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Format: Abstract

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Responses of collicular fixation neurons to gaze shift perturbations in head-unrestrained monkey reveal gaze feedback control.

Choi WY¹, Guittton D.

Author information

Abstract

A prominent hypothesis in motor control is that endpoint errors are minimized because motor commands are updated in real time via internal feedback loops. We investigated in monkey whether orienting saccadic gaze shifts made in the dark with coordinated eye-head movements are controlled by feedback. We recorded from superior colliculus fixation neurons (SCFNs) that fired tonically during fixation and were silent during gaze shifts. When we briefly (≤ 700 ms) interrupted gaze shifts by transiently braking head movements, SCFNs fired steadily during brake-induced gaze immobility, and their mean frequency was inversely related to the remaining distance between current gaze position and the target. After head release, a corrective gaze saccade brought gaze on the unseen goal, and SCFN firing frequency peaked. The results support gaze feedback control and show that the SC is part of a network that encodes, during orientation, the distance between eye and target, irrespective of gaze trajectory characteristics.

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