## Appendix A: Analyses using different phonological distances

In the methods section, we based the choice of setting the threshold of edit distance at 2 on the fact that the early lexicon is very sparse in terms of phonological neighborhood; the early proposal that set the threshold at 1 (e.g., Vitevitch, 2008) was defined in the context of rather mature, dense lexicon. Increasing the threshold from 1 to 2 allows for a more reasonable representation of the similarity space of the early phonological network.

That said, it is useful to include the results obtained with both thresholds. In addition, it could be useful to compare the results to the case of weighted networks, i.e., with no thresholding. The main analyses for these two cases are shown in what follows.

### Analyses using phonological networks constructed with an edit distance of 1

We show in Figure 8 the correlation between the phonological connectivity and age of acquisition in both comprehension and production. The sparsity issue — due to the low phonological neighborhood in the children's lexicon — is apparent: Most words had 0 connectivity, and a few had non-zero but small degrees. The values of the correlations are much lower than the ones obtained with a threshold of 2.

The next figures show how the phonology-based mechanism of growth (phonoEXT) fares in comparison to semEXT and other predictors of learning in each language (Figure 9) and across all languages (Figure 10). These figures show that phonoEXT based on edit distance 1 had no noticeable effect on learning.

### Analyses using weighted phonological networks with no thresholding

We constructed weighted phonological networks where the edge between a given pair of words $(w_1, w_2)$ was weighted by a measure of similarity defined as $1 - NED(w_1, w_2)$, where $NED(w_1, w_2)$ is the Normalized Edit Distance with values in the range $[0, 1]$. We obtain $NED(w_1, w_2)$ by dividing the edit distance by the maximum possible distance between the

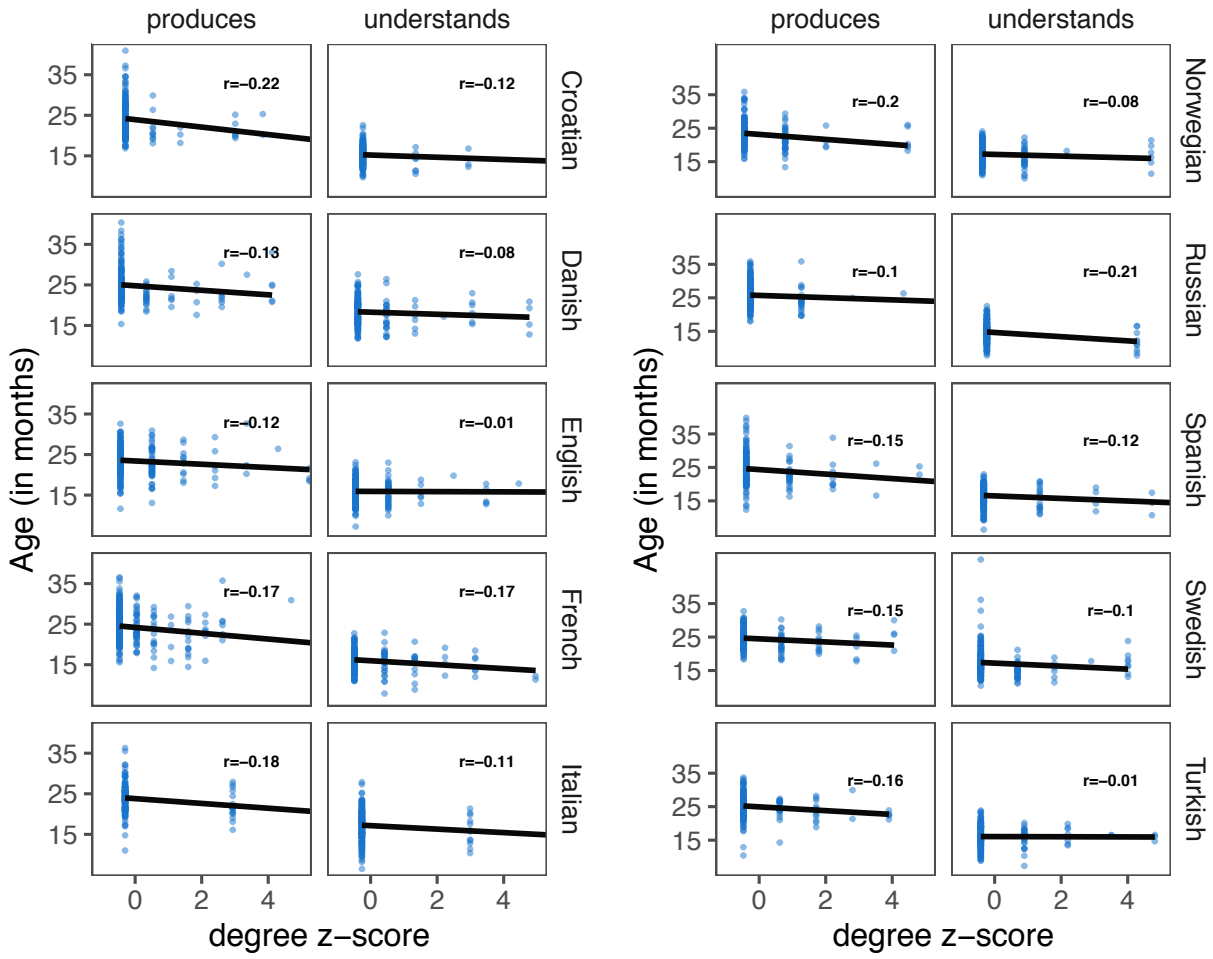


*Figure 8*. Age of acquisition in both comprehension and production as predicted by the degree (i.e., connectivity) in the phonological networks, using an edit distance of 1. Each point is a word, with lines indicating linear model fits, and numbers indicating the Pearson correlation coefficients.

two words, that is, the length of the longer word. The phonological connectivity of a given word $w$ was defined as the sum over all weighted edges with every other word $w_i$ in the network, i.e., $\sum_i(1 - NED(w, w_i))$.

The results were as follows. The correlations were lower than the ones obtained with the thresholds 2 and 1 (Figure 11). That sais, we found a (slight) predictive effect of phonoEXT when controlling for frequency and length (Figures 12 and 13).

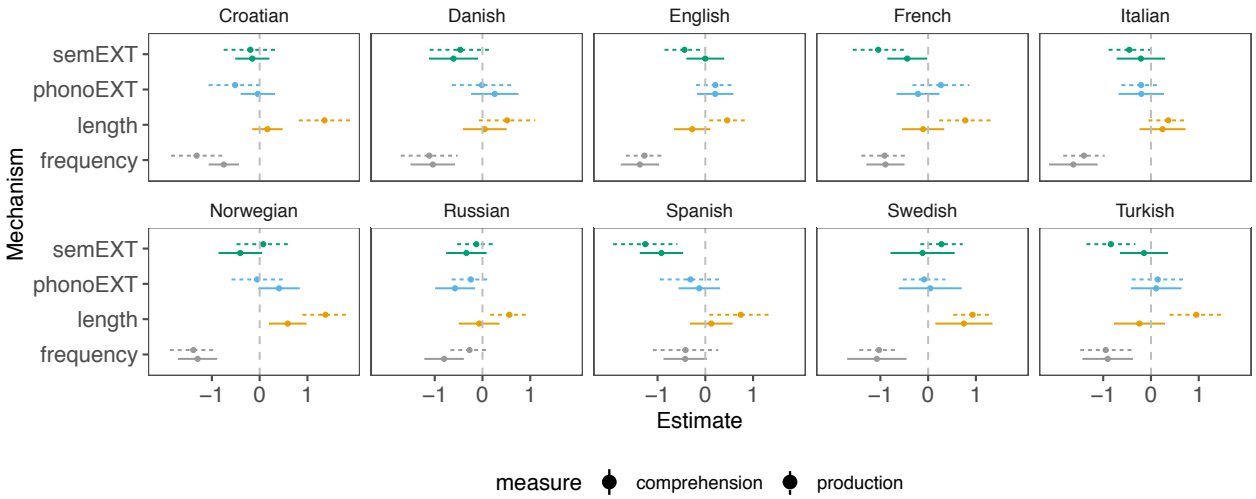


*Figure 9*. Estimates of the relative contribution of each predictor of AoA in the regression models. The phonological networks were based on an edit distance of 1. Ranges indicate 95% confidence intervals. Positive values indicate a positive relationship (e.g. longer words tend to have a higher AoA), while negative values indicate a negative relationship (e.g. words with higher frequency tend to have a lower AoA).

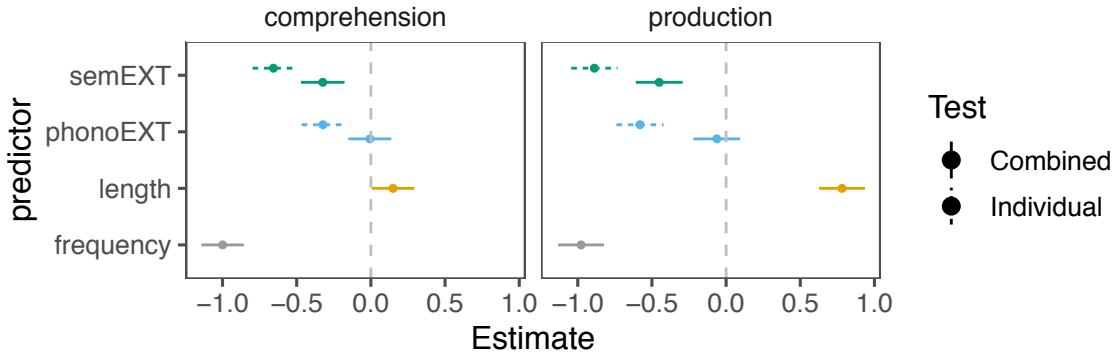


*Figure 10*. Estimates of the relative contribution of each predictor of AoA in the combined model. The phonological networks were based on an edit distance of 1. Ranges indicate 95% confidence intervals. Dotted ranges indicate the estimates for the predictor in a separate model that includes only this predictor as a fixed effect.

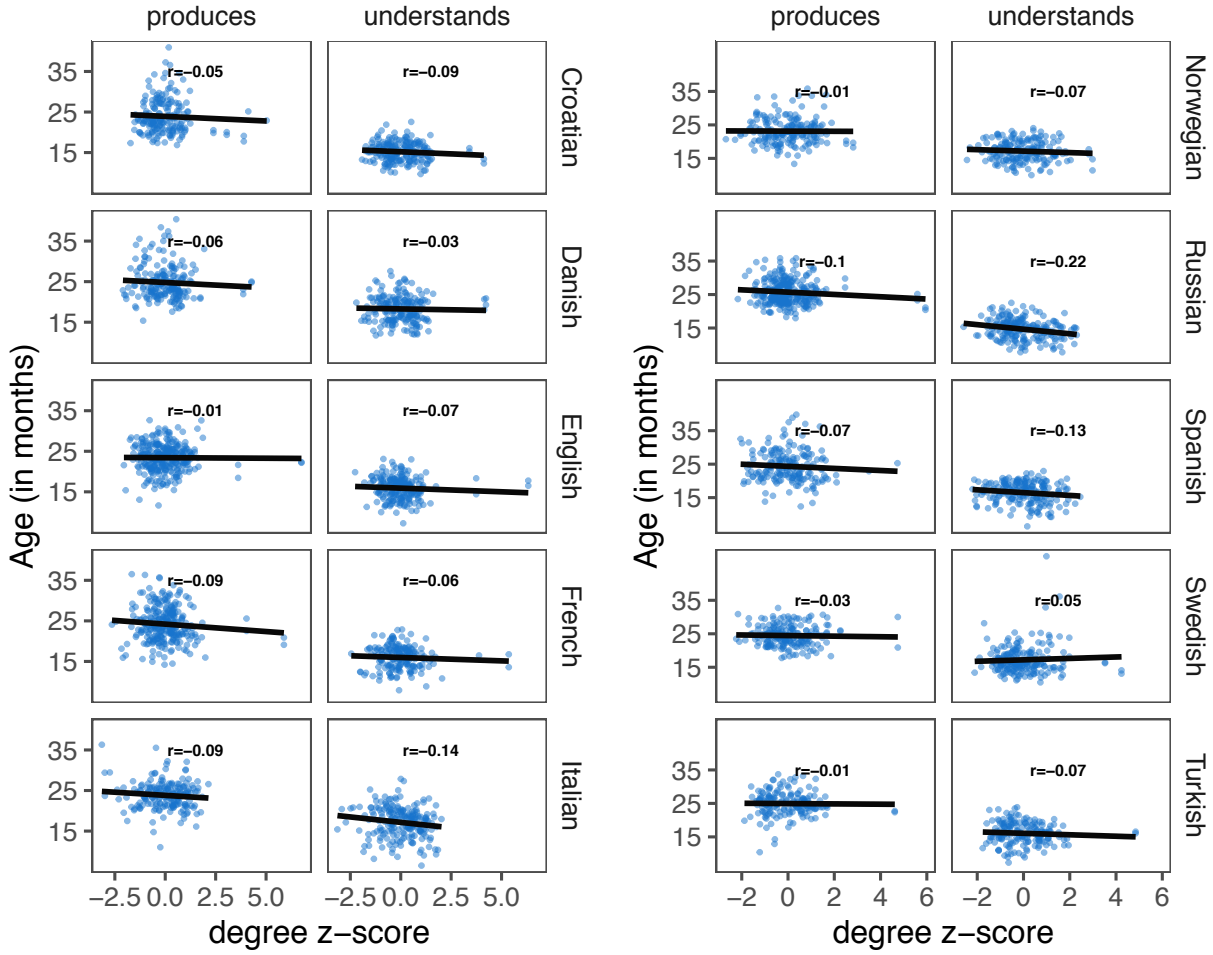


*Figure 11*. Age of acquisition in both comprehension and production as predicted by the connectivity in the phonological network, using weighted edges. Each point is a word, with lines indicating linear model fits, and numbers indicating the Pearson correlation coefficients.

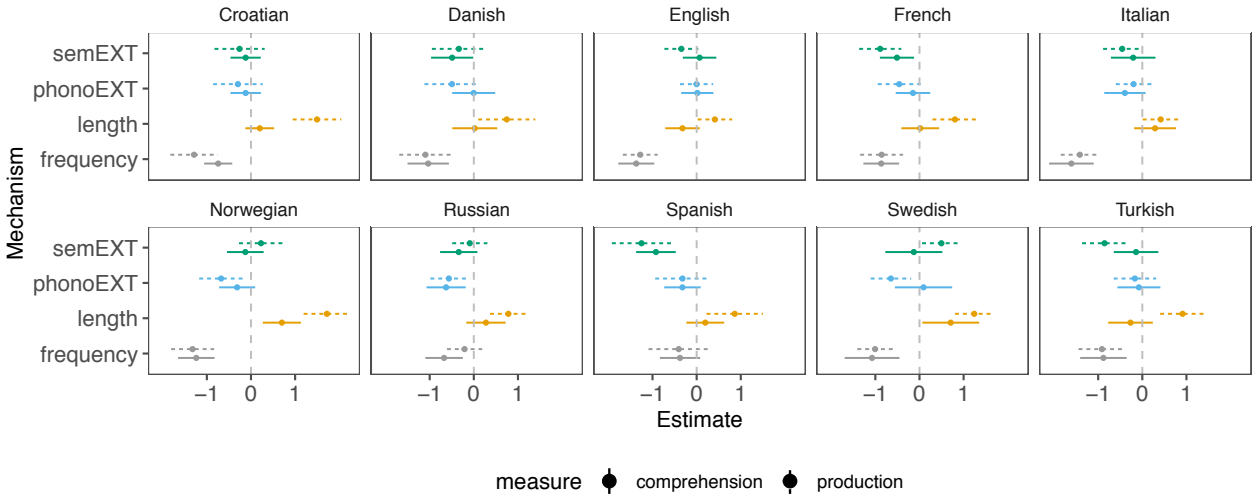


*Figure 12*. Estimates of the relative contribution of each predictor of AoA in the regression models. In the phonological networks, the edges between pairs of words were weighted by a normalized edit distance. Ranges indicate 95% confidence intervals. Positive values indicate a positive relationship (e.g., longer words tend to have a higher AoA), while negative values indicate a negative relationship (e.g., words with higher frequency tend to have a lower AoA).

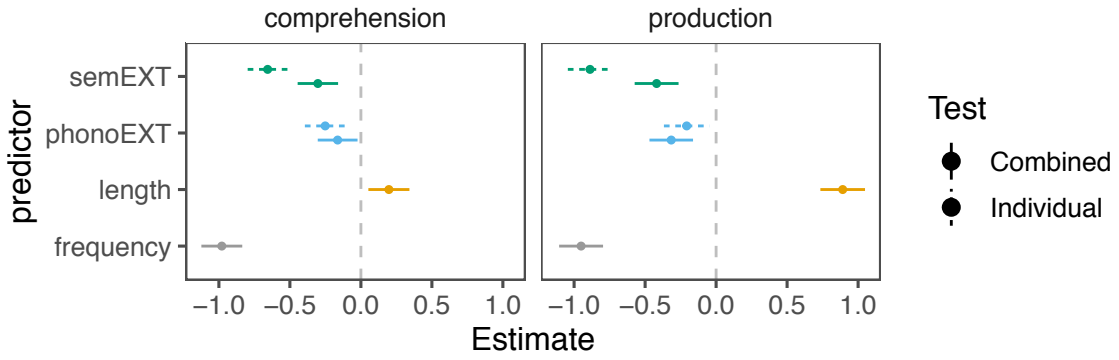


*Figure 13*. Estimates of the relative contribution of each predictor of AoA in the combined model. In the phonological networks, the edges between pairs of words were weighted by a normalized edit distance. Ranges indicate 95% confidence intervals. Dotted ranges indicate the estimates for the predictor in a separate model that includes only this predictor as a fixed effect.

## Appendix B: Phonological connectivity across languages

We were interested in investigating if, for a given meaning (e.g., "dog" in English and "chien" in French), phonological connectivity varied across languages. For example, if "dog" is highly connected in the English phonological network, will "chien" also be highly connected in the French network, or will these two forms be situated independently in their relative phonological networks?

If the phonological networks are very similar across languages, then network growth in the phonological domain may be deeply intertwined with growth in the semantic domain, rather than being an independent mechanism of acquisition. If, instead, the phonological connectivity is different from language to language, then this fact would lend support to phonological growth being an independent driving mechanism of early word learning.

To test this hypothesis, we compute the correlation of the unilemma's phonological connectivity between every pair of languages. In Figure 14, we plot the distribution of the pairwise Pearson correlation coefficient. Generally speaking, languages are not highly correlated at the phonological level as the distributions peak at low values of $r$, showing that phonological connectivity is not (at least not fully) determined semantically.

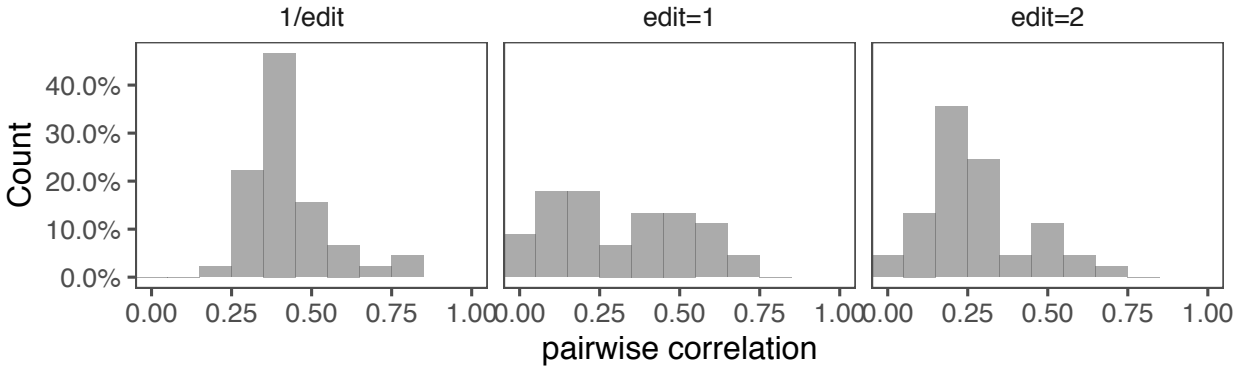


*Figure 14*. The distribution of the Pearson correlation coefficients of the unilemma's phonological connectivity between every pair of languages.