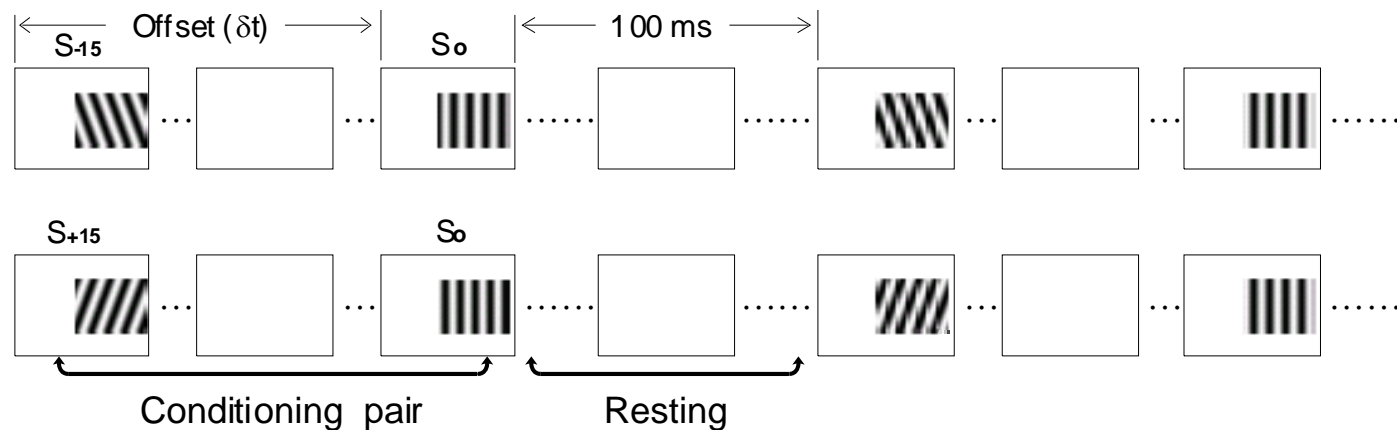




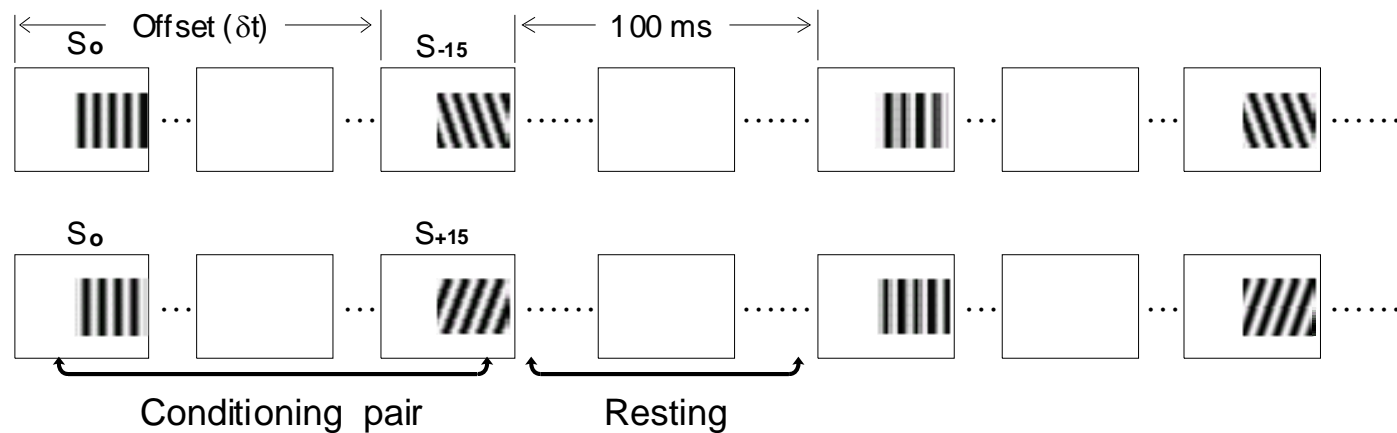




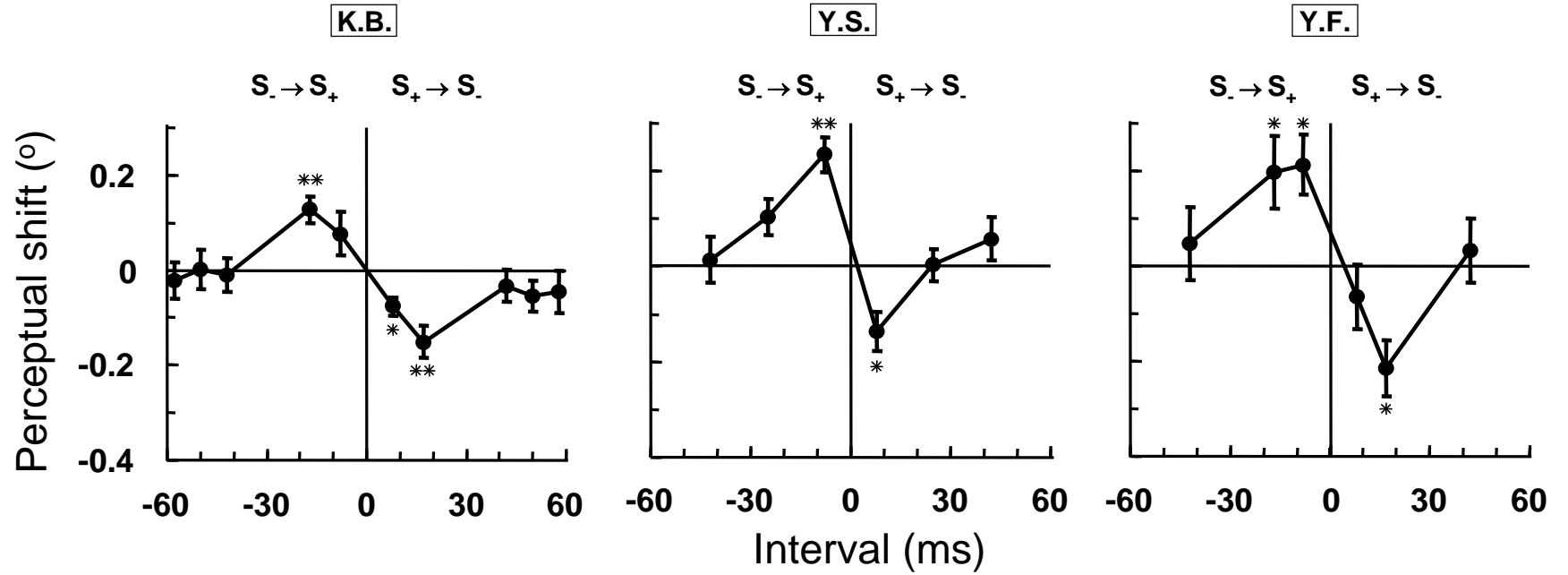
b $S_{\pm 15} - S_0$



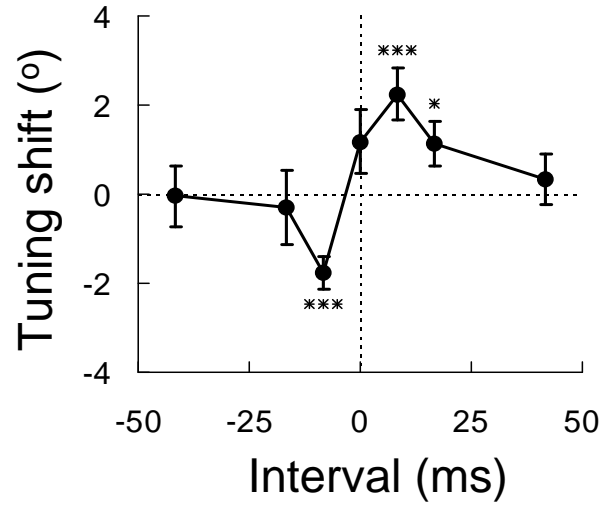
$S_0 - S_{\pm 15}$



Human psychophysics

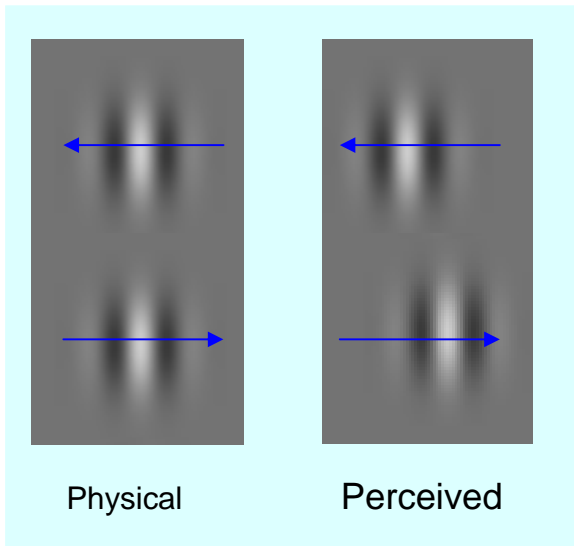


Cat V1



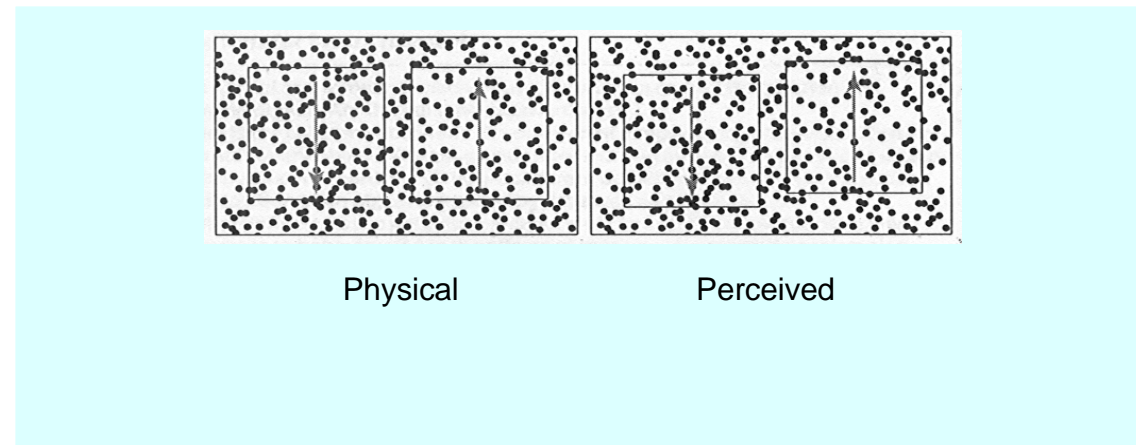
Illusion 1: Shift in Perceived Target Position Induced by Local Motion

De Valois & De Valois (1991)



Demo

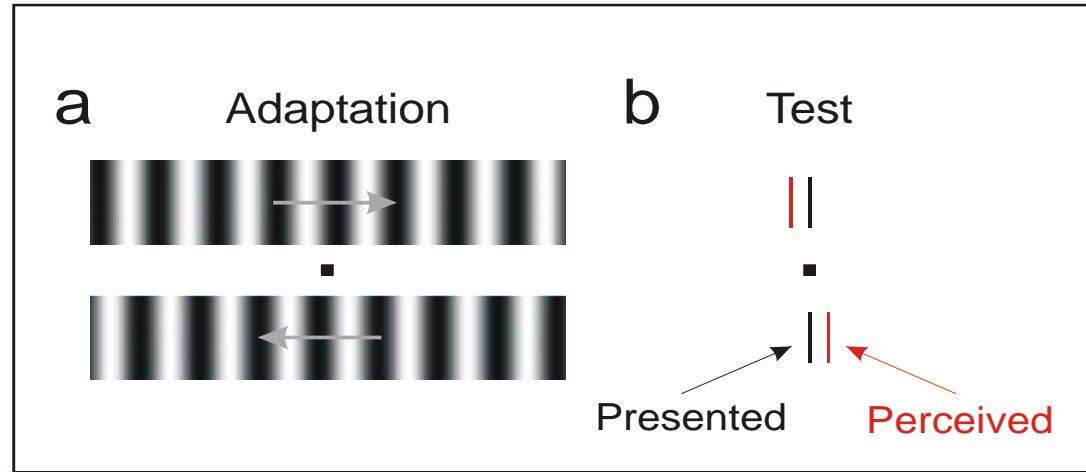
Ramachandran & Anstis (1990)



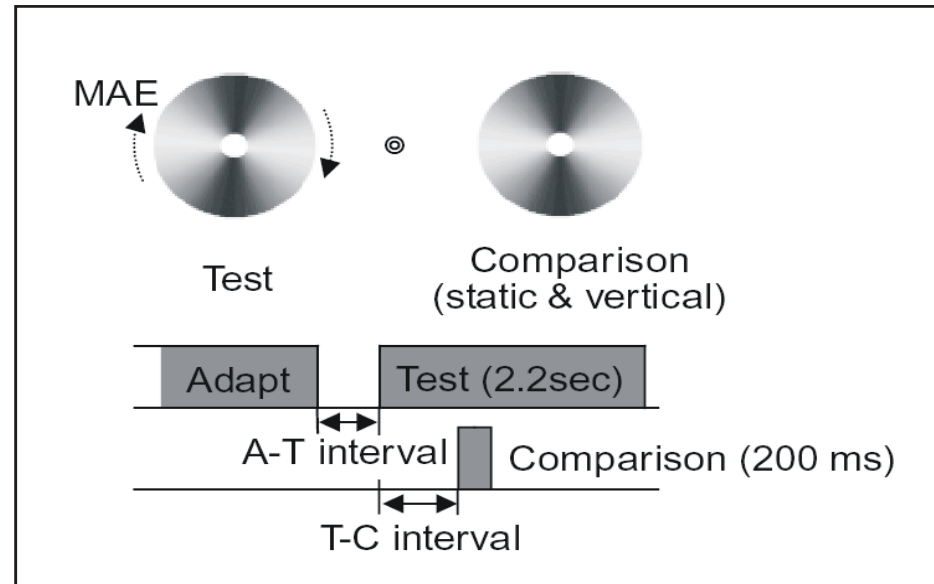
Demo

Illusion 2: Shift in Perceived Target Position Induced by Motion Adaptation

Snowden, 1998

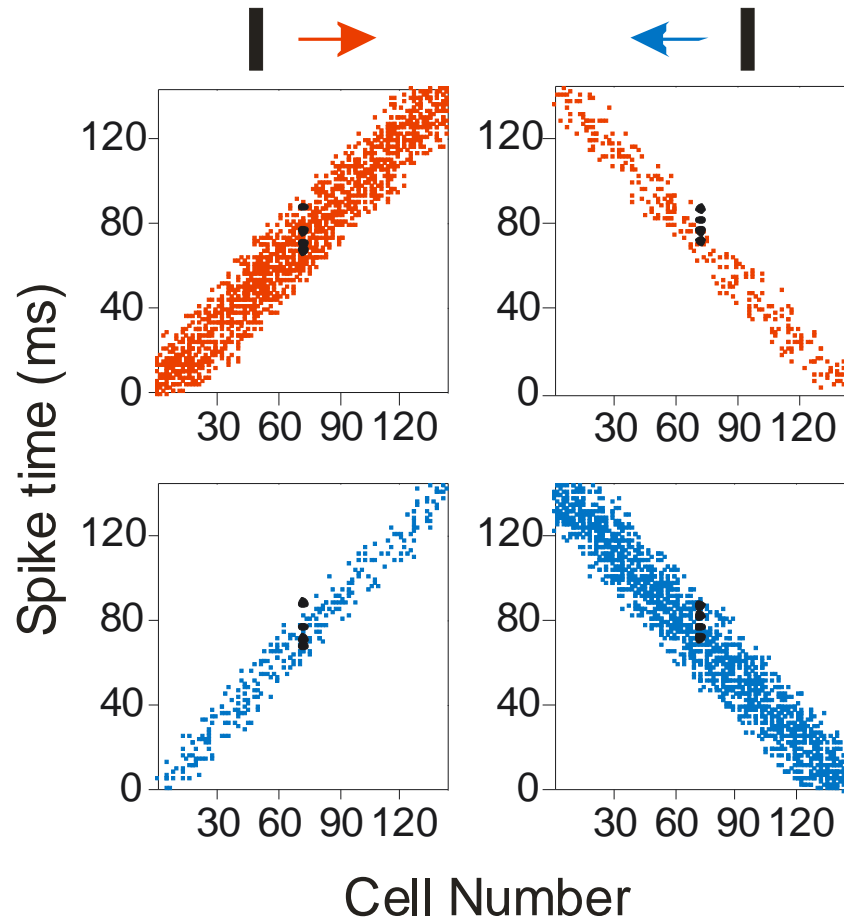
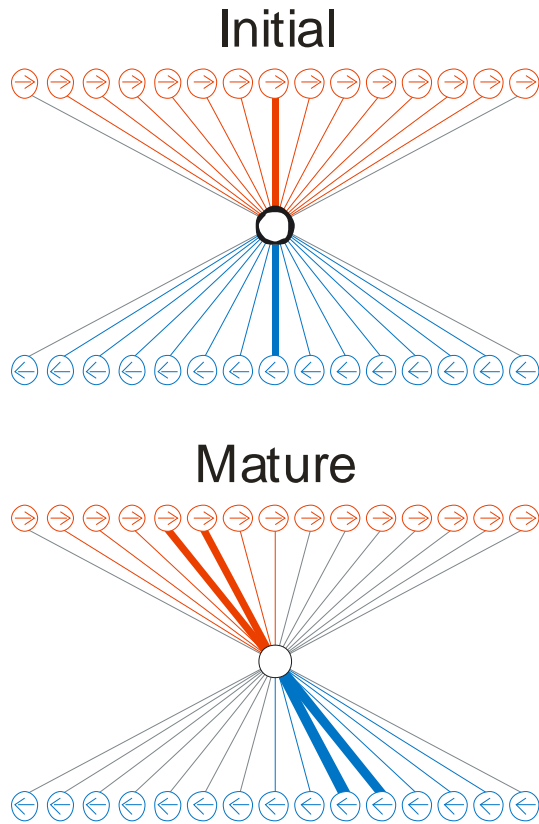


Nishida & Johnston, 1999



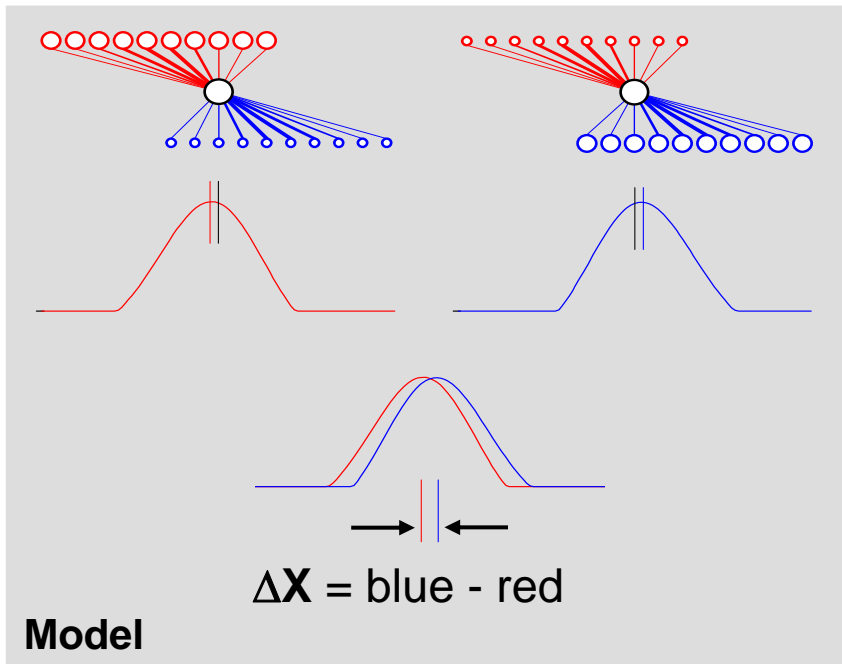
STDP and motion stimuli

during development of cortex circuit

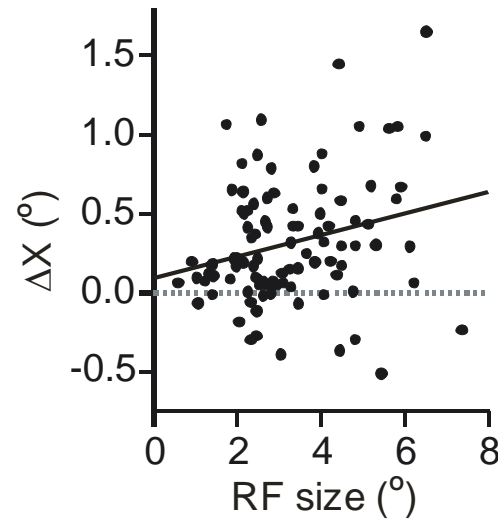
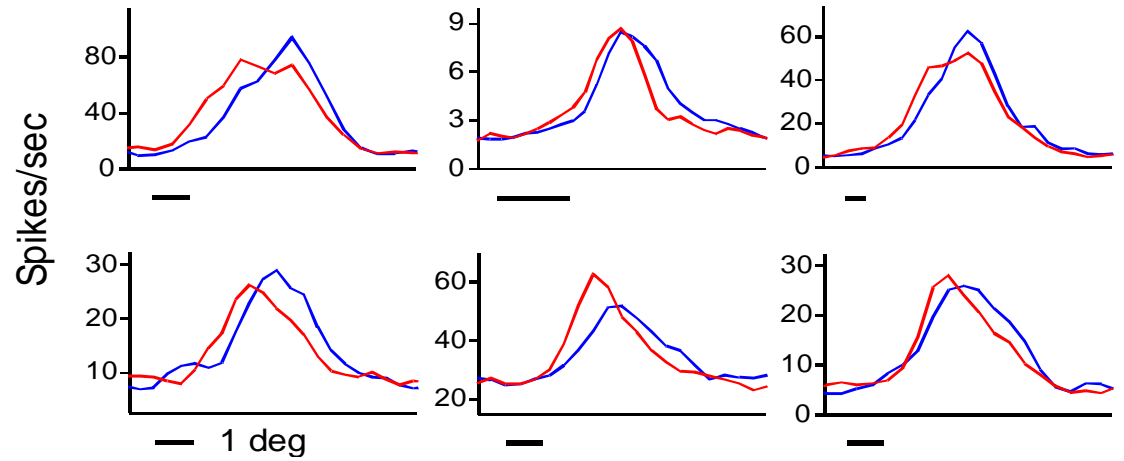


Prediction 1: Dependence of Cortical RF on Local Motion

RF Mapping w/ Local Motion



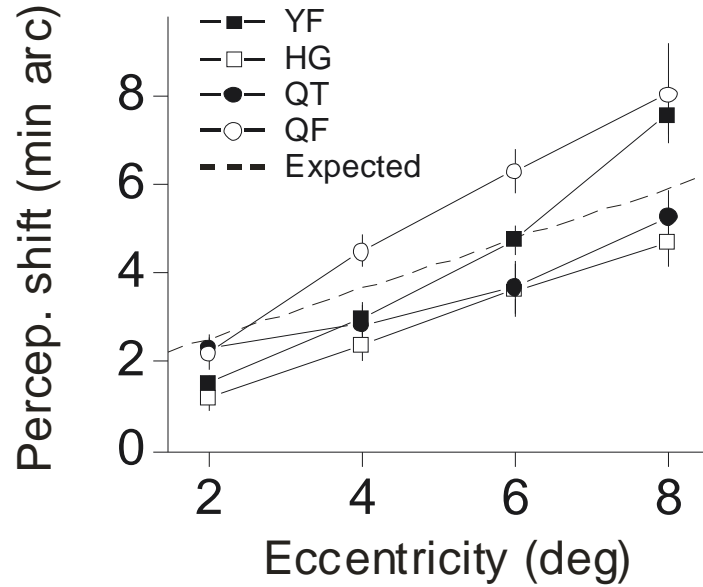
Data



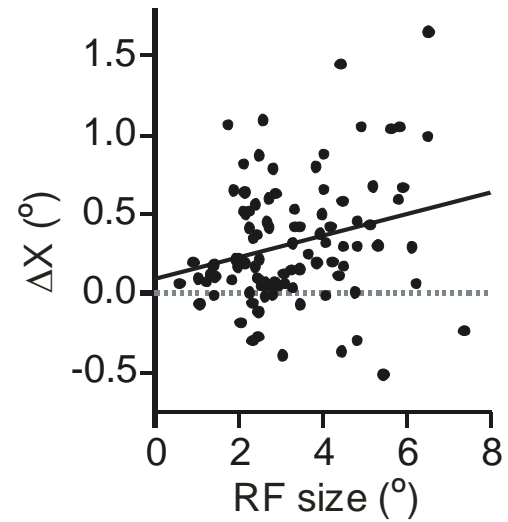
Fu et al.,
J. Neurosci., 2004

Physiological Basis of Illusion 1

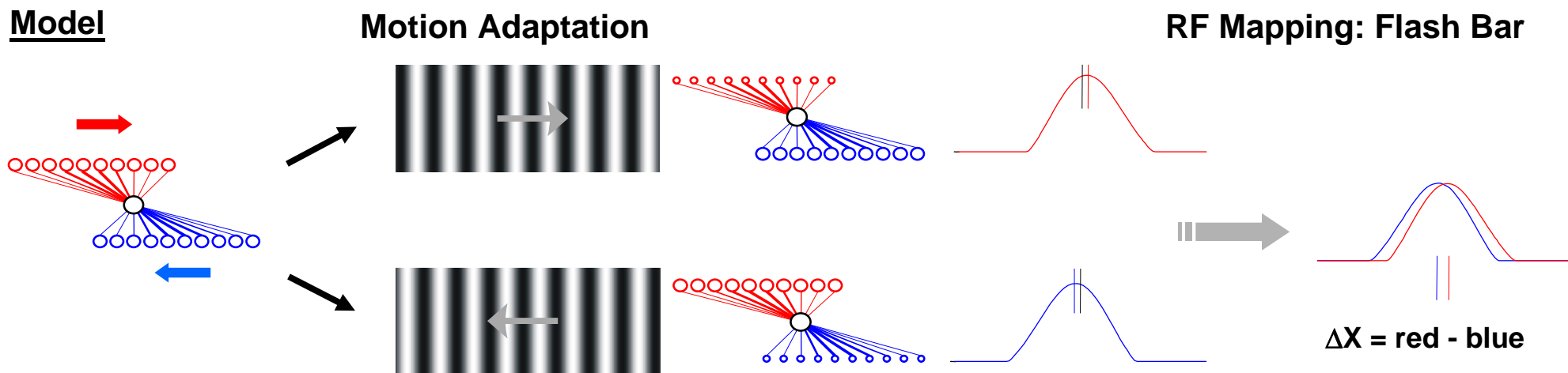
Human Psychophysics



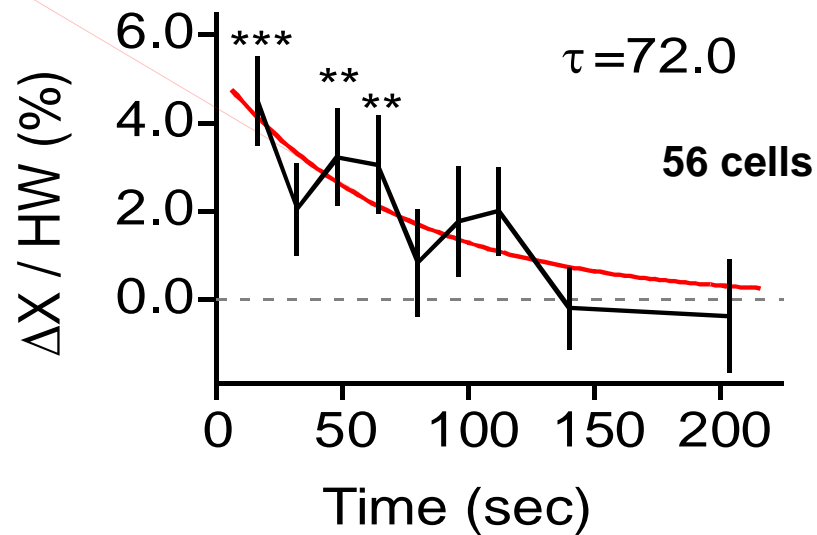
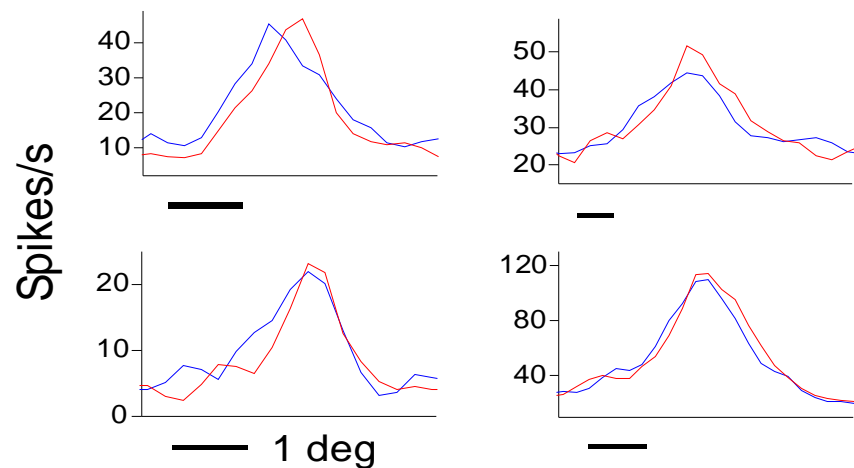
Cat V1



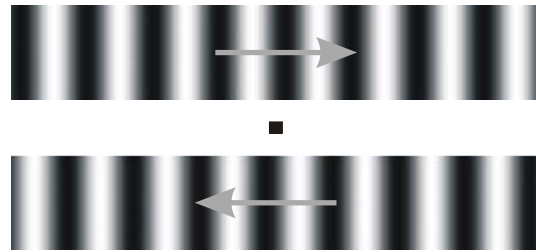
Prediction 2: Dependence of Cortical RF on Motion Adaptation



Data



Physiological Basis of Illusion 2



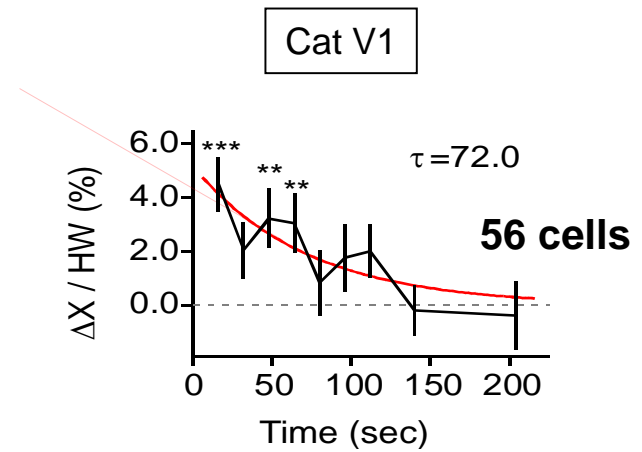
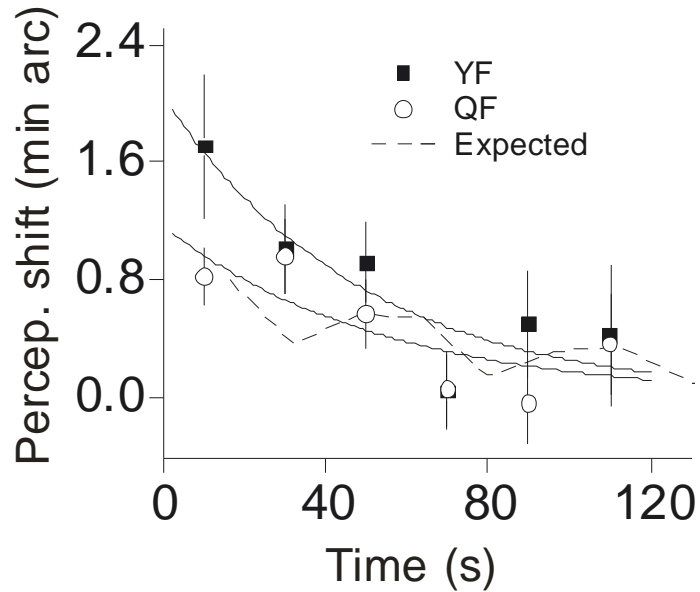
Adaptation

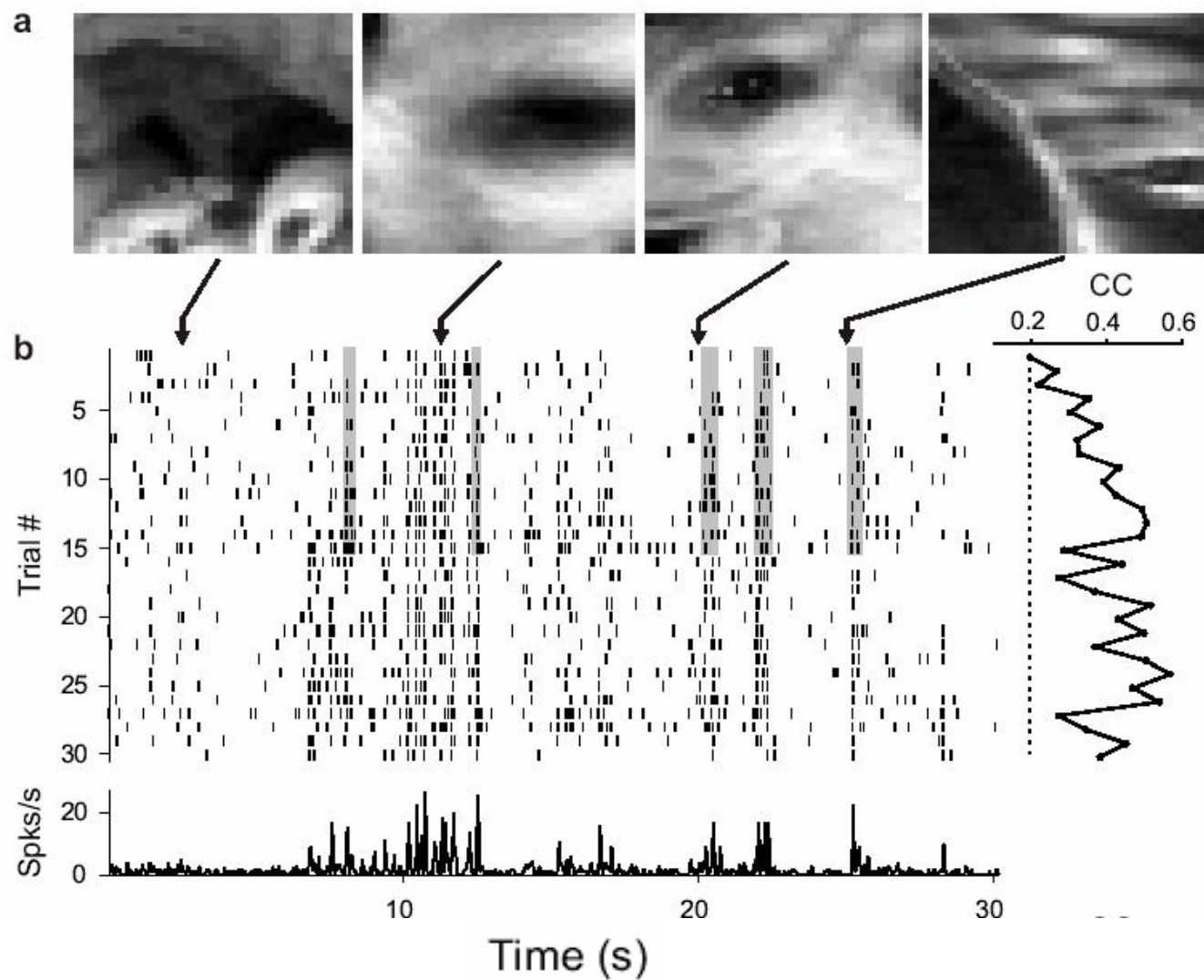
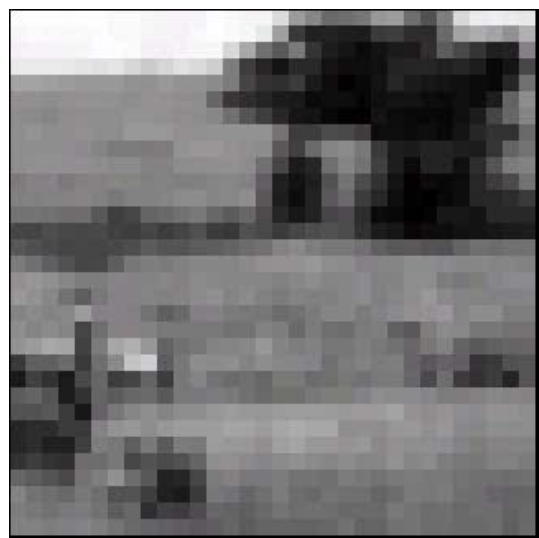


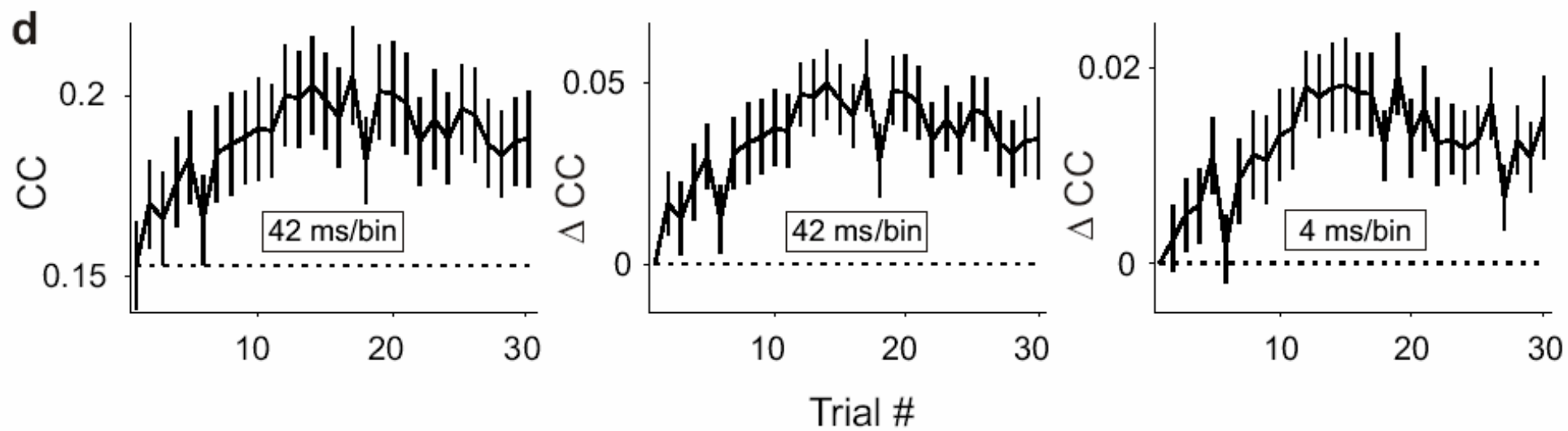
Physical/ Perceived

Psychophysics (Snowden, 1998)

Human
Psychophysics





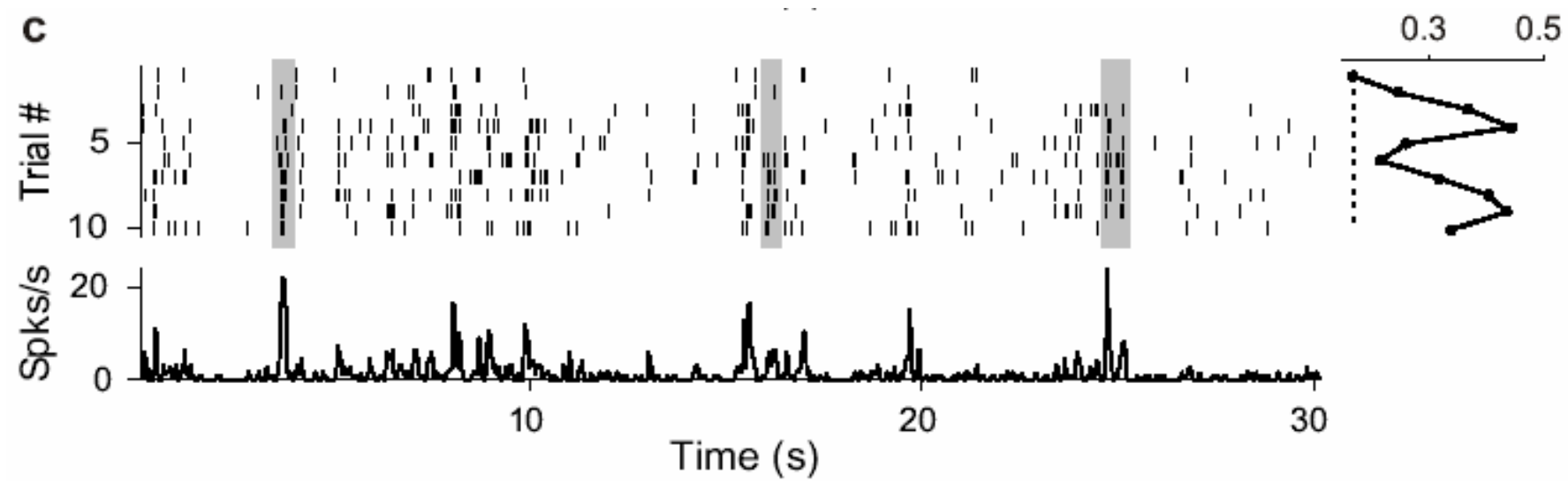


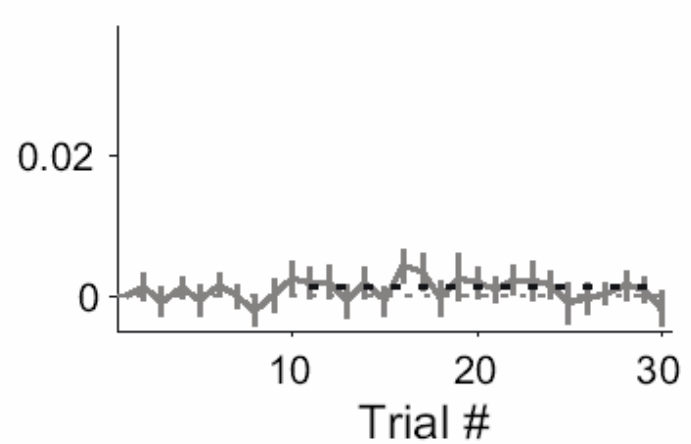
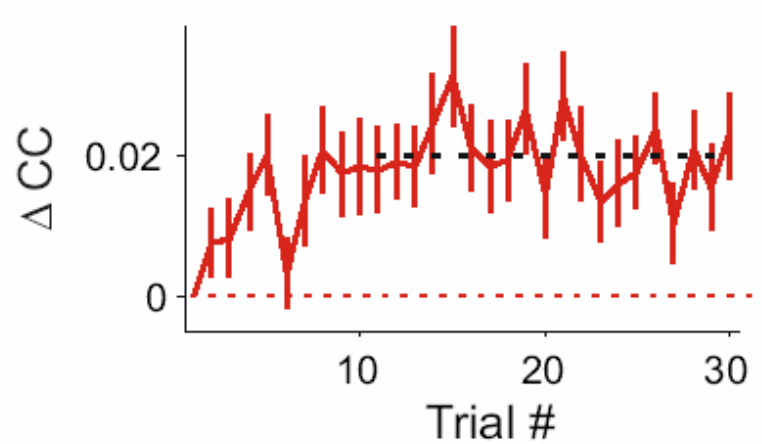
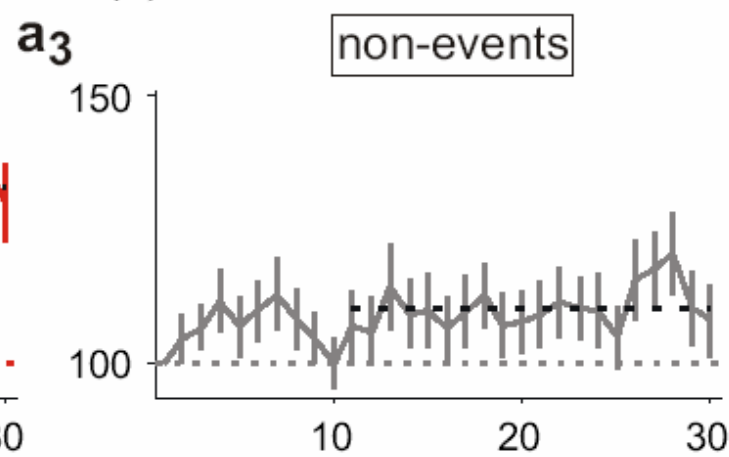
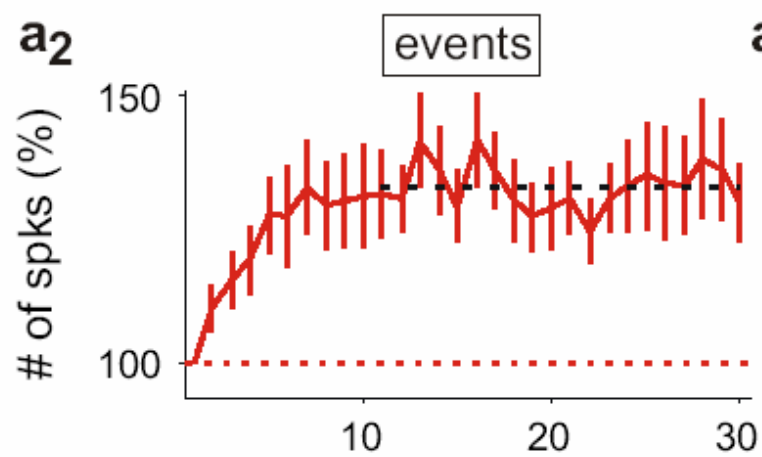
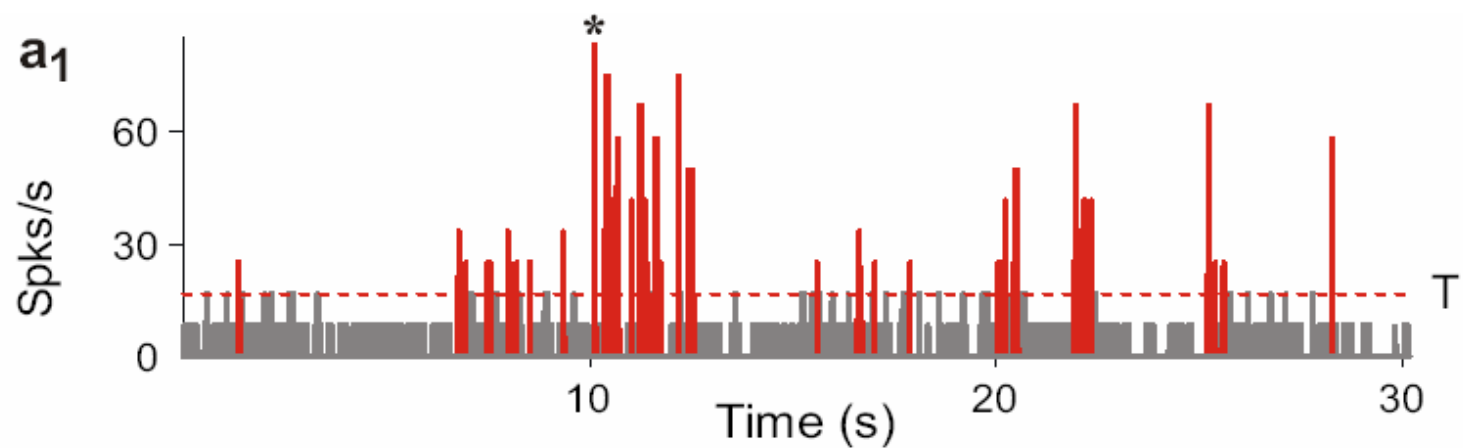
What we found so far

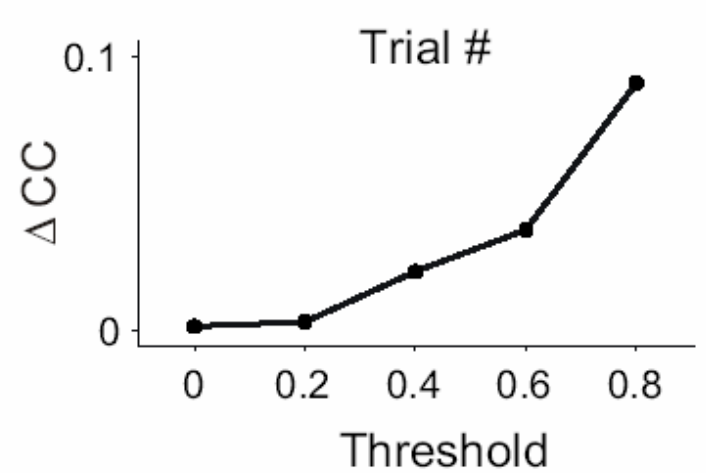
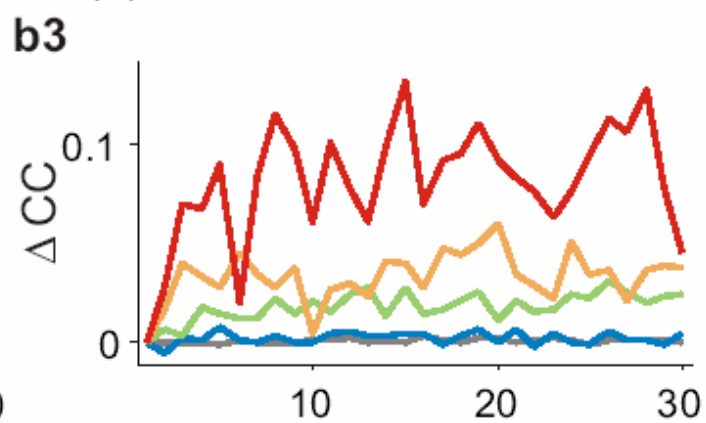
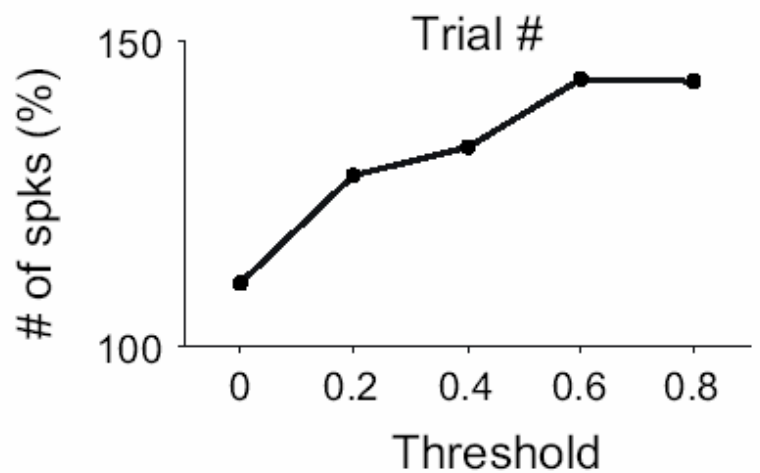
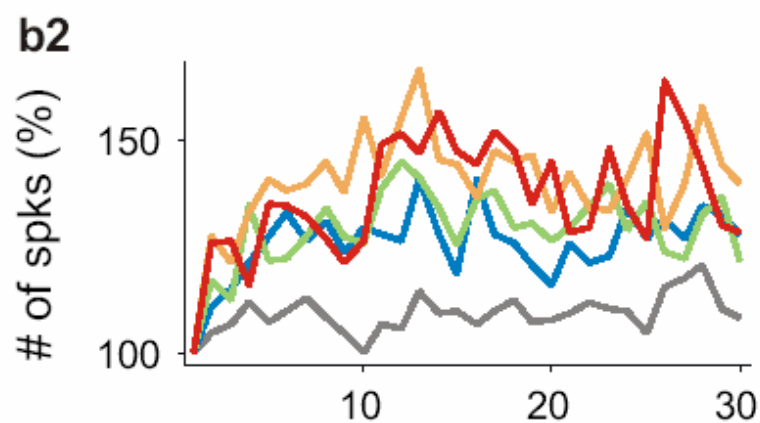
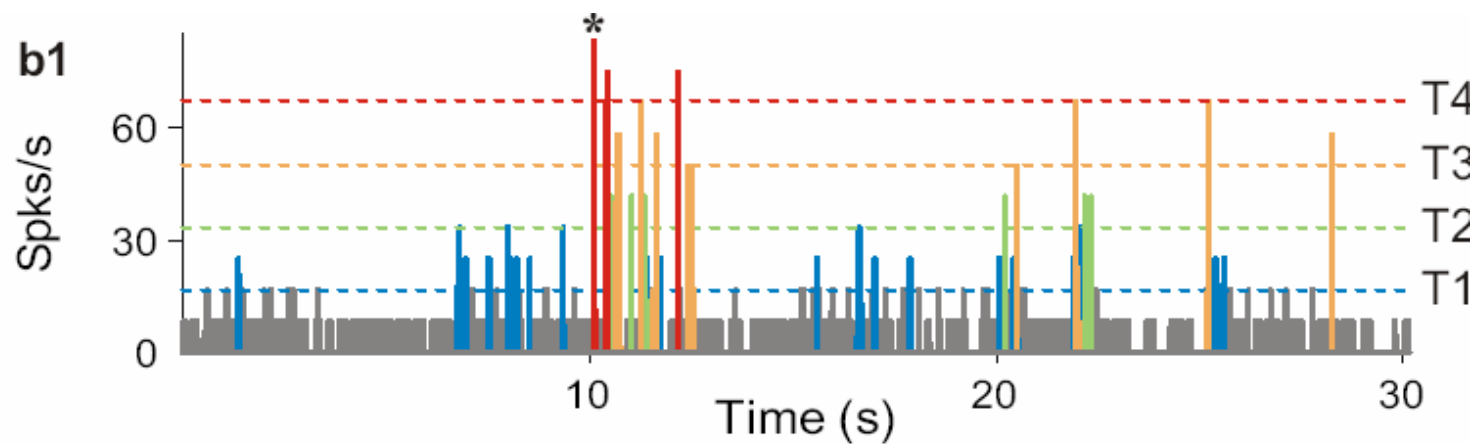
1. Repeated exposure to natural stimuli (and possibly other types of stimuli) enhances response reliability

Questions

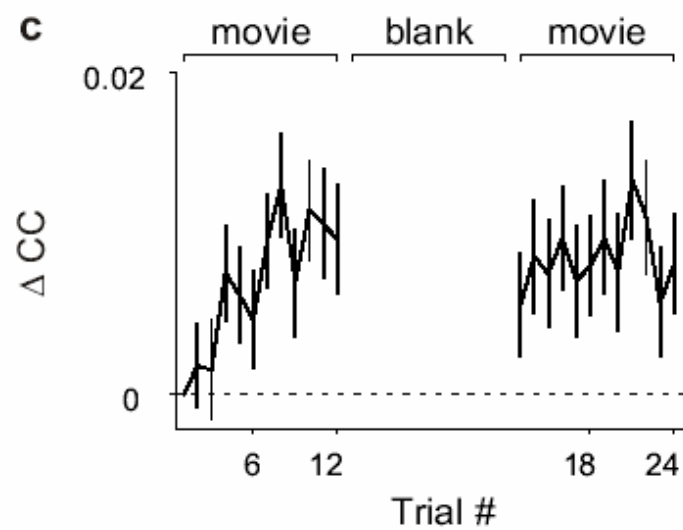
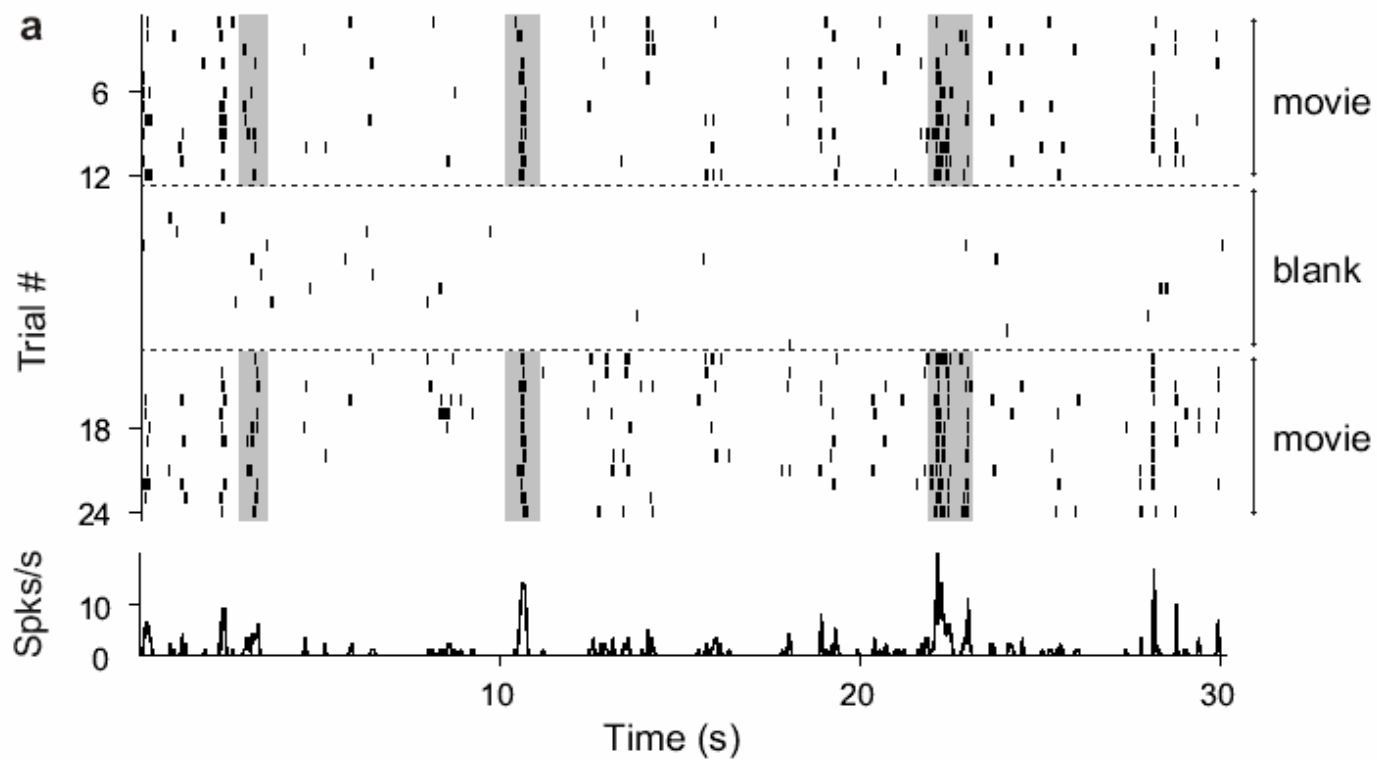
- Which part of the natural stimuli induce the changes in cortical neurons?
- What changes in response properties underlie the improvement in reliability?



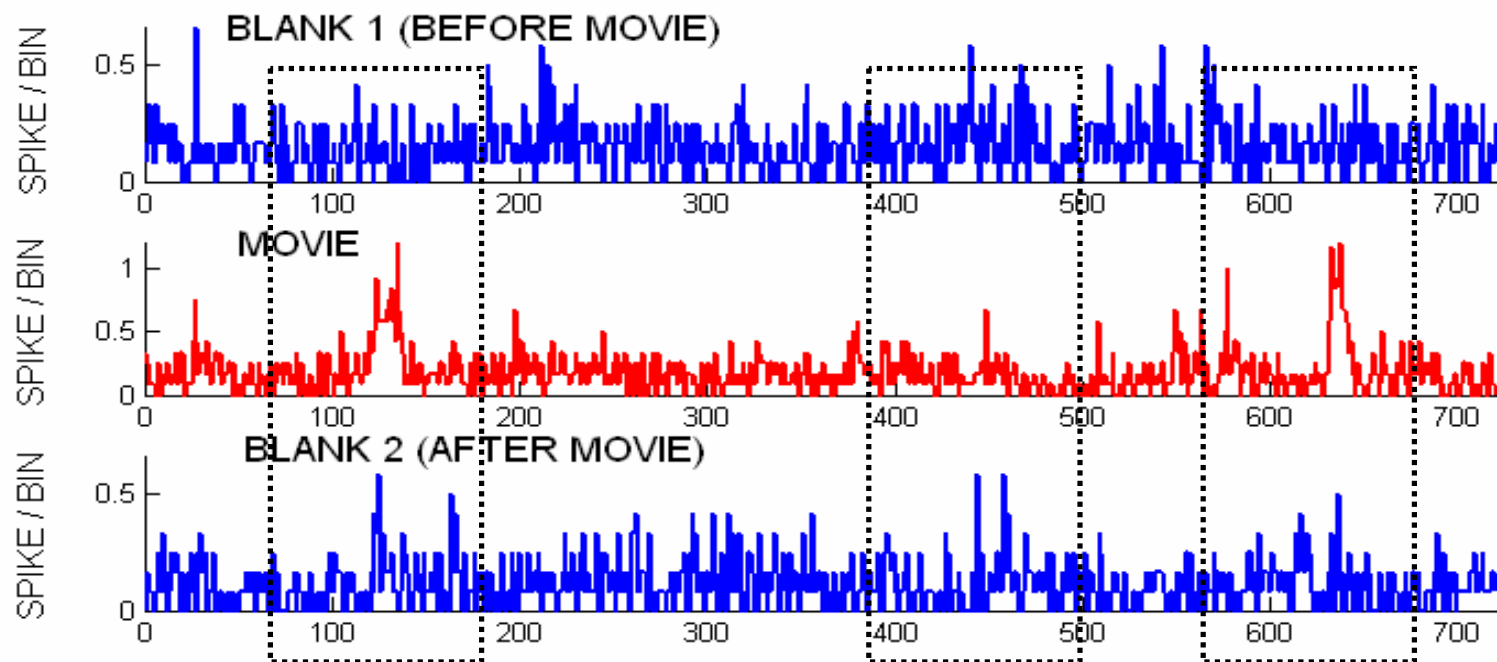


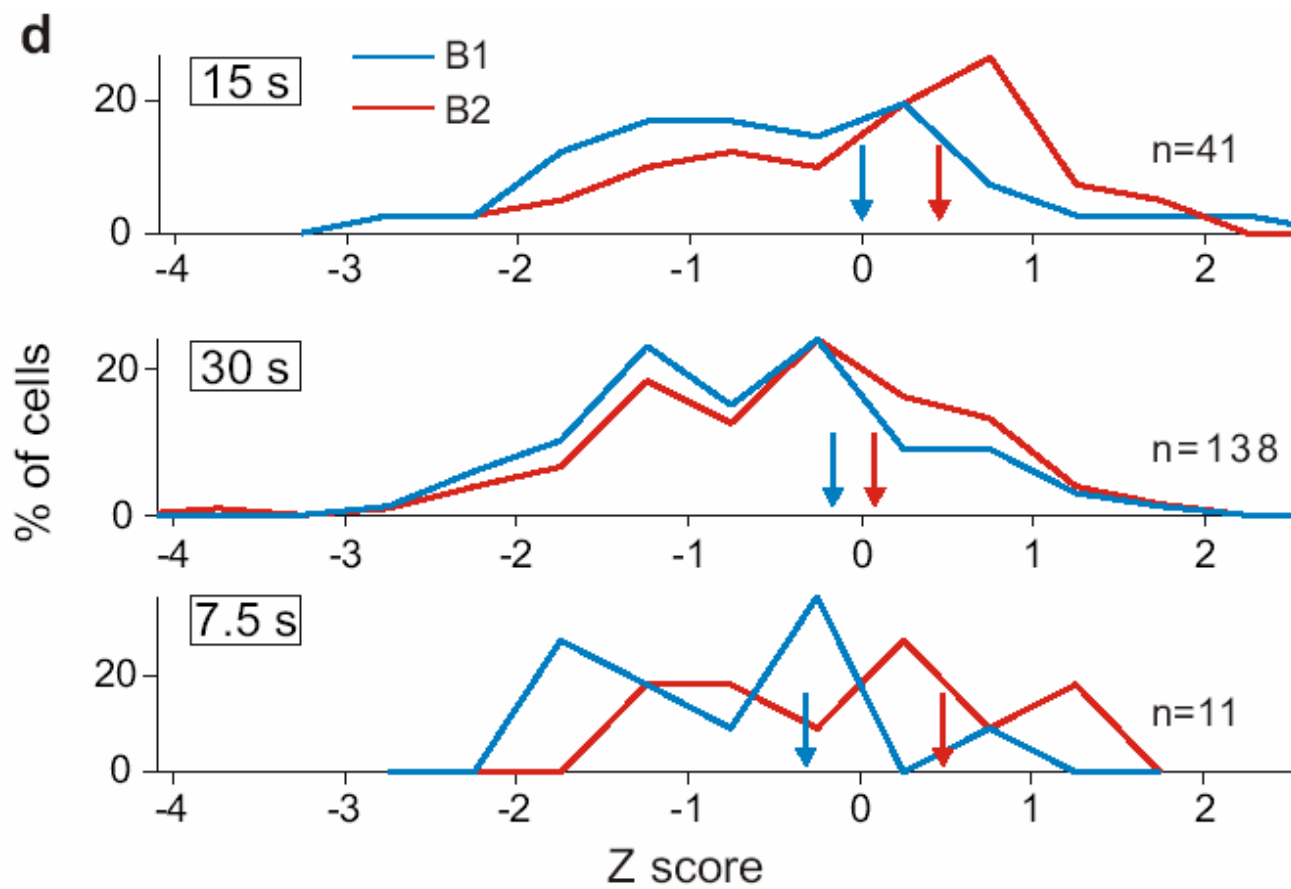


1. Which part of the natural stimuli induce the changes in cortical neurons?
 1. Preferred stimuli (?)
2. What changes in response properties underlie the improvement in reliability?
 1. Point process adaptive filtering, but we haven't found anything consistent...



050609_LS_08&9_reclustered.N034_113_B5.sb0.mat (B2-N2-B3)(1 frame / bin)

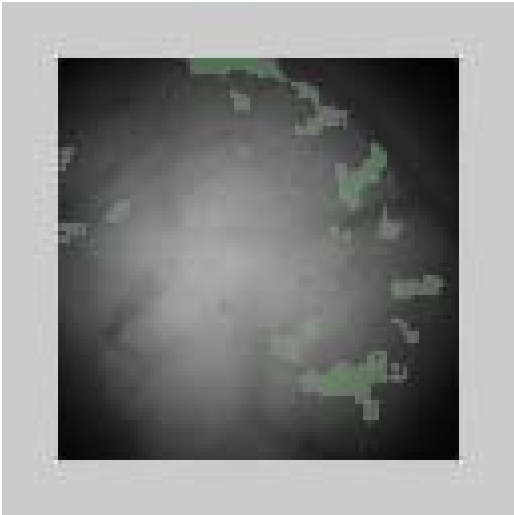




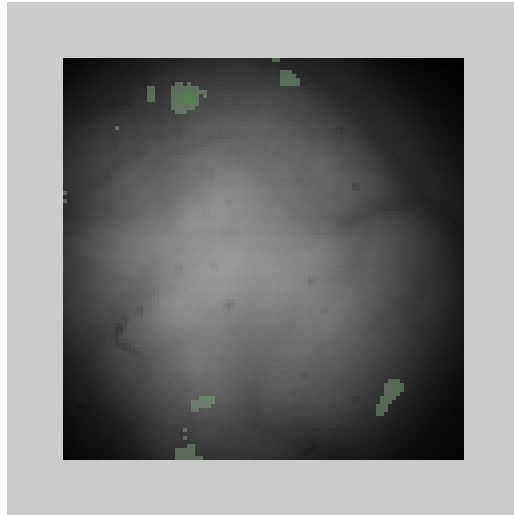
VSD imaging

Spontaneous waves

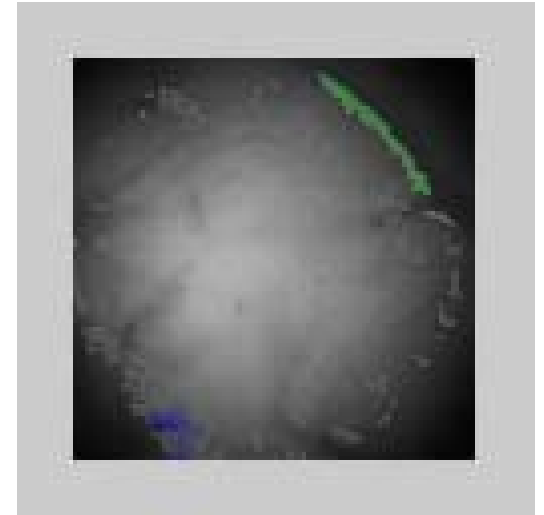
Before



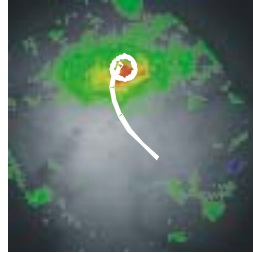
After



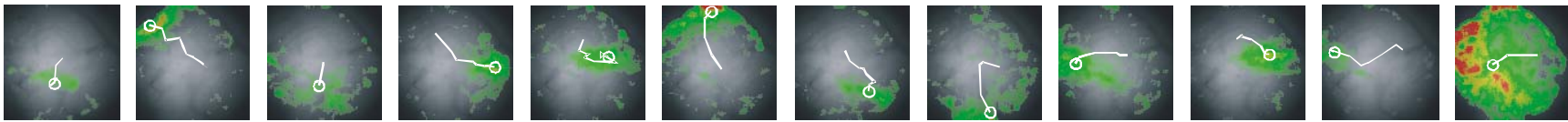
Response to
a flashed spot



Evoked wave
(template)



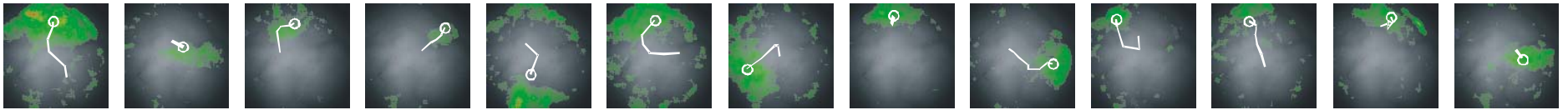
Before



*

*

After

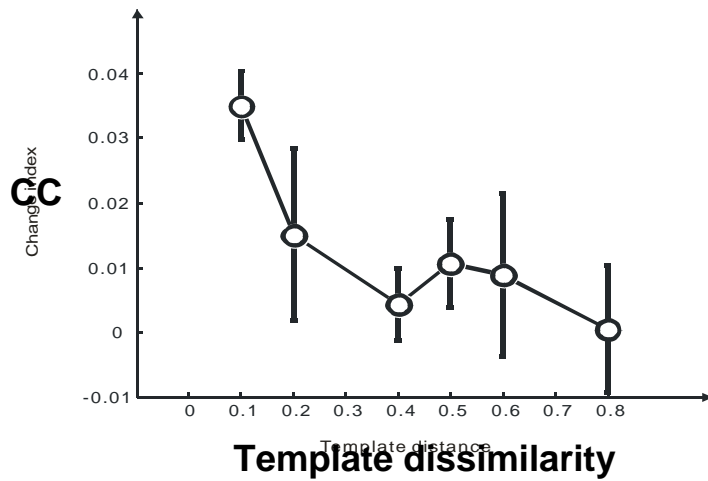
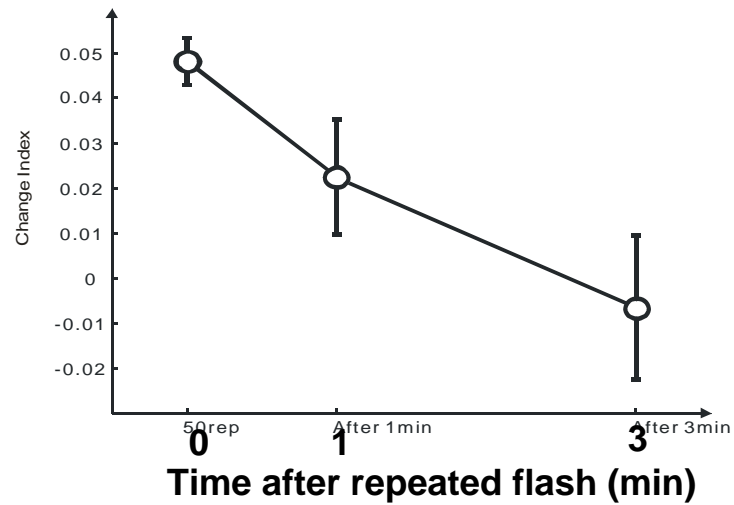
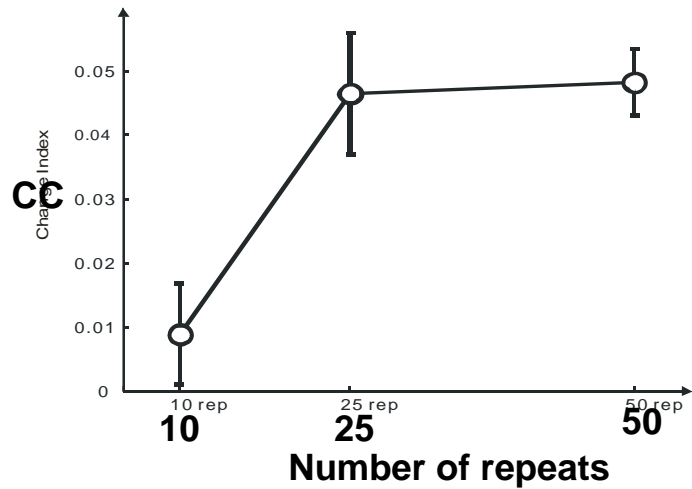


**

*

*

**





Yu-Xi Fu



Dan Meliza



Natalia Caporale



Haishan Yao



Rob Froemke



Feng Han