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## **Acquisition of New Word Meaning. MEG Study**

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The question which is crucial for understanding neurophysiology of language is how our brain transforms sensory-motor experience to get word semantics. Vocabulary of any human language exceeds any size limits estimated in terms of modern theories of memory and learning that challenges science to describe speech semantic mechanisms within human brain. Multiple research works support the embodied cognition theory. Associative learning paradigm implies that the word meaning encoding is implemented in the brain via Hebbian-type learning. We developed an auditory-motor experimental procedure that allowed investigating neural underpinning of word meaning acquisition by way of “trial-and-error” learning that mimics basic aspects of natural language learning.

Participants were presented with eight pseudowords; four of them were assigned to specific body part movements during learning blocks – through commencing actions by one of participant’s extremities and receiving a feedback. The other pseudowords were used as controls. MEG was recorded during passive listening of the pseudowords before and after learning. Correlation between the brain activity and the learning rate in participants proves that the effect observed is relevant to formation of a memory trace linking the acoustic pseudowords to their meaning. A significant effect was found in the parabelt areas responsible for spectrotemporal analysis and the initial steps of word recognition (middle part of the STG). Also, activation of the posterior opercular part of the IFG was observed, supposed to reflect subvocal rehearsal and articulatory coding of the perceived speech sounds. Both effects appeared within the left hemisphere only. We observed that the new-word-pseudoword differential brain activity occurs at least 250 ms after disambiguation point. The spatial-temporal pattern of a new-word effect indicates that the neural processes engaged in learning the unknown word differ from those involved in the decoding of well-known word semantics.

Taken together, our findings imply that long-term effects of natural language usage may involve multiple consolidation phases; rooting the word meaning into one’s sensory-motor experience is a necessary but not a sufficient prerequisite for its embedding into the associative structure of semantic memory.

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