Non-adjacent dependency learning over different segments in speech

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Processing dependencies between distant speech elements is central to human language (e.g. he sings) (cf. e.g. Friederici, Mueller & Oberecker, 2011). It has been suggested that vowels are the segmental unit that is informative when extracting structural regularities, while consonants guide lexical processes (cf. Bonatti et al., 2005). Support for this claim stems mainly from artificial grammar learning (AGL) experiments employing variable repetition-based ABB or ABA structures (Toro et al., 2008a, 2008b; Monte-Ordoño & Toro, 2017). In the present EEG-study, 29 adult participants were exposed to an AXB grammar coded over specific trisyllabic sequences (biXpe, goXku). Learning phases alternated with a grammaticality judgment task, in which we tested for successful generalization of this regularity not only on the syllable, but also on the vowel (xiXxe, xoXxu) and consonant (bxXpx, gxXkx) level. The behavioral results indicate low learning rates and few learners across all three conditions (SYL n=7, VOW n=3, CON n=6). In contrast to the suggested rule-related function of vowels in auditory speech processing, the EEG results of the testing phases reflect early discrimination effects only for correct and incorrect syllable sequences, but not for consonants and vowels. When comparing the first and third minute of exposure in the learning phase, we find a learning-related N400 component (cf. Rodríguez-Fornells et al., 2009). We conclude that the experiment seemingly tested less for perceptual level deviant recognition, but rather for learning and memorization of concrete forms, comparable to word learning. Participants strategically mainly attended to the syllables and hence did not generalize the dependency to vowels or consonants.

References

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