Lexicon as a Dynamical System: Computational and Neural Mechanisms

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How does a child rapidly acquire and develop a structured mental organization for the vast number of words in the first years of life? How does a bilingual individual deal with the even more complicated task of learning and organizing two lexicons? It is only until recently have we started to examine the lexicon as a dynamical system with regard to its acquisition, representation, and organization. In this talk, I outline a proposal based on our research that takes the dynamical approach to the lexicon, and discuss how this proposal can be applied to account for lexical organization, structural representation, and competition within and between languages. In particular, I provide computational evidence based on our DevLex model, a self-organizing neural network model, and neuroimaging evidence based on fMRI studies, to illustrate how children and adults learn and represent the lexicon in their first and second languages. In the computational research, our goal has been to identify, through linguistically and developmentally realistic models, detailed cognitive mechanisms underlying the dynamic self-organizing processes in monolingual and bilingual lexical development; in the neuroimaing research, our goal has been to identify the neural substrates that subserve lexical organization and competition in the monolingual and the bilingual brain. In both cases, our research allows for a better understanding of the interactive dynamics involved in the acquisition and representation of one or multiple languages.