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The Earliest Stages of Language Learning: Introduction

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This volume brings together work by researchers who examine the nature of language learning but who normally do not publish in the same journals, go to the same conferences, or consider themselves as working in the same field (e.g., second-language acquisition). Yet they share common questions, such as: How do the resources that learners of a new language bring to the task affect learning, and what are the mechanisms that govern language learning? To answer these questions, they have all decided that phenomena of language learning (and acquisition, for those inclined to distinguish the two) need to be studied in populations for which preexisting knowledge is homogeneous and with tight control over the input that the learners receive, thereby minimizing the influence of the notoriously wide range of variables affecting second-language learning. As a consequence, they study learners who are exposed to a new language for the first time. The authors differ with respect to their views on what type of language should be learned, ranging from natural to artificial, and in which setting, ranging from mere exposure over classroom instruction to laboratory experiments.

Given the immense difficulties involved in controlling for the linguistic knowledge that second-language learners bring to the task, using artificial

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language stimuli is inherently attractive. Provided that learning and representing properties of an artificial language involves the same processes as for a natural language, artificial stimuli allow for a strict control of learner and input variables that natural language input can hardly afford. Yet, from a different perspective, learning properties of an artificial language might just miss essential aspects of natural second-language learning. The contributions to this issue represent the full range of quasi-natural to highly abstracted input. The findings reported allow for some interesting conclusions concerning which aspects of second-language learning are well captured by artificial learning paradigms and which aspects are not.

When bringing together this particular group of experts with their different approaches to the study of language learning, our aim was to explore (a) where the results on the learning of different aspects of a new language converge despite the very different approaches and (b) whether the processes examined with artificial language input are the same as those examined with natural second-language input. Guided by these two questions we now briefly introduce the contributions to this issue.

Gullberg, Roberts, Dimroth, Veroude, and Indefrey exposed learners to a few minutes of naturalistic continuous audiovisual input from an unknown natural language. They show that observers extracted possible second-language word forms, phonotactic constraints, and—with gestural support—even word meanings. Whether or not observers were able to segment words out of the continuous speech stream and recognize them later was related to both preexisting and exposure-induced neural differences. The neural structures involved in segmenting possible word forms out of continuous natural language input seem to be similar to those found with artificial language input. Additionally, de Diego-Balaguer and Lopez-Barroso report successful word segmentation within minutes. They exposed participants to a continuous stream of nonsense syllables and found that successfully segmented artificial word forms show an electrophysiological signature that is known from natural words.

Two articles present new insights into behaviorally and neurally distinct processes involved in word learning. The series of studies on learning new words of the native language reviewed by Laine and Salmelin supports a distinction between short- and long-term maintenance of new words, with neocortical structures supporting the former and hippocampal structures supporting the latter. Furthermore, the findings suggest that the role of semantics in the learning tasks and learning strategies affect which cortical structures are recruited. Lindsay and Gaskell also demonstrate complementary roles for medial temporal and neocortical structures and show that, initially, novel words may be

recollected and behave in a wordlike fashion in some respects although they are not yet integrated in the mental lexicon. It takes sleep-mediated consolidation or a specific training regime ("spaced learning") for novel words to induce lexical competition effects that are diagnostic for interaction with other words in the lexicon.

In contrast to these studies conducted in laboratory settings, Rast studied word learning in a classroom setting but with full input control. She shows that the ability of French learners to repeat and translate second-language Polish words is not only affected by factors affecting the salience of the words in the input but also by their similarity to first-language words and even words of other second languages. By contrast, there seems to be no crosslinguistic influence on the learning of Polish syntactic structures.

Not only for the study of word learning, but also with respect to the acquisition of morphological and syntactic rules, the authors of this issue used widely different materials and settings. Ellis and Sagarra combined laboratory and classroom teaching approaches in their studies on the acquisition of Latin temporal reference. They report a general preference for lexical above morphological cues, an influence of the complexity of first-language morphology and of manipulations of the salience of morphological cues. Davidson reports changes in electrophysiological responses to second-language German and Dutch inflectional and word order violations within hours of training. Electrophysiological responses (ERPs) to feedback during training were predictive of individual differences in performance improvement on task. McLaughlin and her colleagues measured electrophysiological responses to inflectional violations over the first year of second-language classroom instruction. They report individual differences in ERP responses, indicating discrete stages of grammatical learning. The rate of the transition is influenced by the relationship between the first and the second language.

In addition to word segmentation (see above), de Diego-Balaguer and Lopez-Barroso also studied the learning of nonadjacent dependencies ("rules") in streams of artificial syllables. Again, within minutes of exposure, an ERP signature related to the presence of such dependencies emerged that was different from the word segmentation response and enhanced by the presence of additional prosodic cues. Folia and colleagues studied implicit artificial syntax learning in adults involving complex syntactic dependencies while controlling for local substring familiarity and associative chunk strength, also manipulating sleep as a consolidating factor. They report functional magnetic resonance data showing virtually identical involvement of BA 44 and BA 45 in the processing of artificial and natural language grammar. Transcranial magnetic stimulation

(TMS) findings support these results showing that repetitive TMS to LIFG/BA 44, 45 interferes with grammaticality judgments. The final part of their article discusses the language learning problem from a mechanistic neurobiological point of view, combining the notion of innate language constraints with the notion of domain general learning mechanisms.

Whereas the contributions on natural second-language grammatical learning report crosslinguistic effects of the first language—an aspect of second-language grammatical learning that, to date, has not been captured by artificial language paradigms—the contributions reporting grammatical learning in artificial languages emphasize the relevance of their findings for natural languages. The final two articles assess commonalities and differences by comparing grammatical learning in (more) natural and (more) artificial materials. Williams compared grammatical learning between "Japlish" (a language with an English lexicon and Japanese grammar) and an analogue with a meaningless lexicon. He concludes that there are common sequence learning mechanisms but that (a) the representations over which sequences are processed are different and (b) even if constraints on sequences of grammatical categories are learned, that is not the same as learning rules. Robinson compares artificial grammar learning on symbol strings with the learning of aspects of Samoan grammar. He also concludes that there is a common component of artificial and natural grammar learning but observes a differential effect of the frequency with which parts of the test sentences had occurred in the training material ("chunk strength"). Robinson suggests that artificial grammar learning may be a better model for first-language than for second-language grammatical learning.

As this brief tour of the contents hopefully indicates, the mix of disciplines and approaches represented at the 3rd A. Guiora Conference on the Cognitive Neuroscience of Language made it a very lively event. The wealth of data and theoretical insights presented generated engaged discussions and many new ideas about how to further our understanding in this domain. Through this collection of articles, which provides a unique state-of-the-art overview of a range of approaches to the study of the earliest stages of (second) language learning, we invite the reader to share the excitement with us.