Electrophysiological and haemodynamic biomarkers of rapid acquisition of novel wordforms

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Humans are unique in developing large lexicons; to achieve this, they are able to learn new words rapidly. However, neural bases of this rapid learning, which may be an expression of a more general mechanism rooted in plasticity at cellular and synaptic levels, are not yet understood. Here, we highlight a selection of recent EEG and fMRI studies that attempted to trace word-learning in the human brain non-invasively. They show a rapid development of cortical memory traces for novel wordforms over a short session of auditory exposure to these items. Moreover, they demonstrate that this effect appears to be independent of attention, reflecting a largely automatic nature of word acquisition. At the same time, it seems to be limited to stimuli with native phonology, likely benefiting from pre-existing perception-articulation links in the brain, which suggests different neural strategies for learning words in native and non-native languages. We also show a complex interplay between overnight consolidation, amount of exposure to novel vocabulary and attention on speech input, which all influence learning outcomes. In sum, the current experiments suggest that our brain may effectively form new cortical circuits online, as it gets exposed to novel linguistic patterns in the sensory input. A number of brain areas, most notably in (but not limited to) hippocampus and neocortex, appear to take part in word acquisition. Critically, the currently available data not only demonstrate hippocampal role in rapid encoding followed by slow-rate consolidation of cortical memory traces, but also suggest immediate neocortical involvement in the word memory trace formation.