

Are lateral inhibition and Hebbian learning responsible for visual perceptual priming?

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Perceiving and identifying an object is improved by prior exposure to the object. There is experimental evidence that behavioral priming is accompanied by reduced neural activity, but it is still unclear how suppression of neuronal activity with repetition correlates with improvement in psychophysical measurements of behavior. In contrast, in the field of perceptual decision making better performance is thought to be associated with higher neural activity in appropriate cortical areas. In the present work we suggest a model that can address the contradiction. Key assumptions of the model are 1) sharpening representations in lower visual areas, such as V1, is due to Hebbian learning, 2) sharpening in lower areas leads to sparser representations in higher areas, such as IT, and 3) sparser representations in higher areas facilitates the competition among many competing representations, therefore shortening the response time.

The model predicts that blockade of long-term plasticity in lower visual areas should produce a stronger deficit in priming compared to blockade of plasticity in higher areas.