Neuronal plasticity that underlies improvement in perceptual performance

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Zohary, E, Celebrini S, Britten KH, Newsome WT. 1994.

Abstract:
The electrophysiological properties of sensory neurons in the adult cortex are not immutable but can change in response to alterations of sensory input caused by manipulation of afferent pathways in the nervous system or by manipulation of the sensory environment. Such plasticity creates great potential for flexible processing of sensory information, but the actual effects of neuronal plasticity on perceptual performance are poorly understood. The link between neuronal plasticity and performance was explored here by recording the responses of directionally selective neurons in the visual cortex while rhesus monkeys practiced a familiar task involving discrimination of motion direction. Each animal experienced a short-term improvement in perceptual sensitivity during daily experiments; sensitivity increased by an average of 19 percent over a few hundred trials. The increase in perceptual sensitivity was accompanied by a short-term improvement in neuronal sensitivity that mirrored the perceptual effect both in magnitude and in time course, which suggests that improved psychophysical performance can result directly from increased neuronal sensitivity within a sensory pathway.

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