

Limits of intraocular and interocular transfer in pigeons

Laura Jimenez Ortega, Katrin Stoppa, Onur Gunturkun and Nikolaus F. Troje

The retina of the pigeon has two areas of enhanced vision: the red field looking into the frontal binocular field and the yellow field projecting into the lateral monocular field. The entire retina projects to the tectofugal pathway, whereas the monocular areas mainly project to the thalamofugal pathway. In the present study we examine how the information received in different retinal areas and hemispheres is integrated within the pigeon brain. The pigeons' task was to discriminate between two shapes by pecking on one of the two keys located at one end of an experimental alley, while walking back and forth between two feeders. Intraocular transfer between the red and the yellow field was tested by moving the stimulus from the frontal to the lateral visual field in consecutive steps and vice versa. When the stimuli were perceived among the edge between the red and the yellow field, the pigeons showed a drastic decrease of performance that we interpret to result from a switch from the tectofugal to the thalamofugal system. There were virtually no traces of intraocular transfer of information from the tectofugal to the thalamofugal pathway, although, in a second experiment a weak intraocular transfer of information from the thalamofugal to the tectofugal system was observed. In a third experiment, interocular transfer of information between the yellow fields of the two eyes was tested. In eight out of nine birds, no interocular transfer was found. In addition, pigeons showed more difficulties to learn the task in the monocular right visual field than in the monocular left visual field, suggesting the existence of an asymmetric organization of the thalamofugal system in the pigeon brain.