Cortical activity influences the efficacy of geniculocortical communication

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Whether or not a cortical neuron responds to an incoming input depends on a number of factors. This study examined the role of ongoing cortical activity on spike efficacy at the geniculocortical synapse. We recorded single-unit responses from neurons in primary visual cortex (V1) of the macaque monkey and used electrical stimulation in the lateral geniculate nucleus (LGN) to identify cortical neurons that received direct LGN input. We then examined ongoing spontaneous activity preceding the arrival of electrically-evoked geniculocortical inputs. Particular patterns of preceding cortical activity were predictive of suprathreshold responses to geniculocortical input. Namely, cortical spiking activity between 30-40 Hz and displaying rhythmic patterns (at roughly 30 msec intervals) in phase with incoming input led to an increase in geniculocortical efficacy. Similarly, suprathreshold responses to geniculocortical input were preceded by cortical activity with increased power in the gamma frequency band. Based on these results, we suggest that increasing synaptic efficacy may be one of the mechanisms by which gamma band activity enhances cortical communication in thalamocortical circuits.

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References

[1] Cortical activity influences geniculocortical spike efficacy in the macaque monkey. F. Briggs and W. M. Usrey, *Frontiers in Neuroscience* in press, 2008.