Velum-oral timing and its variability in Korean nasal consonants

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INTRODUCTION

Studies on intergestural timing provides an opportunity to understand not only the coordination patterns [1, 2] but also the flexibility of these coordination [3, 4].

For example for within-segment intergestural timing, largely fixed timing relations are exhibited across contextual variations due to its tight coupling structures. But...

For within-segment timing variability, will the variability change as a function of syllable position or will it remain stable due to the relatively fixed within-segment timing relations?

To investigate this, we examine timing variability across prosodic modulations in multi-gestural segments, focusing on velum and oral gestures in Seoul Korean nasal sequences.

METHODS

Centroid

Data acquisition

Real-time Magnetic Resonance Imaging speech production data of the midsagittal vocal tract (temporal resolution: 12ms/frame)

Subjects

Five native Seoul Korean speakers¹)

Stimuli

Syllable-onset nasals (/n#, /n#/p, /n#/t), syllable-coda nasals (/n#/p, /n#/t), & juncture geminate nasals (/n#/n/1) across three boundary/focus conditions (Wd, AP, & AP+focus; 7/8 reps each)

Data analysis

Velum (VEL): Velum centroid tracking analysis [5]

Tongue Tip (TT): Region-of-interest image sequence analysis [6]

Measurements

Onset lag: the interval from the VEL lowering onset to the TT onset

O-R lag: the interval from TT onset to VEL raising onset (≈ articulatory duration of consonant nasalization)

Statistical testing

Linear mixed effects models for mean lags, and Coefficients of Variation (CoV) [7] using modified signed-likelihood ratio test [8] for comparing variances.

¹) Out of five total subjects, one speaker’s data are omitted due to a lack of quantifiable VEL gestures in onset nasals (/n#/n/1).

RESULTS

Onset lags: onset nasals = coda nasals = geminate nasals

- The positive lag indicates that VEL precedes TT

Greater timing variability in the onset nasals

- CoV: onset /n/ > coda /n/p/ > coda /n/t/ & /n#/n/

O-R lags: onset nasals (near-zero) < coda & geminate nasals

- A near-zero O-R lag is indicative of almost no consonant nasality

Greater timing variability in the onset nasals

- CoV: onset /n/ > coda /n/#p/ > coda /n/#t/ & /n#/n/

CONCLUSION

This study reveals articulatory grounding for phonological phenomena commonly observed in Korean such as onset denasalization or nasal weakening [9, 10].

- Korean onset nasals have a shorter duration of nasality than the coda nasals and are associated with greater variability.

In sum, intergestural timing is not merely a matter of contextual overlap, but rather syllable structure and variability in coupling relations are intrinsic to the representational specification for these segment-sized gestural molecules.

References


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