

P5.25.

Electrophysiology of perceptual categorization of noisy visual stimuli, colored and grayscale

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Our cognitive system segments the world into categories to orient in it. The earliest categorization is made by the sensory systems: perceptual categorization. Visual categorization is helped by colors and is made more difficult by noise. In our study we probed both, removed color information and added two different kind of noise and studied the electrophysiological correlates of the early perceptual categorization. The subjects discriminated between birds and cars as categories and tried to recognize them in grayscale versions and in gradually changing noise levels with two different kinds of noise. We replicated the category differences in the N1 wave. The differences diminished gradually with the amount of noise introduced. The two kinds of noise behaved differently. As predicted by our experiments on macaque monkeys, we did not find differences in the category-related signals between the colored and grayscale versions when the categories were effortlessly recognizable. Generally, the effect of the presence or absence of colors became more pronounced as the difficulty of the recognition increased. This effect was weaker however when the system was driven by a noise which contained homogenous features (parallel lines). This suggests the presence of several strategies and several systems in the early simple process of perceptual categorization. The difficulty of the task activates different strategies and systems resulting in clearly distinguishable electrophysiological traces.