Onset Effects on a Tautosyllabic Vowel: Implications for Weight

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INTRODUCTION

- It has been claimed that onsets, in addition to rimes, contribute to syllable weight [1, 2, 3].
  - Previous studies have examined the effects of onset size and/or voicing [2, 3].
  - Gordon [3] observed that syllables with less sonorous (voiceless) onsets are **heavier** than more sonorous (voiced) ones by calculating perceptual energy from changes in intensity over time.
- This study investigates the effect of onset sonority on acoustics of the tautosyllabic vowel, specifically pitch and duration.
- If vowels with less sonorous onsets have **higher pitch** and **longer duration**, this would implies that vowels with a low sonority onset may have **heavier weight** than those with a high sonority onset.
- Data from languages both with and without lexical stress systems–English and Korean–are examined to compare onset effect.

METHODS

Participants
14 native English speakers & 20 native Korean speakers (balanced for gender)

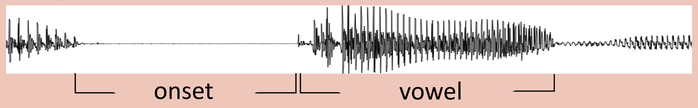
Materials
6 onsets for English and for Korean with different levels of **sonority**

English: /t, s, d, v, n, l/ Korean: /t^{h}, t*, t, č, s, n/ (lowest to highest)

- Target English onsets are placed initially in a bi-syllabic word with initial stress. For Korean, target onsets initiate a tri-syllabic word.
- Onsets occur in an open syllable and in syllables closed with a nasal coda and a stop coda.
- 3 tokens of each onset were recorded.

Measurements
- **Pitch:** Mean pitch value during the tautosyllabic vowel
- **Vowel duration:**
  - For syllables with non-stop onsets, from the beginning of vocalic voicing to the end of vocalic voicing
  - For syllables with stop onsets, from the release of the stop closure to the end of vocalic voicing

e.g. [t*a]



RESULT I - PITCH

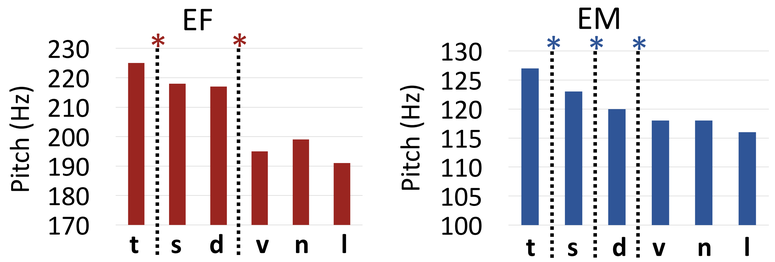


Figure 1. *English female speakers (EF; left) and English male speakers' (EM; right) mean F0 from lowest to highest onset sonority*

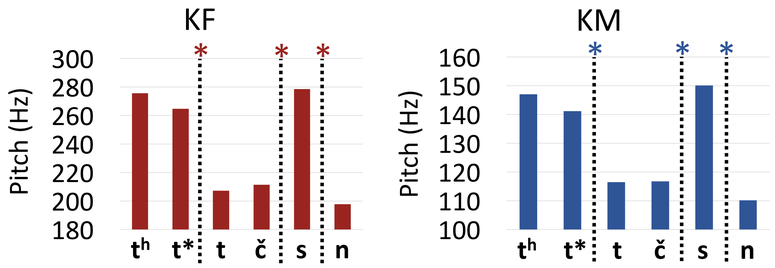


Figure 2. *Korean female speakers (KF; left) and Korean male speakers' (KM; right) mean F0 in syllables with varying onset sonority*

↑ Increasing sonority of the onset is accompanied by **a decrease in mean pitch values**

English: **t > s > d > v,n,l**; Korean: tense/aspirated (**t^{h}, t*, s$^{(h)}$**) > lenis (**t, č, n**)

RESULT II – VOWEL DURATION

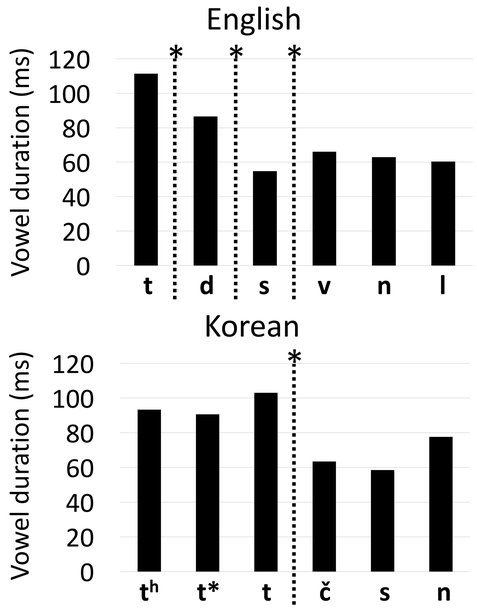


Figure 3. *Mean vowel duration for English speakers*

← Syllables with less sonorous onsets have **longer vowel duration** except for /s/

t > d > (v,n,l) > s

Figure 4. *Mean vowel duration for Korean speakers*

← Syllables with stop onsets have **longer vowel duration** than other onsets

(t^{h}, t*, t) > (č, s, n)

DISCUSSION

- As predicted, syllables with less sonorous onsets have **higher pitch** and **longer vowel duration** in general.
- English pitch **(high to low)**: voiceless stop onsets > voiceless fricatives > voiced stops > voiced fricatives & sonorants
- Korean: tense & aspirated onsets + /s/ **(high pitch)** vs. lenis **(low pitch)** stop onsets **(long vowel duration)** vs. non-stop onsets **(short)**
- In English, onset /t/ had **a longest tautosyllabic vowel** followed by /d/, /v, n, l/, and /s/, respectively, in both open and closed syllables.
- Why does onset /s/ have an exceptionally short tautosyllabic vowel?

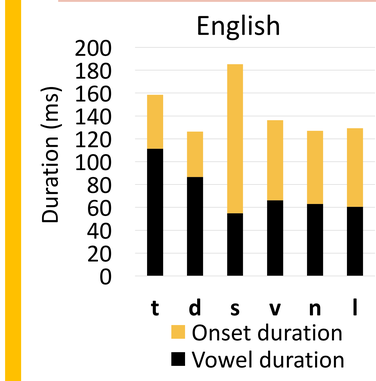


Figure 5. *Mean onset duration and vowel duration in English*

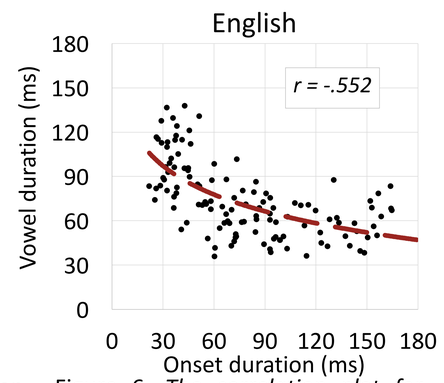


Figure 6. *The correlation plot for onset duration and vowel duration*

↑ Shorter duration of the onset is compensated by **longer duration of a tautosyllabic vowel**

CONCLUSION

- Onset duration and vowel duration stand in a compensatory relationship.
  - → This can be further explored with articulatory measurements of timing and duration of onsets and vowels.
- Although the rimes are traditionally the most important contributors to syllable weight, the results show that onset sonority can affect the nuclear vowel's **pitch and duration** in a systematic way.
- The findings imply that phonological weight, and consequently processes sensitive to weight such as stress, may be influenced by the relation of onsets and their tautosyllabic vowels.

References

[1] Davis, S. (1988). Syllable onsets as a factor in stress rules. *Phonology, 5*(1), 1-19. [2] Gordon, M. (2005). A perceptually-driven account of onset-sensitive stress. *Natural Language & Linguistic Theory, 23*(3), 595-653. [3] Ryan, Kevin M. 2014. Onsets contribute to syllable weight: Statistical evidence from stress and meter. *Language, 90*(2), 309–341.