Undershoot in Kyrgyz **short vowels** increases with the **articulatory distance** to adjacent consonants.

Undershoot in Kyrgyz Short Vowels is Articulatorily Conditioned

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Background

Undershoot

Occurs when articulators fall short of reaching their target position in a gesture.

- Extremely common
- Conditioned by extra-ling. factors (speech rate)
- Result of decreasing articulatory effort
- Related to coarticulation
- Timing vs. adjacent segments debated

Undershoot in vowel length

- In languages with V̆/V: constrast, V̆ more central
- V: articulations thought of as targets for V̆
- At times minor differences phonologised

Vowel length in Kyrgyz

- Largely unstudied
- Documented C influence on V and vice versa
- Potentially high amounts of undershoot

Methodology

Corpus

- Speakers of Turkish, Kazakh, Kyrgyz
- Indiana University Speech Production Lab
- Philips EPIQ 7 Ultrasound System
- C_1VC_2 stems (mostly); range of C_1 and C_2
- in various morphological forms, from 1σ to 3σ
- 2 carrier sentences, 1 each per stimulus
  Үйгө барып, _____ деп айттым.
  [yjɣœ βaɾɯp _____ deβ ɑjttʰɯm]
  "I went/reached home and said _____."
  Үйгө кирип, _____ деп айттым.
  [yjɣœ ɣiɾip _____ deβ ɑjttʰɯm]
  "I entered the house and said _____."
- sentences randomised, 6 per slide, ~150 slides
- session up to 2 hours, optional breaks

Speaker

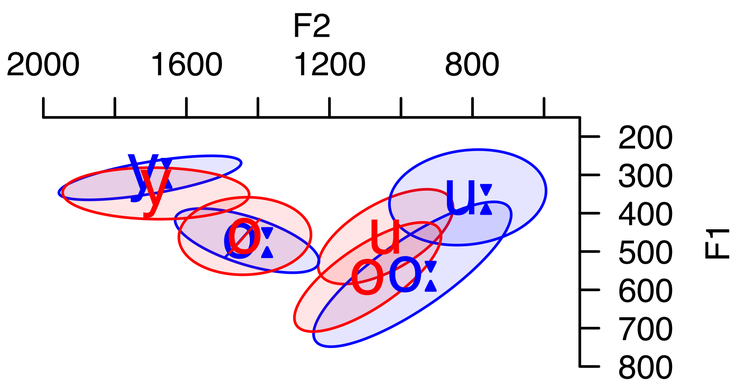
P04: 42/F; from Kyrgyzstan, Jalalabat oblast, Suzaq district, Joon Küngöy village; also knows Russian, Turkish, English, some Arabic

Data processing

- Examined Vs / #K__Dσ(σ) K: k,q D: d,l,n,r,s
  - Avoids documented palatal C influence on V
  - Avoids stress effects
  - Avoids other limitations of corpus
- US frames acquired every 19.6ms (51Hz)
- Processed in UltraTrace (Murphy et al. 2020)
- US & audio recordings aligned, adjusted by hand
- US frames traced by hand
- US frame closest to vowel midpoint selected

Findings

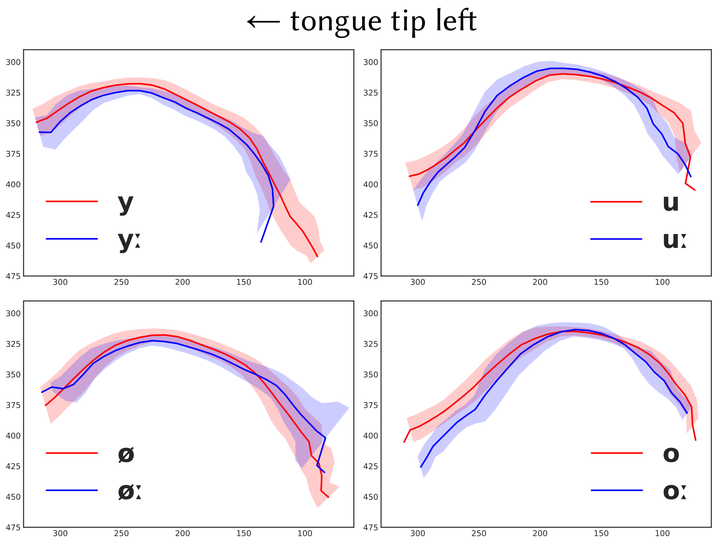
Acoustic



1. Spectral differences between V̆ and V:
2. Mainly back V̆ more central than V:

Articulatory

← tongue tip left



3. back V̆s — raised tongue tip
4. front V̆s — raised tongue dorsum
5. back V̆s — backed tongue root

Analysis

Effect of **preceding dorsal** on undershoot:

- All Vs: tongue body closer to Cs' POA
- Front Vs: velum (4); back Vs: uvula (5)

Effect of **following coronal** on undershoot:

- Back Vs: tongue tip closer to aleveolar ridge (3)
- Front Vs: tongue is already very close

Effect of undershoot on **high vs non-high** (back) Vs:

- Tongue tip: more undershoot in non-high V
- Tongue dorsum & root: more undershoot in high Vs

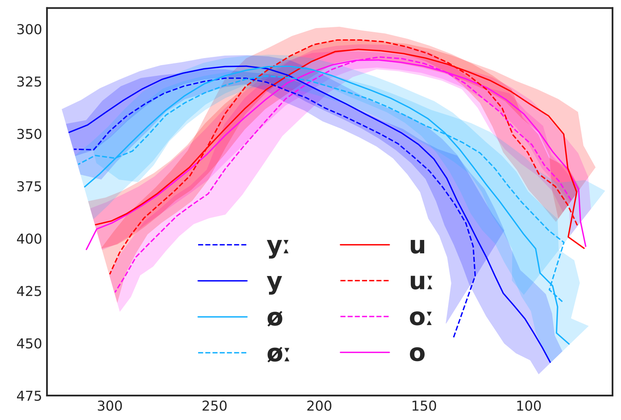
Effect of undershoot on **formants** (2):

- Front Vs: no effect, dorsal raising small
- Back Vs: connection between formant and articulation differences not yet modeled

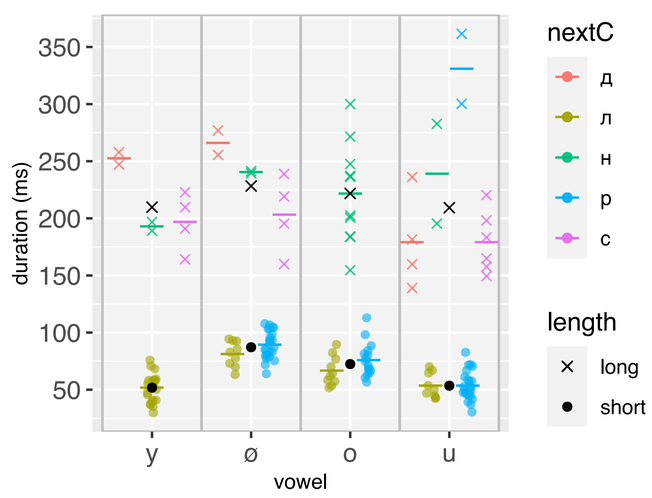
Generally: most undershoot where largest articulatory effort would be required

Supplemental data

All vowels together



Durations



Words examined

колдогу	кororду	көрүмөбү?	кулумабы?	курунда	күлүмөбү?
колдубу?	корот	көрүндө	кулуна	курүптур	күлүндө
колумабы?	корсунбу?	көрүнө	кулунда	куудагы	күлүнө
колуна	коруптур	көрүптүр	курабы?	куудубу?	күлүптүр
колунда	көлдүбү?	көрөбү?	курарды	куунубу?	күлөбү?
коондогу	көлдөгү	көрөрдү	курат	куурду	күлөрдү
коондубу?	көлүмөбү?	көрөт	курганга	куусуна	күлөт
коонумабы?	көлүндө	көөдөгү	курганын	куусунбу?	күүдөгү
коонуна	көлүнө	көөнүбү?	курдагы	куусунда	күүнүбү?
коонунда	көргөнгө	көөсүндө	курдубу?	күлгөнгө	күүсүндө
коргонго	көргөнүн	көөсүнө	курсунбу?	күлгөнүн	күүсүнө
коргонун	көрдүбү?	күлдагы	курумабы?	күлдүбү?	
кордубу?	көрдөгү	күлдубу?	куруна	күлдөгү	
коробу?	көрсүнбү?			күлсүнбү?	

158 V tokens: 24 y 8 yː 34 u 14 uː
34 ø 8 øː 26 o 10 oː

Future work

- Examine articulation of adjacent Cs
- Expected acoustic effects = observed? Model!
- Examine other Kyrgyz speakers in corpus
- V̆ versus V: in other articulatory contexts?
- Do these findings hold up cross-linguistically?
- Can undershoot effects be lang.-dependent?

References

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