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Abstract:
The transfer of information from the retina to the cortex takes time, which complicates the interaction of an organism with its dynamic environment. In principle, the adverse effects of latency could be minimized by predicting future visual input based on the recent past. We investigated whether such predictive responses exist in the dorsal aspect of the medial superior temporal cortex (MSTd). We presented optic flow stimuli that changed predictably along a trajectory in spiral space. We first defined the onset latency as the time between the appearance of the stimulus on the screen and the peak of the onset response. Because the starting position of the stimulus was randomized, the onset response could not involve successful prediction, and served as a baseline measure of latency. Second, we calculated the steady-state latency as half the difference between the time of the peak response to one sequence of optic flows and the time of the peak response to the reversed sequence. In our sample of 89 neurons, the mean steady-state latency was 18 ms (SD=52), much shorter than the mean onset latency of 46 ms (SD=17; paired t-test $p<0.001$). The dynamics of the transition from onset latency to steady-state latency was very rapid; neurons operated at the short steady-state latency within 100 ms after stimulus onset. This finding is consistent with a rapid prediction of the future state of a predictable stimulus. The mechanism for these effects could include short-term, pattern specific adaptation. We are currently investigating whether these effects reflect a flexible and functional compensation for latency that could facilitate sensorimotor interactions of the organism with its surroundings.