

LESS ISN'T ALWAYS MORE: REMOTE DEPENDENCY-LEARNING AND THE EFFECT OF PRIOR EXPOSURE

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Statistical learning has been held up as an important mechanism in language acquisition. For instance, it may support the detection of grammatical dependencies between functional words (*Sharpe is saving Wellington's life*) through a mechanism that tracks co-occurrence statistics between non-adjacent units (Gómez, 2002; Gómez & Maye 2005). While infants are sensitive to individual functional words around 8-11 months (Shi & Lepage, 2008), they begin tracking dependencies between them only at 18 months: this delay is attributed to the fact that the remote dependency-learning mechanism may rely on working memory capacities which only develop around 18 months (Santelmann & Jusczyk, 1998). The slow development of working memory prompts the child to initially focus on smaller units before computing relationships between them, a process which, according to the Less-is-More Hypothesis (LisMH, cf. Newport 1990, Elman, 1993), is highly beneficial to language acquisition. The LisMH, together with the acquisition timeline of functors and dependencies between them, would therefore predict that remote dependency-learning should be facilitated by prior familiarity with individual elements entering dependencies.

We tested the proposal that dependency-learning is enhanced by prior familiarity with the dependent elements in an artificial grammar learning paradigm with adult subjects. We investigated remote dependency-learning in nonsense strings with the structure aXb (e.g. tep wadim lut), where a predicted b with 100% probability. In 3 Pre-familiarization Conditions (Experiment 1) subjects were first exposed to a pre-familiarization phase of varying lengths (1, 2 or 8 minutes), where they heard aY and Zb strings (e.g. tep poemer or naspu lut, presented in random order and with 750ms pauses between them) which were meant to facilitate the identification of a and b elements. Subsequently, they were familiarized with the aXb language for 12 minutes, and tested on their sensitivity to dependencies by giving grammaticality judgments on novel aX'b strings, either correct (aiX'bi) or incorrect (aiX'bj).

We compared participants' accuracy in accepting correct strings and rejecting incorrect ones across the 3 Pre-familiarization Conditions and found a significant difference between the 1-minute and the 8-minute Pre-familiarization, in the opposite direction than expected: only participants in the 1-minute Pre-familiarization Condition performed above the 50% chance level (mean accuracy $M=59.72\%$, $p=.006$), those in the 8-minute Prefamiliarization did not ($M=48.61\%$, $p=.616$). Therefore, prior familiarity with dependent elements seemed to inhibit the acquisition of the dependencies themselves. We further showed that the salience of the dependent a/b elements at Pre-familiarization had an impact on learning. Although the 1-minute Pre-familiarization Condition showed significant learning, when we modified this Condition slightly by rendering the a/b tokens more acoustically prominent (Experiment 2, $M=53.03\%$, $p=.590$), or simplifying the Pre-familiarization by presenting individual a/b tokens instead of aY/Zb phrases (Experiment 3, $M=50.42\%$, $p=.906$), learning was significantly poorer (at chance level). This suggests that rendering the dependent elements (acoustically/distributionally) more salient during Pre-familiarization, thus facilitating their detection, amplified the negative Pre-Familiarization effect on learning.

We conclude that these findings run counter to our predictions based on the LisMH: remote-dependency learning is not aided, but in fact impeded by prior exposure to individual dependent elements. Instead, we argue that the remote dependency-learning mechanism is constrained to only operate prior to the full identification/encoding of the dependent elements, and that this is in line with literature positing that sensitivity to remote dependencies arises at a much earlier stage, around the age of 4 months (Friederici et al. 2011).

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