

Articulatory Characteristics of Word-Initial Liquids in Korean Loanwords: Evidence from Ultrasound Tongue Imaging

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This study investigates the articulatory properties of word-initial liquids in Korean loanwords using ultrasound tongue imaging of the tongue tip movement. While Korean word initial liquids are not allowed in Korean, the growing number of loanwords from languages such as English has introduced word-initial liquids that do not undergo these phonological processes. This development raises questions about the phonetic and phonological status of word-initial liquids in contemporary Korean.

Previous studies have approached this issue primarily through individual perception of word-initial liquids (Chae, 2002; Lee, 1996) or indirect acoustic evidence (Cho, 2014), leading to mixed claims that word-initial liquids are realized either as a flap or clear-[l], or in free variation. However, these accounts relied largely on researchers' intuition or qualitative visual inspection of spectrograms, a methodologically limited approach in light of the weak and unstable acoustic cues of approximants.

To address these limitations, the present study investigates the articulatory properties of word-initial liquids using ultrasound tongue imaging. Twenty-one native Korean speakers produced thirty-six loanwords with word-initial liquids, along with sixteen word-medial intervocalic and sixteen word-medial coda liquids. The target items were randomized and embedded in a carrier sentence '_____ tanato na-a teusejo.' meaning 'Please also include the word _____. ' To minimize coarticulatory effects with the preceding vowels, the stimuli were elicited in sentence-initial position.

Participants produced a list of the sentences while an ultrasound probe was stabilized under the jaw; Articulate Assistant Advanced (AAA; Articulate Instruments Ltd., 2012) captured synchronized audio and ultrasound video. Recorded audio files in WAV format were exported from AAA to generate annotations and forced-aligned using the Montreal Forced Aligner (MFA; McAuliffe et al., 2017). Annotated TextGrid files were subsequently imported into AAA for further analysis. The tongue splines were fitted using DeepLabCut (DLC), a deep-learning-based algorithm, and an M-mode-inspired coordinate system was developed to analyze tongue-tip movement over time.

Generalized Additive Mixed Models were used to analyze horizontal and vertical tongue-tip trajectories, and duration was examined using linear mixed-effects models. The results revealed systematic articulatory differences across positions as shown in Figures 1 and 2: word-initial liquids were produced with a more fronted and higher tongue-tip position than word-medial or coda liquids, while word-medial intervocalic liquids exhibited the most retracted and lowest tongue-tip position. Duration patterns further distinguished the three positions: coda /l/ exhibited the longest duration, followed by word-initial /l/, whereas intervocalic /l/ was the shortest (all $p < .05$).

These findings indicate that word-initial liquids in Korean loanwords exhibit a distinct articulatory profile, suggesting that they constitute an independent allophonic variant rather than a simple extension of existing intervocalic or coda realizations. The results provide articulatory evidence for the emergence of a novel phonetic category in the Korean liquid system driven by loanword adaptation.

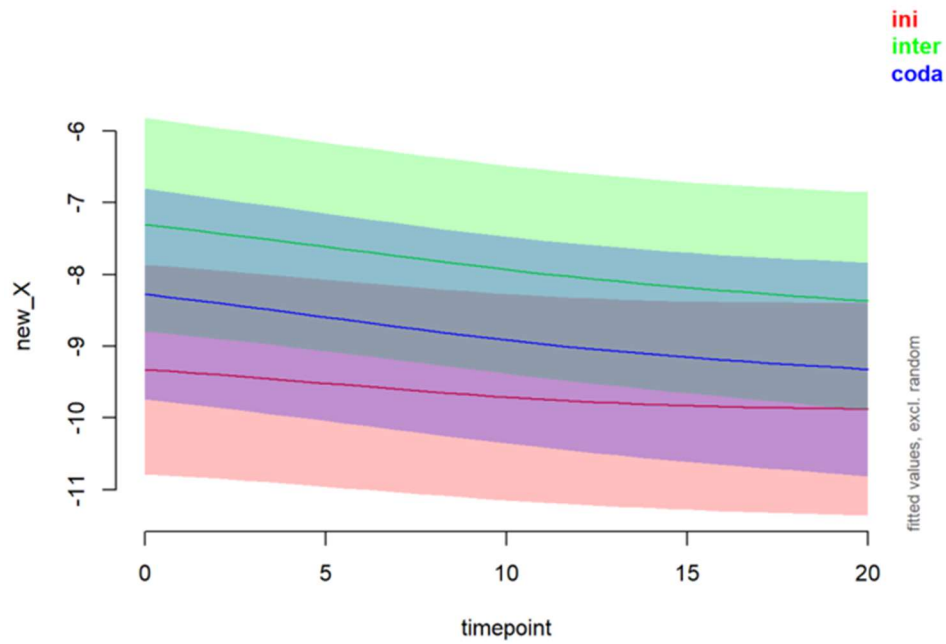


Fig. 1. Fitted graph of the X-coordinate model across three positions.

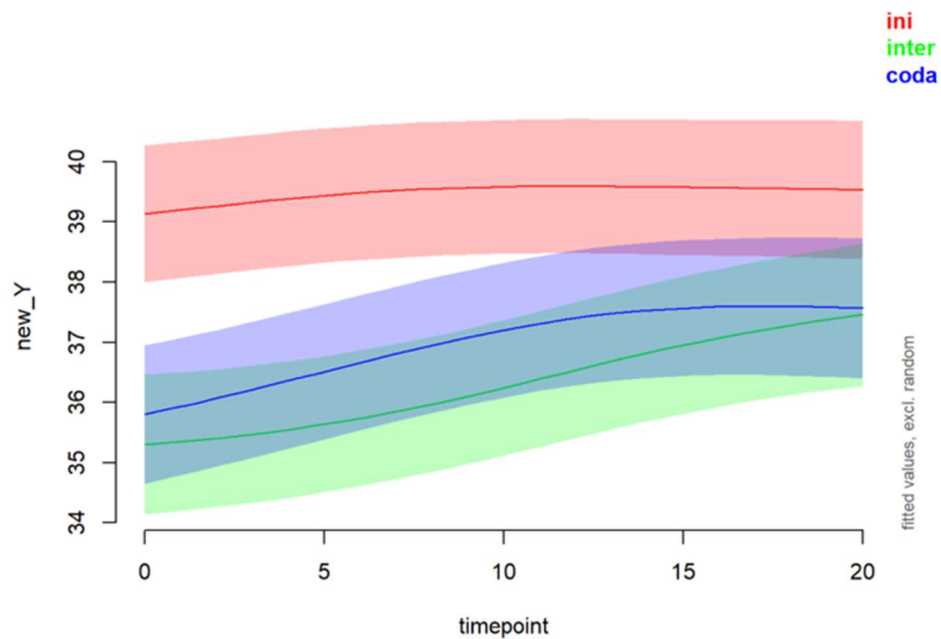


Fig. 2. Fitted graph of the Y-coordinate model across three positions

References

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