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Optic flow detection in the caudate nucleus of a primate

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The caudate nucleus (CN), as an input structure of the basal ganglia, is considered to play an important role in the control of oculomotor and skeletomotor processes. For completing the motor task, basal ganglia need sensory information from organisms of the surrounding environment as well. Our aim was to investigate the effect of optic flow as a dynamically changing visual stimulus on the caudate nucleus. An awake monkey (Macaca mulatta) of the female sex was used in the experiments. Extracellular multielectrode recordings were carried out with 16 implanted platinum-iridium electrodes in the CN. During fixation we applied 'center in' and 'center out' optic flow stimulation. The activity of 43 of the 84 recorded CN neurons was modulated by optic flow stimulation. Fifteen CN neurons showed increased firing rate, while 28 responded with decreased activity. The influence of the 'center out' optical flow to the responsiveness of each visually active CN neuron was significantly stronger than that of the 'center in' optic flow stimulation. Based upon our results we can draw the conclusion that the dynamic component of the visual information is represented in two different ways in the CN. CN neurons enhance (CN neurons with increased activity) or discontinue (CN neurons with decreased activity) the tonic inhibition of the superior colliculus originating from CN through the substatia nigra pars reticularis (SNr), and thereby they may help keeping fixation or triggering the necessary saccade.