Chain Shifts and Transphonologizations are Driven by Homophony Avoidance

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Loss of a phoneme contrast through merger is significantly associated with a low degree of resulting word-level homophony [1,2]. For example, there are very few English words distinguished by the two low-back vowels /ɑ/ as in 'cot', and /ɔ/ as in 'caught', and this vowel contrast has merged in many dialects of North American English. In contrast, phonemes that do not merge are characterized by a greater number of such 'minimal pairs', that is, words that would become homophonous if the phonemes were to merge. In these previous studies, homophony avoidance was associated with *lack* of change. Here, we show that homophony avoidance also appears to drive two superficially distinct, *active* sound changes: chain shifts and transphonologizations.

Chain shifts occur when a set of phonemes move in concert within phonetic space. For example, the front vowels in New Zealand English have undergone a chain shift upwards, such that the vowel /æ/ in 'pat' has raised to /ɛ/, and the original /ɛ/ in 'pet' has raised to /e/ [3,4]. **Transphonologizations**, on the other hand, occur when the primary cue distinguishing two phonemes merges, while a minor cue expands in concert to become the primary cue. For example, aspirated and lenis stops in Korean are historically distinguished by a voice-onset-time (VOT) difference, with a minor distinction in f0 on the following vowel. In modern Seoul Korean, this VOT difference is collapsing, while the f0 difference has expanded to become the primary cue, e.g. [pʰal] 'arm' vs. [pal] 'foot' → [pál] vs. [pàl] [5,6]. These two superficially distinct classes of sound change have in common that phonemic and lexical contrast is maintained throughout the change: in a chain shift, one phoneme moves into the space occupied by another, which concomitantly shifts away into a neighboring part of the phonetic space. In a transphonologization, one cue to a phoneme contrast merges, while at the same time another cue to the same contrast expands.

We show that while phoneme mergers are characterized by a low number of minimal pairs (and therefore low numbers of resulting homophones), chain shifts and transphonologizations are characterized by especially high numbers of minimal pairs. Our dataset comprises phonemically transcribed corpora from a genetically and areally diverse set of twelve languages which have undergone historically recent mergers, chain shifts and transphonologizations– Cantonese, Dutch, American English, British English, French, German, Icelandic, Korean, Slovak, Spanish, Turkish, and Vietnamese. We identified the number of minimal pairs distinguished by each phoneme contrast participating in a change, as well the number of minimal pairs associated with a comparison set of similar contrasts that have not participated in a change. We modeled these minimal pair counts using a Bayesian zero-inflated Poisson regression, with change type ('Merged' vs. 'Shifted/Transphonologized' vs. 'No Change') as a fixed-effect predictor and random intercepts for each language. Relative to the distribution of minimal pairs of non-changing phoneme contrasts, we find that mergers, as shown previously, are drawn significantly from the lower end of this distribution. Conversely, we find that contrasts that have undergone chain-shifts and transphonologizations are drawn significantly from the higher end of this distribution (Figure 1).

These findings are consistent with computational work showing that category shift in one phonetic dimension (e.g., chain shifts) and category shift across multiple phonetic dimensions (e.g., transphonologizations), can be driven by the same mechanism [7]. More broadly, these findings provide support for usage-based theories of change in which information-theoretic factors like homophony avoidance play a fundamental role in shaping languages' sound systems over time [8-11].

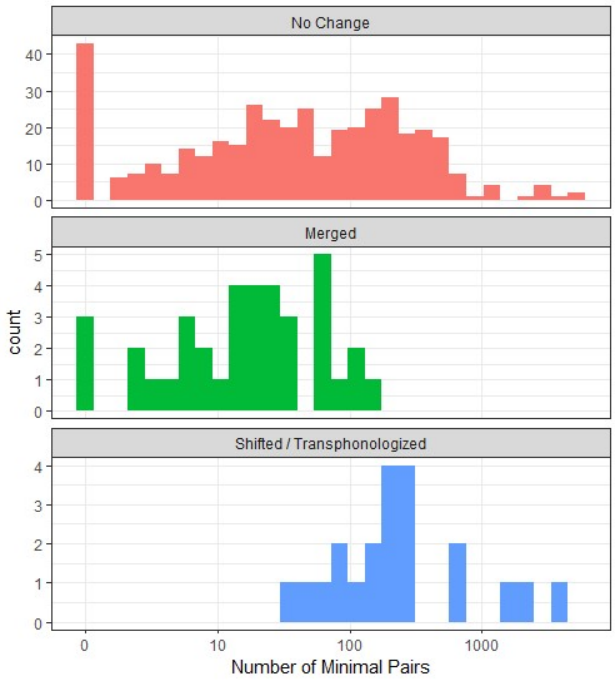

Fig. 1. Comparison of minimal pair counts for each sound change category.

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