PNAS Plus Significance Statements

Image statistics underlying natural texture selectivity of neurons in macaque V4

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Our visual world is richly decorated with a great variety of textures, but the brain mechanisms underlying texture perception remain poorly understood. Here (pp. E351–E360) we studied the selectivity of neurons in visual area V4 of macaque monkey with synthetic textures having known combinations of higher-order image statistics. We found that V4 neurons typically respond best to particular sparse combinations of these statistics. We also found that population responses of texture-selective V4 neurons can explain human texture discrimination and categorization. Because the statistics of each image can be computed from responses of upstream neurons in visual area V1, our results provide a clear account of how the visual system processes local image features to create the global perception of texture in natural images.

Ventral aspect of the visual form pathway is not critical for the perception of biological motion

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Perceiving the movements of people around us is critical for many daily skills (from detecting threats to social interactions) and involves both form and motion perception. Even though the "form" visual pathway is standardly activated by biological motion stimuli, it is unknown whether this pathway's integrity is critical for the perception of biological motion. Here (pp. E361–E370), we examined whether damage to different aspects of the form pathway affects biological motion perception. Individuals with lesions to the ventral aspects of this pathway evinced normal biological motion perception despite their impairments in form perception. Our counterintuitive findings indicate that biological motion can be perceived and processed normally even when the ability to perceive the form or the actor executing the movements is impaired.

Relative contribution of TARPs γ-2 and γ-7 to cerebellar excitatory synaptic transmission and motor behavior

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AMPA-type glutamate receptors (AMPARs) are the primary means through which the CNS carries out rapid, excitatory postsynaptic signaling. Members of the transmembrane AMPAR regulatory protein (TARP) family of AMPAR auxiliary proteins are essential for the localization and function of AMPARs. Yet TARP family members differ in the ways in which they regulate AMPAR function. Much is known about the function of "typical" TARPs such as γ-2, but little about "atypical" TARPs such as γ-7. Using the cerebellar cortex as a model system, in which well-defined neuronal cell types exhibit differential expression of both γ-2 and γ-7, we examined the relative roles of these two TARP family members in both excitatory synaptic transmission and motor behavior related to cerebellar function (pp. E371–E379).

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