

Exploring systematicity in the developing lexicon with phonological networks.

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Infants' early words are phonologically similar (Vihman, 2016). Deuchar and Quay (2000) show that 13/20 of a bilingual (English-Spanish) child's first words are produced with a CV structure, and many are identical: *car*, *clock*, *casa* 'house' and *cat* are produced as /ka/, and *papa* 'daddy', *pájaro* 'bird' and *panda* as /pa/. Infants may produce newly-acquired words in a systematic way, drawing on what they already know in development to further advance their phonological/lexical knowledge and articulatory skills. This would help them deal with the combined challenges of memory, planning and articulation in early phonological development.

Network analysis can account for systematicity in early phonological acquisition, whereby similarity between forms determines their connectivity within a network. If early phonological development is indeed led by systematic production, as the above example suggests, then we would expect the early network to show tight clusters of similar-sounding forms. This hypothesis can be tested via two models of network growth: preferential attachment (PAT; an internally-driven network where new words resemble the most well-connected forms in the existing network) and preferential acquisition (PAQ; an externally-driven network where acquisition reflects the connectivity of the target language, in this case the input, Hills et al., 2009). Previous studies have tested connectivity between *target forms* (i.e. adult target productions) of vocabulary norm data, with mixed results (Fourtassi et al., 2020; Siew & Vitevitch, 2020). In this study, I draw on naturalistic data to test infants' *actual productions* of early words, to identify whether developing phonological networks are driven by PAT- or PAQ-like growth. I propose that PAT offers a more plausible model for phonological development, given that infants tend to adapt early words to fit established production routines (Vihman, 2019), and thus new words are likely to resemble existing words in the network.

I analyze early phonological networks (constituting >1.6 million unique connections) from 9 infants (4 males; Demuth et al., 2006; Demuth & Tremblay, 2008) between 0;11 to 2;6. Phonological distance between each word and each other word in each child's data was computed to establish networks of infant productions using Euclidean distance (see Monaghan et al., 2010), to generate network growth values that represent PAT- and PAQ-like network growth (see Siew & Vitevitch, 2020 for full outline of network growth values). Results show that infants draw on what they already know in early production: logistic regression models with word learning in the following month as a dependent variable (was the word learned: yes or no) showed that PAT growth values, but not PAQ, predicted whether or not a word was learnt in the following month ($\chi^2(2)=11.29$, $p<.01$) when frequency in the input and word length in phonemes were controlled for. There was no interaction with age ($p>.5$), suggesting that this is not only an effect of very early learning, but is retained across the first two years of word production.

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