

Individual differences in production and perception of nasal coarticulation: implications for sound change

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Producing and perceiving speech are fundamentally distinct processes: they employ different parts of human anatomy and involve autonomous mechanical actions. Yet, at the cognitive level, production and perception must utilize (at least some of) the same representational structures in order for communication to be successful—a perception-production link. The role of an individual's perception-production linkage in influencing sound change is the focus of the current study.

The 'misparising' of coarticulation as signifying a phonological feature has been long discussed as an avenue for phonetic-to-phonological change (Ohala, 1993). For example, a VN utterance produced with overlapping nasalization on the vowel might be misheard by a listener as an underlying nasal vowel, triggering sound reanalysis. Synchronic experimental evidence of partial perceptual compensation for coarticulation supports this possibility: while coarticulatory properties are factored out by the perceptual system, some of the acoustic effects of coarticulation remain perceptible (Beddor & Krakow, 1999). We aim address the question of what type of listener is prone to partial compensation and, hence, more likely to encode vowel nasality in English.

In the current study, we explore correlations between individual differences in the production of nasal coarticulation and patterns of partial perceptual compensation in American English. Oral vowels (from C_C contexts), nasal vowels (from C_N contexts), and hypernasal vowels (from N_N contexts) were cross-spliced into C_C, C_N, and N_N words. Word pairs were presented to listeners in a paired discrimination task, where similarity of vowels was assessed, and a ratings task, where relative nasality of vowels was judged. In the discrimination task, variation in individuals' production of nasal coarticulation predicted patterns of partial perceptual compensation: Individuals who produce less extensive nasal coarticulation exhibit failure to compensate; put differently, they are more prone to accurately hearing phonetic properties of coarticulated vowels. Individuals who produce more extensive nasal coarticulation were more likely to compensate fully, hearing nasalized vowels in context as equivalent to oral vowels. However, in the ratings task, listeners' failure to compensate was observed overall in context-inappropriate nasalization conditions (e.g., hypernasal vowels in C_N).

The results of this study suggest a connection, though capricious, between representations used to produce and perceive speech. Taken together, the current findings indicate that task matters in whether listener-specific factors or sub-allophonic patterns trigger incomplete compensation. The discrimination results suggest that more implicit and sensitive perceptual processes recruit greater use of listeners' idiosyncratic gestural structures; meanwhile, the ratings results suggest that metalinguistic judgments about vowel properties recruit greater use of phonetic pattern speech-community norms. This suggests that speech representations are rich and complex enough to synthesize individuals' idiosyncratic articulatory structures and more generalized, across-speaker phonetic patterns.

The finding of individual differences in phonetic representations correlating to patterns of partial compensation has potential implications for the study of sound change. Idiosyncratic phonetic representations influence how nasal coarticulation is produced and phonetically perceived. This has the potential to generate hypotheses about individual differences in phonetic-to-phonological reanalyses (e.g., Ohala, 1993)—for example, listeners who are themselves hypocarticulators are potentially more likely to phonologize nasal coarticulation.