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Role of excitatory state in visual cortical plasticity

The balance between cortical excitation and inhibition defines the excitatory state which appears to be critical for cortical plasticity. In the adult visual cortex retinal lesions induce a transient state of increased excitability that facilitates neuronal plasticity and the reorganization of cortical representations. A sequence of functional and structural changes indicates a leading role of decreased inhibition followed by an increase in excitability. Currently we investigate the influence of transcranial magnetic stimulation (TMS) on the cortical excitatory state and cortical plasticity visualized by voltage sensitive dye imaging. Characteristically, 10 Hz TMS increases cortical excitability and reduces inhibition, while 1 Hz TMS strengthens intracortical inhibition. After conditioning with 10 Hz TMS we demonstrate a significant increase of adult cortical plasticity in response to specific visual stimulation.