Imaging Language Processing in the Brain

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The past decade has produced an explosion in the application of neuroimaging techniques to linguistic research. Functional magnetic resonance imaging (fMRI) in particular has been extensively applied to the investigation of the neural correlates of language processing. In the first part of the talk I will provide the neuroimaging evidence for the poverty of the stimulus problem in second language (L2) acquisition. Neural correlates of acquiring new second language knowledge were examined using fMRI. Post-puberty Japanese participants learned a new English rule with simplex sentences during one-month of instruction, and then they were tested on "uninstructed complex sentences" as well as "instructed simplex sentences." The behavioral and neuroimaging data show that L2 learners can acquire more knowledge than is instructed, suggesting the interweaving of nature and nurture in L2 acquisition. I will specifically show that the processing of structure-dependent computation is associated with the activation of Broca's area, and will then discuss several topics regarding structure-dependence in natural language as well as the role of Broca's area. Time permitting, I will move on to the second part of my talk on a discussion of effects of social interaction on the acquisition of Japanese sign language (JSL). Children acquire a language used around them, but less trivial is the fact that they do so from people: children fail to acquire a language from TV, or computer presentations (Baker 2001). At the earliest phases of language acquisition social interaction is essential for phonetic learning (Kuhl 2007). No study, however, has yet examined how social interaction during second language acquisition of syntax in adulthood will affect the neural mechanisms. I will show, by examining the acquisition of JSL under two different social learning conditions, that learning JSL through interaction with a deaf signer resulted in the change in the activation of Broca's area. This suggests that in addition to early speech learning, social interaction is crucial in order for L2 learners to come to rely on native-like neural mechanisms in processing syntax.