

EEG asymmetry suggests left-hippocampal dominance in visually triggered arousal reactions of pigeons

Alexei L. Vyssotski¹, Andrei N. Serkov², Alexander V. Latanov², David P. Wolfer^{1,3}, Hans-Peter Lipp¹

¹Institute of Anatomy, University of Zurich, Zurich, Switzerland

²Chair of Higher Nervous System Activity, Moscow State University, Russia

³Department of Biology, Swiss Federal Institute of Technology, Zurich, Switzerland

In most species, the power of the EEG usually decreases with the salience of a stimulus. It has been shown that natural closing of an eye leads to increase of EEG power in the contralateral hemisphere in mallards kept in observation boxes. The goal of the current study was to check how an occlusion of the left, right and both eyes affects the EEG in pigeons observing a natural environment in which they have to look for predators and food. In this situation, they do not habituate to the visual environment and remain attentive. Since visual input reaches exclusively the contralateral hemisphere, such an outdoor situation permits to study hemispheric dominance for perception of naturalistic salient cues relevant for the species. Electrodes were implanted intracerebrally into the left and right hippocampus and hyperpallium apicale. A portable (7 g) 8-channel EEG recorder allowed the bird to move freely in a large outdoor aviary. Occlusion of both eyes increased the power of the EEG significantly at all electrode sites, least in the right hippocampus. Interestingly, occlusion of either the left or right eye increased EEG power similarly at the same electrode sites, albeit to a lesser degree. On the other hand, unilateral occlusion reinforced, independently of the side of occlusion, EEG power in the left hippocampus but less in the right hippocampus. Since decrease in EEG power means less synchronization between structures, it appears that the paradoxical insensitivity of the right hippocampus towards monocular and binocular input blockade reflects continuous alertness to any kind of stimulus, while the comparatively strong increase of the EEG power in the left hippocampus indicates some dependency on visual input, irrespective of the input side. Pending further recordings, this would imply left-hippocampus dominance for processing of visually triggered arousal reactions.

Supported by Swiss NF, NCCR “Neural Plasticity and Repair” and SCOPES 111081