Perceptual Differences Between Indo-European and Sinitic Language Speakers: A Gating Experiment

This study investigates cross-linguistic perceptual differences through a gating experiment on final stops. Participants included 20 native speakers of French, 19 of Dutch, and 18 of Polish, along with 82 native speakers of Taiwanese Southern Min. However, only 18 Taiwanese Southern Min participants passed a pre-test and were included in the main experiment. The stimuli consisted of naturally produced Taiwan Southern Min (TSM) CVC syllables, with manipulation applied to the vowel duration (VC) through gating: full vowel duration (unaltered), and vowels gated by removing the final 25 ms or 50 ms. Participants were asked to identify which stop coda they heard: [p], [t], [k], or [ʔ].

Results, analyzed using a mixed-effects model with accuracy as the dependent variable, revealed that native speakers of TSM performed significantly worse than speakers of Indo-European languages across the Germanic (Dutch), Romance (French), and Slavic (Polish) language families. Among the TSM group, accuracy at the -50 ms gating condition was significantly lower than in the full and -25 ms conditions. In contrast, Indo-European speakers showed a significant drop in accuracy only at -25 ms compared to the full condition.

The lower performance of TSM speakers can be attributed to the typological constraints of Sinitic languages, which strictly segment syllables into onset and rhyme and rarely utilize codas for phonemic contrasts. This structural tendency, traceable to phonological traditions dating back to Tang dynasty dictionaries, suggests that native speakers treat the rhyme as the primary perceptual unit. Consequently, the task of distinguishing between non-functional coda categories (e.g., contrasting stop codas) posed significant challenges for these speakers.

Furthermore, TSM participants appeared not to rely on the second formant (F2) as a cue for stop coda identification. Instead, they attempted to match the perceived acoustic patterns to a limited set of familiar syllabic templates based on prior experience. Overall, these findings support the conclusion that language-specific phonological constraints play a critical role in shaping perceptual performance, particularly when universal phonetic features co-occur with language-specific limitations. This accounts for the significantly lower identification accuracy observed in the TSM group compared to Indo-European language speakers.