Fast Learning of Simple Perceptual Discriminations Reduces Brain Activation in Working Memory and in High-level Auditory Regions.

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Abstract:

Introducing simple stimulus regularities facilitates learning of both simple and complex tasks. This facilitation may reflect an implicit change in the strategies used to solve the task when successful predictions regarding incoming stimuli can be formed. We studied the modifications in brain activity associated with fast perceptual learning based on regularity detection. We administered a two-tone frequency discrimination task and measured brain activation (fMRI) under two conditions: with and without a repeated reference tone. Although participants could not explicitly tell the difference between these two conditions, the introduced regularity affected both performance and the pattern of brain activation. The "No-Reference" condition induced a larger activation in frontoparietal areas known to be part of the working memory network. However, only the condition with a reference showed fast learning, which was accompanied by a reduction of activity in two regions: the left intraparietal area, involved in stimulus retention, and in posterior superior-temporal area, involved in representing auditory regularities. We propose that this joint reduction reflects a reduction in the need for online storage of the compared tones. We further suggest that this change reflects an implicit strategic shift "backwards" from reliance mainly on working memory networks in the "No-Reference" condition to increased reliance on detected regularities stored in high-level auditory networks.

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