Preschool children prefer structural over linear constituent order in learning artificial grammars

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Words occupy different positions within a sentence depending on how they are related, syntactically and semantically, to other words: this principle is known as *structural order*. No language obeys a linear order principle whereby constituents have fixed positions within a sentence.

Do structural order constraints exist in the mind of learners, and, if they do, can they be probed experimentally? We conducted a series of four experiments assessing the performance of preschool children and adults in learning artificial grammars featuring the fundamental distinction between function and content words. Our artificial grammars were constructed either based on plausible rules on the placement of function and content words in a sentence (i.e., *structural order* or *free order*) or based on implausible rules (*linear order*). We tested children and adults from three language groups (Romance, Germanic and Slavic) to assess the dependence of structural order constraints from the first language (L1) of learners. We hypothesized that children would find it more difficult to learn artificial grammars that do not accord with the cross-linguistic typological pattern, but obey instead a linear order rule on the placement of function and content words.

Our results suggest that children are not unconstrained learners. They showed a preference for the grammars they were exposed to during training, and significantly more so for structural order, as compared to linear order grammars. This points to the existence of cognitive constraints or biases on learning that favor the typologically plausible pattern of constituent order. We tested native speakers of three typologically different languages and found support for the notion that learning constraints are only partly dependent on the first language of learners. Most research on language acquisition is guided by the assumption that the underlying processing architecture is shared by speakers of all languages. However, our results suggest that cross-linguistic differences may emerge in the course of the learning process. Cross-linguistic research may therefore prove essential for disentangling which constraints are shared across languages.

The main goal of our experiments was to find (counter)evidence for the presence of learning constraints based on structural order. We present data on the existence of constraints in favor of structural order as is found in every natural language. Minimally, our results suggest that cognitive biases constrain language learning, and by doing so may affect the cultural evolution of languages. A key challenge for future research is to understand learning constraints in greater detail and how they interact with cultural or historical processes shaping natural languages.