

Vowel Chain Shifts and Local Coarticulatory Compression Across Korean Dialects

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Under competing pressures to preserve contrast, enhance perceptual dispersion, and maintain structural symmetry, vowel systems are systematically shaped [1–4]. When a vowel begins to shift, adjacent vowels often respond in coordinated ways, yielding the covariation characteristic of chain shifts [5,6]. Such reorganizations arise through phonetic pathways, whereby structured articulatory and acoustic variation becomes available for listener reinterpretation, with covariation signaling system-level recalibration of contrast relations [7,8]. Low-level variation from coarticulation and contextual perturbation provides raw material for this process [9,10], and when such patterns are treated as stable targets, phonological restructuring may emerge [3,10]. Identifying which forms of phonetic variation are sufficiently systematic to contribute to sound change remains a challenge. Korean provides a testing ground. Seoul Korean exhibits a fronting chain shift involving /o, u, i/ [11–12], whereas North Kyungsang Korean (NKK), despite sharing the vowel inventory, follows a distinct trajectory that includes a re-splitting of /i/ and /Λ/ [13]. These differences motivate the present study, which asks which phonetic patterns—particularly those enhanced in isolation and modulated by dialect, age, and gender—reveal the pressures driving system-wide vowel reorganization, and how consonant–vowel coarticulatory effects further shape these patterns.

Productions from 66 speakers of Seoul and NKK Korean were analyzed (20s Seoul F:12, M:12; 20s NKK F:12, M:12; 50s Seoul F:12, NKK F:6; 50s males not available) [14]. Speakers produced eight monophthongs in isolation and in CV syllables with four bilabial onsets (/m, p, p^h, p^{*}/), yielding 5,267 tokens. Acoustic measurements were obtained in Praat [15], with z-scored F1 and F2 values. Dialectal, age, and gender effects were assessed using vowel-space geometry from z-scored F1–F2, dispersion measured via Vowel Space Area (VSA; Gauss/Shoelace formula) with front/back subpolygons defined by the /i/–/a/ axis, and MANOVA Pillai scores for five vowel-pair contrasts (/u–o/, /o–Λ/, /i–Λ/, /i–u/, /e–ε/) across conditions.

Vowel spaces and front/back subpolygons are shown in Fig. 1. The most advanced configuration appears in Seoul speakers in their 20s, particularly females (Fig. 1a–a'), exhibiting a restructured front–back alignment consistent with an ongoing chain shift: /o/ is raised, /u/ advances frontward, and /i/ fronts further. Similar but less advanced patterns are found for NKK females in their 20s (Fig. 1d–d') and Seoul males in their 20s (Fig. 1b–b'). In contrast, females in their 50s from both dialects (Fig. 1c–c'; 1f–f') retain a more retracted /i/ and /u/ and a less raised /o/, yielding a compact back-vowel subpolygon and reduced dispersion relative to younger groups (VSA; $\beta = 1.20$, $p < .001$). Figure 1 also shows backing of /a/ in 20s speakers, whereas 50s speakers cluster near zero on F2, indicating that reorganization extends beyond the mid–high subsystem. Coarticulatory effects further modulate these patterns: in bilabial contexts, 50s speakers show convergence of /u/ and /o/ and a shift of /i/ toward /u/ (Fig. 1c', 1f'), aligning with reduced Pillai scores (Fig. 2c) and smaller back-vowel subpolygons in CV contexts ($\beta = 0.39$, $p < .001$).

Overall, Korean back vowels reorganize as an integrated system rather than shifting independently. Younger speakers in both dialects converge on a similar /o–u–i/ fronting chain extending to /a/, whereas older speakers maintain a compact, retracted subsystem. This pattern reflects phonetic pressures toward dispersion and contrast preservation, structured by dialect, age, and gender, led by young Seoul females [cf. 8], followed by young NKK females and young males. CV data show that coarticulatory compression reduces vowel distinctiveness in older speakers. We propose that such compression creates pressure for dispersion, to which younger speakers respond by expanding the /o–u–i/ subsystem. Together, these results show how sound change emerges from interactions among dispersion pressures, social structure, and localized coarticulatory dynamics.

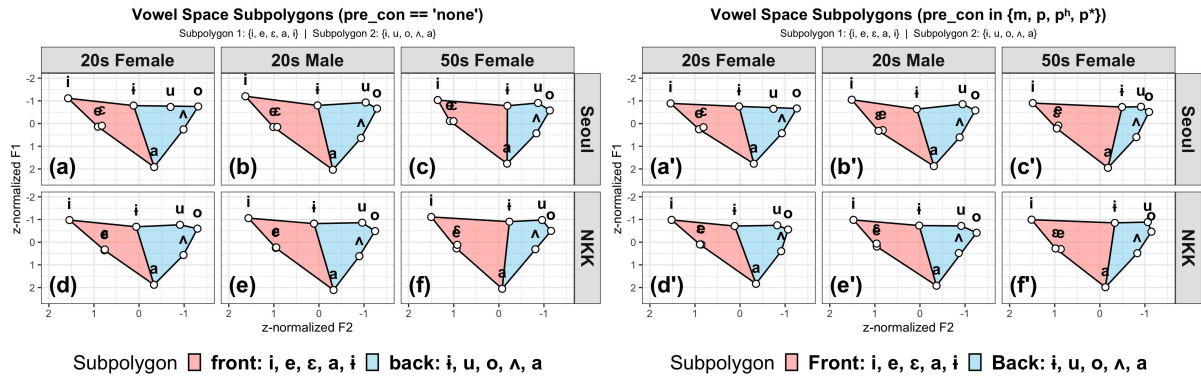


Fig. 1. Vowel-Space subpolygons for Seoul and NKK Speakers across Age, Gender, and Consonant Contexts

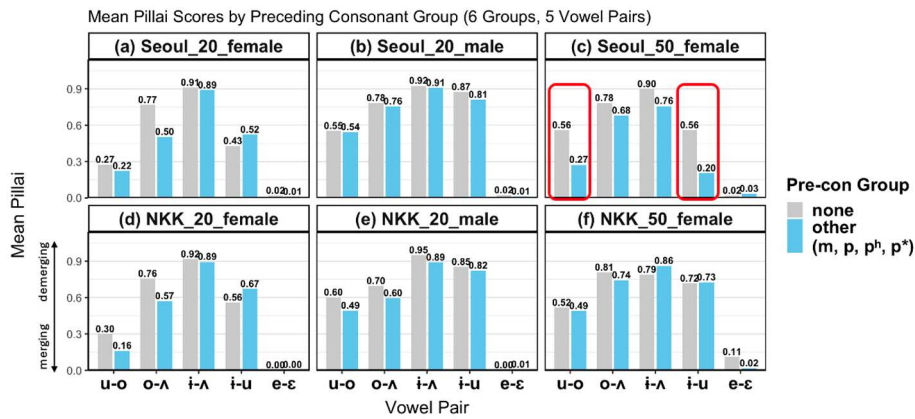


Fig. 2. Pillai scores from MANOVAs on F1 and F2 for five vowel pairs across Seoul and NKK speakers, shown by Age, Gender, and Consonant Context. Note that all vowel pairs show *significant separability* except /e–ε/ which exhibits complete overlap across all groups.

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