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Abstract:
Humans perform an average of 3 fast eye movements per second. During these eye movements, the physical image of the world races across the retina at speeds up to 1000 deg/s, yet this movement is not perceived. A recent publication (Bremmer et.al. JNeurosci, 2009) described how saccades decrease the population activity of areas MT, MST, VIP, and LIP. The time course of suppression qualitatively matched the perceptual loss of sensitivity around the time of saccades in humans. In our current study, we investigated the temporal dynamics of visual responses around saccades in a large population of MT cells. Unlike the previous study, our design allowed us to investigate perisaccadic responses at high temporal resolution in each cell (and not just at population level).
The monkeys either fixated a central target or performed optokinetic nystagmus (OKN), which was induced by moving random dots. At the same time, a noise stimulus was presented in the background. This stimulus drove the MT cells quite strongly and allowed us to observe the influence of eye movements on an ongoing visual response. We aligned the firing rates of each neuron to the saccades. We corroborated the finding that the population response is reduced for stimuli presented around saccade onset, and enhanced just after the saccade offset. However, modulations in single cells were surprisingly heterogeneous. Some cells decreased their firing during and prior to saccades, others increased theirs tenfold. Some modulations started before saccade onset; hence at least part of the modulation in area MT is due to an extraretinal signal.
Taken together these data suggest that while the overall reduction in firing may be a correlate of the behavioral phenomenon of saccadic suppression, a significant number of neurons in area MT change their responses in a manner that is not compatible with simple reduced responsivity.
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