Navigation-relevant landmarks influence on electrical brain activity in flying pigeons

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Analysis of electroencephalograms is widely used in humans and animals for evaluating the type and localization of brain activation, the effects of external sensory stimulation, or the irrelevance of specific stimuli used. It has been shown that pigeons sometimes follow large roads and use landmarks as turning points during their homeward journey (Curr Biol 14: 1239-1249, 2004). The goal of current study was to investigate possible changes in electrical brain activity associated with flying over typical ground features. Additionally, we compared EEG of birds traveling in a flock with birds flying singly. We tested the hypothesis that birds flying in a flock should pay less attention to topographical landmarks, with the exception, perhaps, of the leading bird. Finally, in order to compare the influence of topographical landmarks on EEG, we released the birds in a featureless landscape, i.e. from a boat in the middle of the Mediterranean sea, to force them to fly half their home journey over sea surface, and the other half - over land.
To record EEG in the flying pigeons an ultra-light (2g) four-channel EEG/single-unit recorder ("Neurologger") has been developed (www. vyssotski. ch/neurologger2, J Neurophysiol 95:1263-1273, 2006). The EEG recorded the electric brain activity from the cortex in each of the two hemispheres. In addition to the Neurologger the pigeons were also equipped with a small GPS data logger which recorded the precise position of animal during its journey (www. newbehavior. com, for the last versions see also www. technosmart. eu).
The data recorded by the Neurologger revealed that the brain areas monitored by the electrodes were activated when the birds crossed roads and road junctions. As expected, pigeons flying in flocks appeared to pay less attention to ground features than when flying singly. Additionally, when flying over the sea pigeons had reduced brain activity compared to when flying over the land.

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