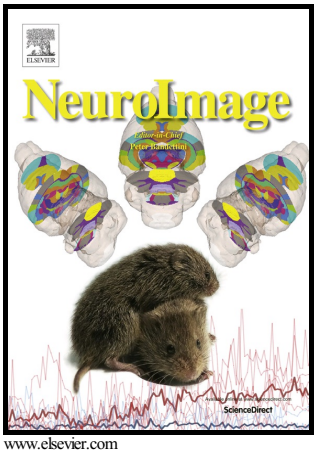

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Effects of adaptation on numerosity decoding in the human brain

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Abstract

Psychophysical studies have shown that numerosity is a sensory attribute susceptible to adaptation. Neuroimaging studies have reported that, at least for relatively low numbers, numerosity can be accurately discriminated in the intra-parietal sulcus. Here we developed a novel rapid adaptation paradigm where adapting and test stimuli are separated by pauses sufficient to dissociate their BOLD activity. We used multivariate pattern recognition to classify brain activity evoked by non-symbolic numbers over a wide range (20-80), both before and after psychophysical adaptation to the highest numerosity. Adaptation caused underestimation of all lower numerosities, and decreased slightly the average BOLD responses in V1 and IPS. Using support vector machine, we showed that the BOLD response of IPS, but not in V1, classified numerosity well, both when tested before and after adaptation. However, there was no transfer from training pre-adaptation responses to testing post-adaptation, and vice versa, indicating that adaptation changes the neuronal representation of the numerosity. Interestingly, decoding was more accurate after adaptation, and the amount of improvement correlated with the amount of perceptual underestimation of numerosity across subjects. These results suggest that numerosity adaptation acts directly on IPS, rather than indirectly via