Cortical fingerprints of the facilitation in speech processing provided by perceptual learning

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Résumé

The human brain is able to understand speech inputs without apparent effort, even in adverse situations. The underlying cognitive system appears to be exceptionally resilient to perturbations of the speech signal. This unique aptitude may be facilitated by different neurocognitive mechanisms, including the ability of improving perceptual efficiency through context-dependent adaptations referred to as perceptual learning. Our study aimed at identifying the neural mechanisms that underlay such processes.
Many neurocognitive aspects associated with the processing of speech were up to now studied by the analysis of event- related potentials. However, none of these cortical responses can be considered as a direct indicator of successful lexical access during speech comprehension. In the experiment presented we wanted to identify electrophysiological correlates of perceptual learning and identification of spectrally reduced speech stimuli.

We used noise-vocoded speech that is very difficult to understand without prior exposure. We designed an experimental paradigm in order to compare cortical activity during the comprehension of a same list of 250 noise-vocoded words before and after a short period of perceptual learning on a different list of 150 stimuli, to make sure of the presence of a generalization effect.
We compared the oscillatory activity following stimuli rated as "intelligible" or "unintelligible" by participants. Results show that we were able to identify three oscillatory activities with specific topology and latency resulting from a successful lexical access.

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