4aSCb20 Durational and spectral factors in judgements of American Raising

ASA/CAA, 2024.05.16 | *Elliott Moreton (UNC-Chapel Hill), Jeff Lamontagne (Indiana U.), Monica Nesbitt (Indiana U.)* | Ottawa

Big Question: How do phonological processes acquire **non-surface** conditioning over time?

Local Question: /ai/-Raising can respond to **underlying** voicing of flapped /t/ (un-Raised *rider* vs. Raised *writer*) from the earliest stages (Fruehwald, 2016). How so, if it is phonologized from a **purely phonetic** precursor?

One proposal: Pre-existing stem-level Clipping shortens *all pre-voiceless vowels*; phonetic /ai/-Raising then applies *only to shortened /ai/* (Bermúdez-Otero, 2019):

		ride	*write*	*rider*	*writer*
UR		ɹaɪd	ɹaɪt	ɹaɪd-ə ɹ	ɹaɪt-ə ɹ
Stem	Clipping	—	ɹ̆aɪt	—	ɹ̆aɪt
Word		—	—	ɹaɪdə ɹ	ɹ̆aɪtə ɹ
Phrase	Flapping	—	—	ɹaɪɾə ɹ	ɹ̆aɪɾə ɹ
Phonetics	/ai/-Raising	—	ɹ̆ʌɪt	—	ɹ̆ʌɪɾə ɹ
SR		ɹaɪd	ɹ̆ʌɪt	ɹaɪɾə ɹ	ɹ̆ʌɪɾə ɹ

I.e., in incipient Raising, **the phonological category is determined by Clipping, which applies to all vowels, not by /ai/-Raising.**

⇒ Across varieties at different stages of phonologization,

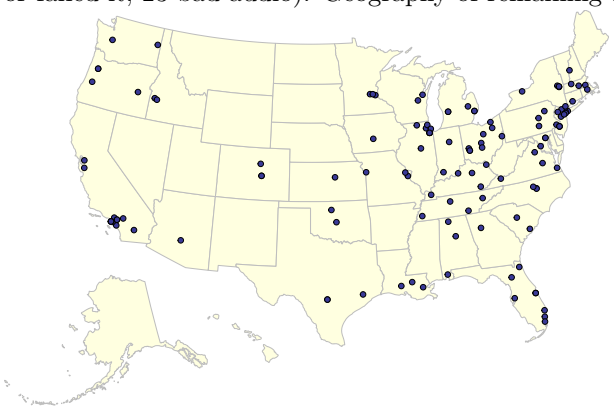
▶*Hyp. 1*: /ai/-Raising implies /ai/-Clipping. NO

▶*Hyp. 2*: Phonological category judgements of /ai/ are at least as well predicted by Clipping as by Raising. NO

▶*Hyp. 3*: Phonological category judgements of /ei/ and /ai/ are positively correlated. YES

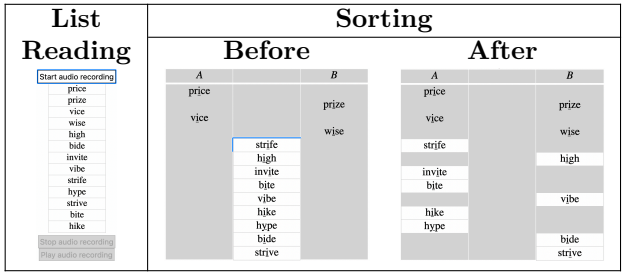
Experiment: Reading and sorting of /ai/ and /ei/

Participants: Recruited via Prolific Academic across the U.S. to sample varieties at different stages of phonologization. 201 finished; 75 were excluded (52 skipped practice or failed it; 23 bad audio). Geography of remaining 126:

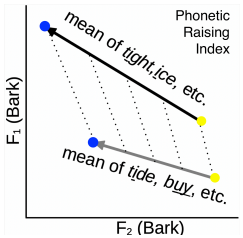


Stimuli: Monomorphemic monosyllables. Each list was **all /ai/** (25 words) or **all /ei/** (18 words).

Tasks: Read aloud, then sort into groups judged to share vowel with (non-rhyming) guide words (Di Paolo and Faber, 1990).



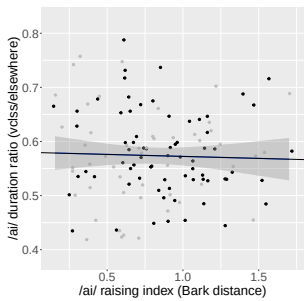
▶**Raising Index**: Mean absolute Bark distance between corresponding time points in pre-voiceless vs. elsewhere (bigger = more Raising). *See figure* ⟶ Detects both Canadian Raising and Southern Glide Weakening.



▶**Duration Ratio**: Mean pre-voiceless duration / mean elsewhere duration (smaller = more Clipping)

▶**Sorting Index**: Agreement between sort response and Raising rule (+1 = pre-voiceless always sorted with *write*, others with *ride*; 0 = random sorting, −1 = reversed).

Hyp. 1: /ai/-Raising implies /ai/-Clipping. NO. There is no correlation.



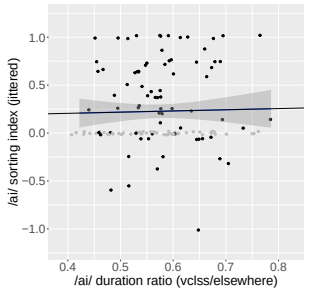
Linear regression:

▶Predicted: slope < 0

▶Observed: slope $= -0.007$, s.e. $= 0.021$, $p = 0.72$, ($R^2 = 0.001$)

▶(Gray points are from participants who left all words in the center column. They were included in regression.)

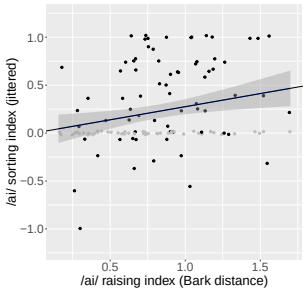
Hyp. 2: /ai/-sorting predicted by /ai/-Clipping at least as well as by /ai/-Raising. NO. The reverse is true.



▶Predicted: slope < 0

▶Observed: slope $= 0.12$, s.e. $= 0.44$ ($R^2 = 0.77$)

▶Clipping doesn't predict /ai/-sorting at all, nor /ei/-sorting (not shown.)

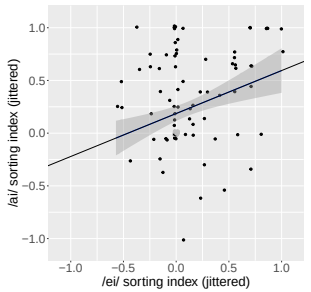


▶Predicted: slope > 0

▶Observed: slope $= 0.27$, s.e. $= 0.10, p = 0.006$ ($R^2 = 0.064$)

▶Post hoc: Mainly due to "±1.0" sorters.

Hyp. 3 /ei/- and /ai/-sorting should correlate. YES.



▶Predicted: slope > 0.

▶Observed: slope $= 0.41$, s.e. $= 0.11$, $p = 0.00043$ ($R^2 = 0.095$).

▶Post hoc: Effect due *entirely* to "±1.0" sorters. Less "1.0" sorting of /ei/ than /ai/ (2 vs. 12, $p = 0.013$).

Discussion

Mixed results for Clipping proposal: Clipping ▶is not a precondition for /ai/-Raising, ▶does not predict /ai/ (or /ei/) sorting, and ▶lacks other properties of a stem-level rule (e.g., lexical exceptions not involving /ai/, late acquisition in L1).

Alternative explanation for Fruehwald (2016)'s Philadelphia results: **Abstract Phonetics Hypothesis**: Abstract conditioning is already present in phonetic precursors **before phonologization**, and can be phonologized along with them. Predicts opaque interaction of Flapping and phonetic /ei/-Raising (e.g., Raised *later*).

Thanks to Kelly Berkson, Stuart Davis, and UNC-CH's P-Side caucus. Supported in part by U.S. NSF BCS 1651105, "Inside phonological learning", to E. Moreton and K. Pertsova.

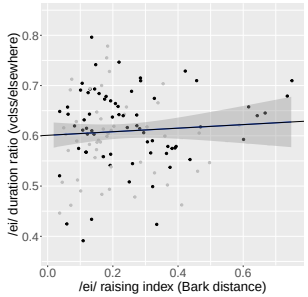
References

Bermúdez-Otero, R. (2019). English /aI-raising: new insights into an old problem. Handout from a talk presented at the IGRA (Interaction of Grammatical Building Blocks) Research Training Group, University of Leipzig, July 19.

Di Paolo, M. and A. Faber (1990). Phonation differences and the phonetic content of the tense-lax contrast in Utah English. *Language Variation and Change 2*, 155–204.

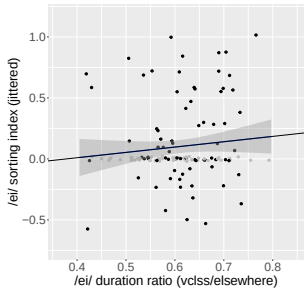
Fruehwald, J. (2016). The early influence of phonology on a phonetic change. *Language 92*(2), 376–410.

Does /ei/-Raising imply /ei/-Clipping? NO

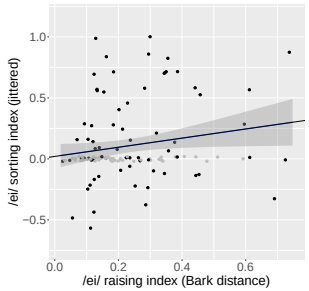


▶slope = 0.03552, s.e. = 0.04736, $p = 0.46$ ($R^2 = 0.0048$)

Is /ei/-sorting better predicted by /ei/-Clipping than by /ei/-Raising? NO

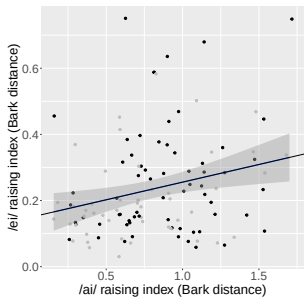


▶Observed: slope = 0.44, s.e. = 0.35, $p = 0.22$ ($R^2 = 0.012$)



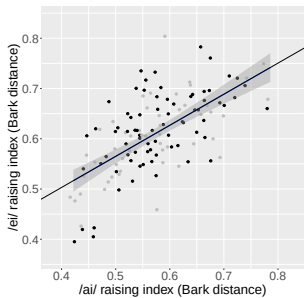
▶Observed: slope = 0.37, s.e. = 0.18, $p = 0.04$ ($R^2 = 0.036$)

Is /ei/-Raising correlated with /ai/-Raising? YES



▶slope = 0.10, s.e. = 0.038, $p = 0.0061$ ($R^2 = 0.065$)

Is /ei/-Clipping correlated with /ai/-Clipping? YES



▶slope = 0.62, s.e. = 0.064, $p < 0.0001$ ($R^2 = 0.4315$)

Does anything change when geographical clumps are removed? NO

As the map shows, some dialect regions were sampled multiple times, with the result that observations were not really independent of each other. To address this problem, we took 1000 bootstrap resamples from the data, subject to the condition that no two participants in the resample were closer than 250 km to each other in terms of the population centroid of the three-digit ZIP code either (a) where they grew up, or (b) where they live now (i.e., both conditions had to be satisfied simultaneously). The two linear models for Hypothesis 2 were fit to each bootstrap resample. The 95% bootstrap confidence intervals for the slopes were

- $[-0.682, 1.633]$ (median 0.447) for Sorting Index as a function of Duration Ratio
- $[0.009, 0.568]$ (median 0.252) for Sorting Index as a function of Raising Index

Please write to us if you know of...

- an English dialect that has pre-voiceless Raising of something other than /ai/ or /au/
- non-/ai/, non-/au/ lexical exceptions to Clipping
- pre-voiceless Raising of any sort in a non-English language

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