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To investigate effects of frequency and neighborhood density in production and comprehension, it is desirable to have control over language users’ linguistic experience and the similarity relations in the language. Both can be accomplished with an artificial lexicon. This method has been successfully used to study the effects of frequency and phonological similarity in word recognition (Magnuson, 2003). We report results from two artificial lexicon studies (with a third in progress) that track the emergence of frequency and density effects in naming and recognition during word learning.

Subjects learned to name novel pictures using CVCV words from an artificial lexicon during 75-minute sessions on 5 consecutive days. Frequency distributions and phonological similarity relations were built into the lexicon: 12 high- and 12 low-frequency words, 12 high- and 12 low-density words. In the first study, subjects were tested on their ability to name pictures in isolation at the end of each day. In the second study, subjects were also tested on a 4AFC word recognition task. In an ongoing study, subjects name and identify pictures in identical 4-picture displays. We measure error rates, naming latencies, decision latencies, and eye movements. We use mixed-effects models with subject, word, and image as random factors, and report results of χ^2 -tests on factor removal.

In naming and recognition, frequency effects emerge early in training and diminish over time. This holds true for all dependent measures: LF words initially show higher error rates, longer naming latencies, and slower recognition performance (all $p < .05$). These differences lessen over the course of training (e.g. sess. x freq. prod. err.: $p < .05$). Neighborhood density does not affect error rates in production or comprehension (all $p > .5$), but temporal measures differ. Density effects in naming stay constant over training (sess. x dens.: both $p > .6$), but they increase in recognition. RTs show that density effects increase with training ($p < .05$), and eye-tracking results trend in the correct direction (analysis in progress).

Experience with a word strengthens its representation. Common frequency effects show that experience benefits both production and comprehension. In contrast, neighborhood density effects strengthen over time in recognition but don’t change in naming. Frequency and density interact differently in production and comprehension, suggesting differing roles for phonological similarity across modalities. We explore current theories of lexical representation and access in light of these data.