Recursive patterns of phonological change in the lexicon

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When children begin acquiring a new sound, they often produce the sound correctly in some words, but not others. The resultant gradual process of sound change, known as lexical diffusion, raises an interesting question of why some words appear to be more susceptible to change than others. Recent investigations in acquisition have linked sound change to the lexical characteristics of words, e.g., word frequency, neighborhood density, age of acquisition, grammatical category (Gierut & Storkel, 2002; Morrisette, 1999; Tyler & Edwards, 1993). This paper reports findings from 2 studies that reveal that sound change follows a cyclic pattern, being implemented recursively in words of high then low frequency.

The purpose of the first investigation was to cross-sectionally examine the course of sound change for 20 preschool children in the process of acquiring coronal and velar stop consonants. Importantly, children were at different stages in the process of acquiring the stops. That is, some children produced the stops accurately in only a few words that were sampled, whereas other children produced the stops accurately in many words that were sampled. Rank ordering the children on the basis of the number of words with accurate stop productions provided a continuum of learning for these sounds. For each child along the continuum, the average frequency of words produced accurately with the target stops was then calculated and compared to the average frequency of words produced inaccurately. Results revealed that as children progressed from accurate productions in few to many words, they alternated between changing high and low frequency words in the lexicon.

The purpose of the second investigation was to validate this recursive pattern of sound change in words longitudinally for 2 preschool children acquiring velar stop consonants. These 2 children’s productions of velar stops were sampled approximately every 2 weeks over the course of 3 months. The average frequency of words produced accurately with the target velars was calculated and compared to the average frequency of words produced inaccurately at each point in time. Results from this longitudinal investigation supported findings from the cross-sectional investigation. Both children acquired the velar stops by alternating between high and low frequency words across time. What differed across children was the start of the recursive cycle. One child evidenced change first in relatively high frequency words, while the other children evidenced change first in relatively low frequency words. Nonetheless, the recursive alternation between change in high and then low frequency words was uniformly predictable.

While the role of cyclicity is novel to the study of sound change in words, similar cyclicity effects have been documented for featural development in both normal and disordered phonological acquisition (e.g., Gierut, 1996; Gierut & O’Connor, 2002; Ingram, 1990), as well as in other areas of development (Smith & Thelen, 1993). A parallel distributed processing framework (Smolensky, 1987) holds promise in accounting for these results. In particular, it is argued here that children strive to achieve harmony in the lexicon by selecting words of alternating frequencies to undergo sound change. As high frequency words in the lexicon are activated in sound change, the child then strives for lexical harmony by activating low frequency words. Once low frequency words are activated for change, the child then seeks the reverse activation of high frequency words. The result is a recursive pattern of sound change in words of the lexicon.
References