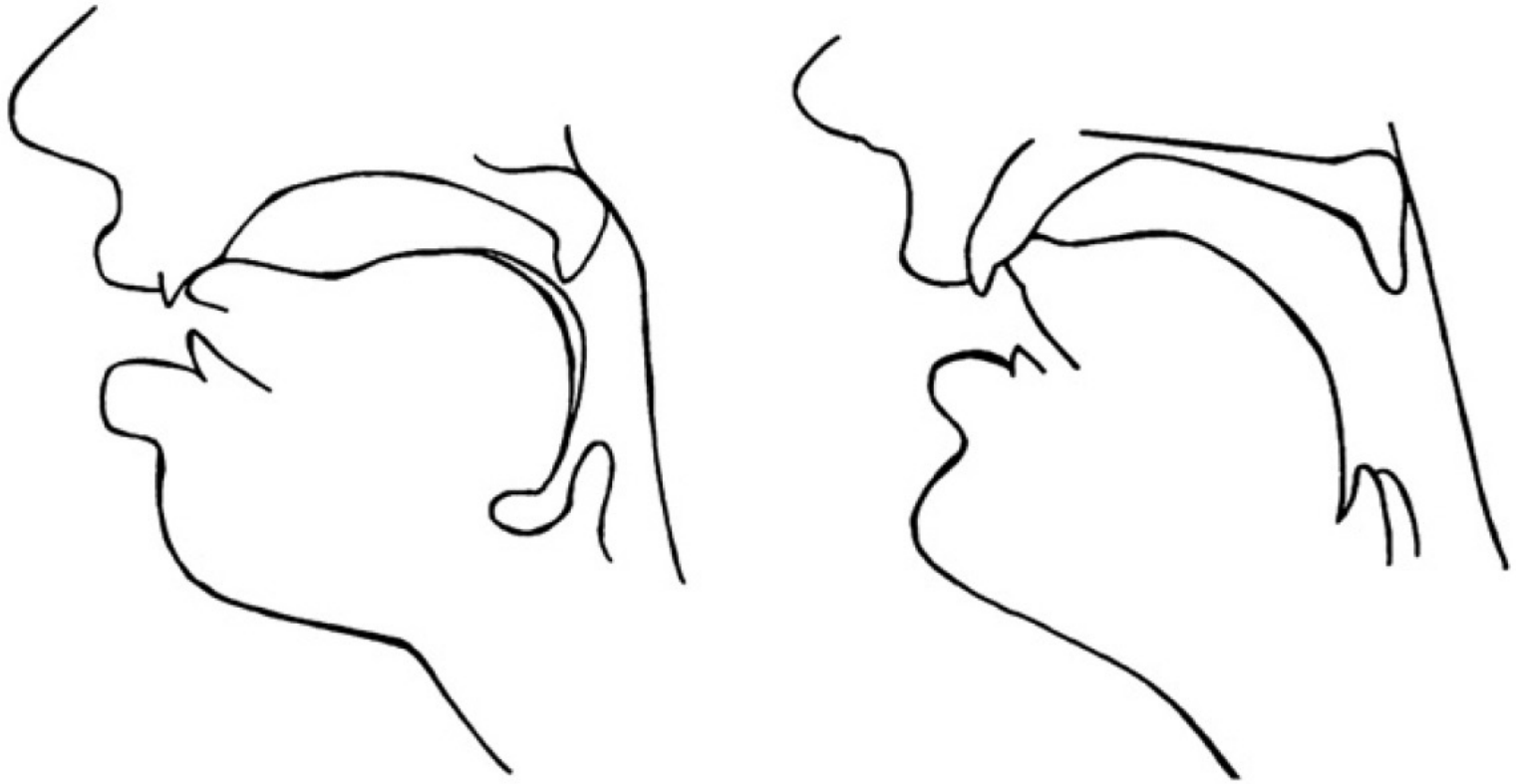
A multislice rtMRI analysis of horizontal tongue narrowing in English laterals

Anisia Popescu[1,2], Louis Goldstein[1], Mairym Llorens Monteserin[1], Shrikanth Narayanan[1]

[1]University of Potsdam, [2]University of Southern California

anisiapopescu@uni-potsdam.de

Lateral consonants



Dark /l/

Clear /l/

Image source: Recasens, 2012

Side channel formation

Hypothesis 1

Narrowing of the tongue blade

Hypothesis 2

Tilting the tongue to one side of the oral cavity

Hypothesis 3

Tongue narrowing as a result of the dual gesture of the lateral

Tongue narrowing

Dark /l/

Clear /l/

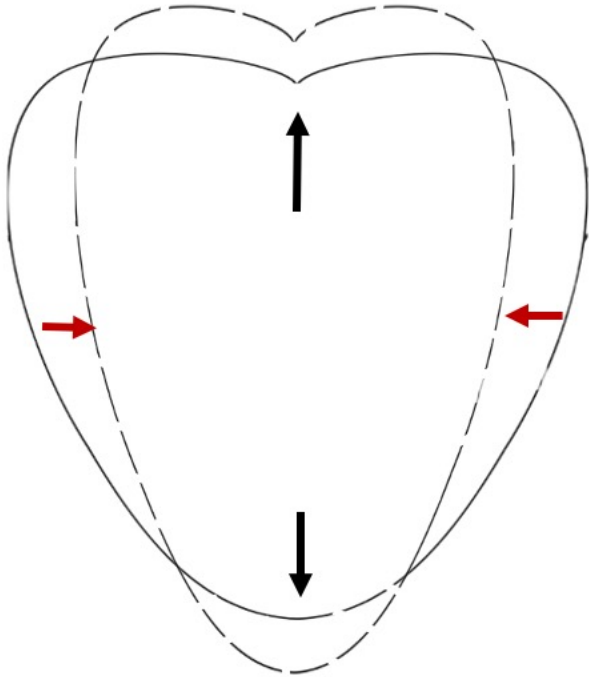
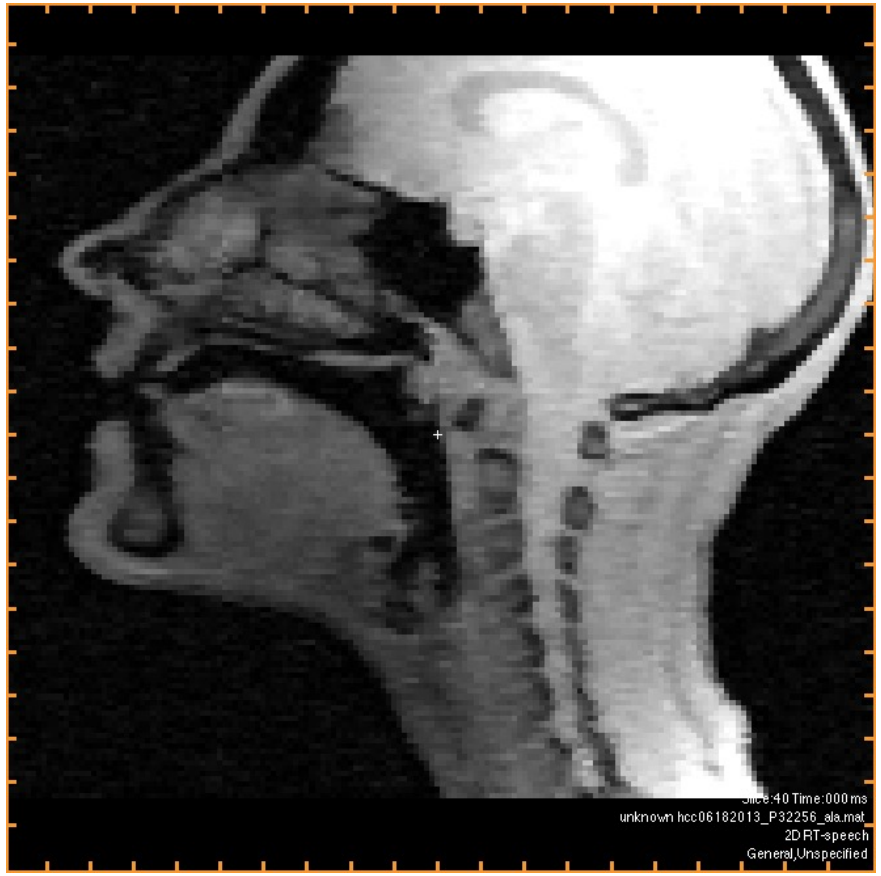
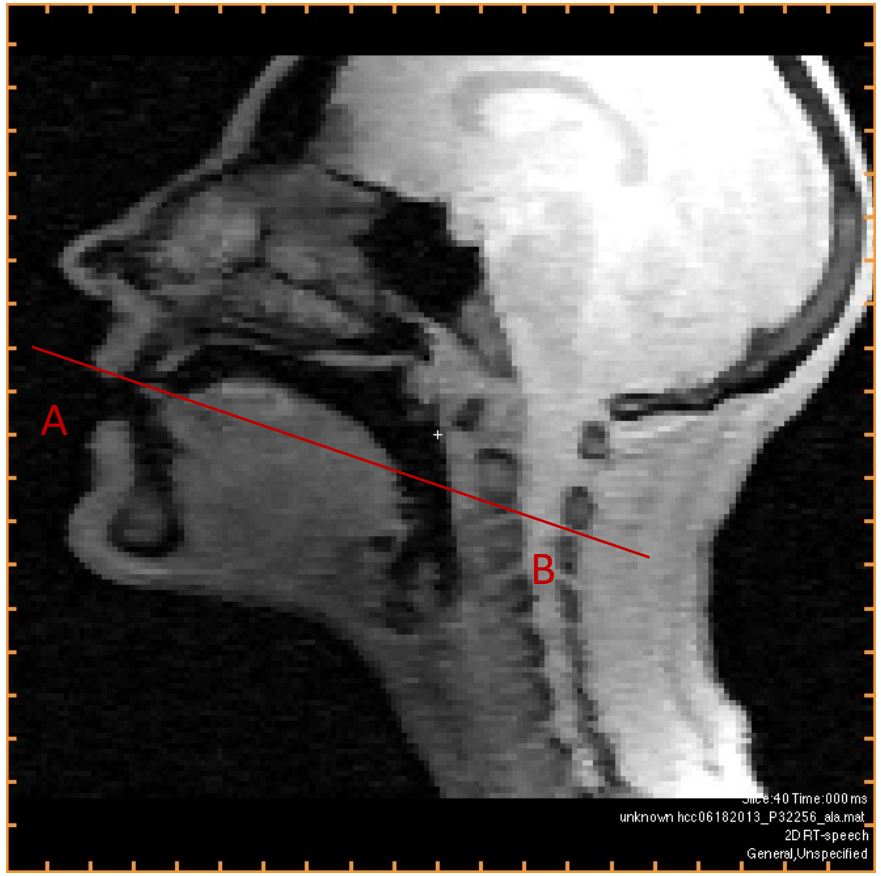


Image source: Recasens, 2012

Side channel MRI imaging



Side channel imaging

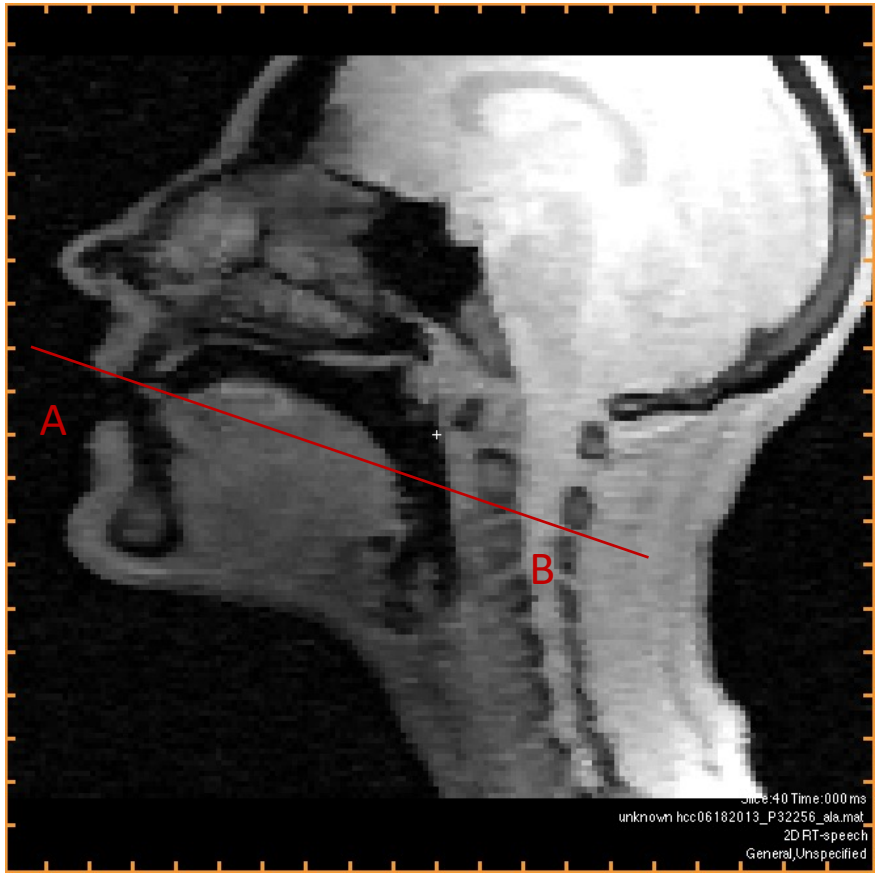


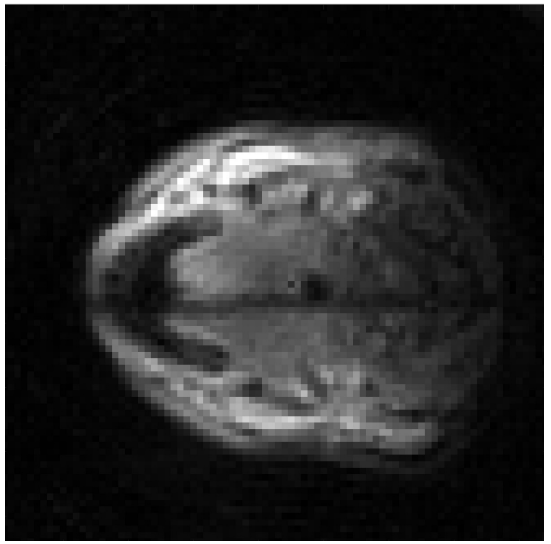
Anchor points:

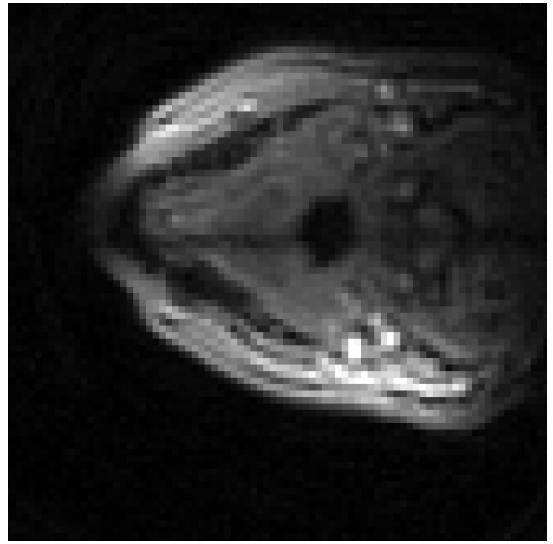
A – most anterior point along the inferior surface of the upper lip

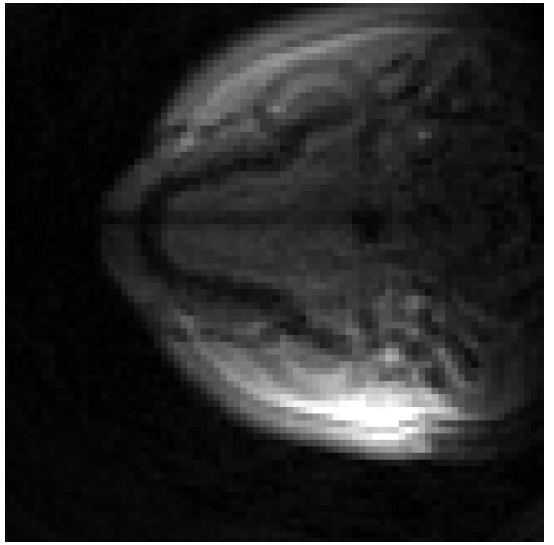
B – Intersection between the spinal cord and the C2-C3 intervertebral disk

Oblique slice









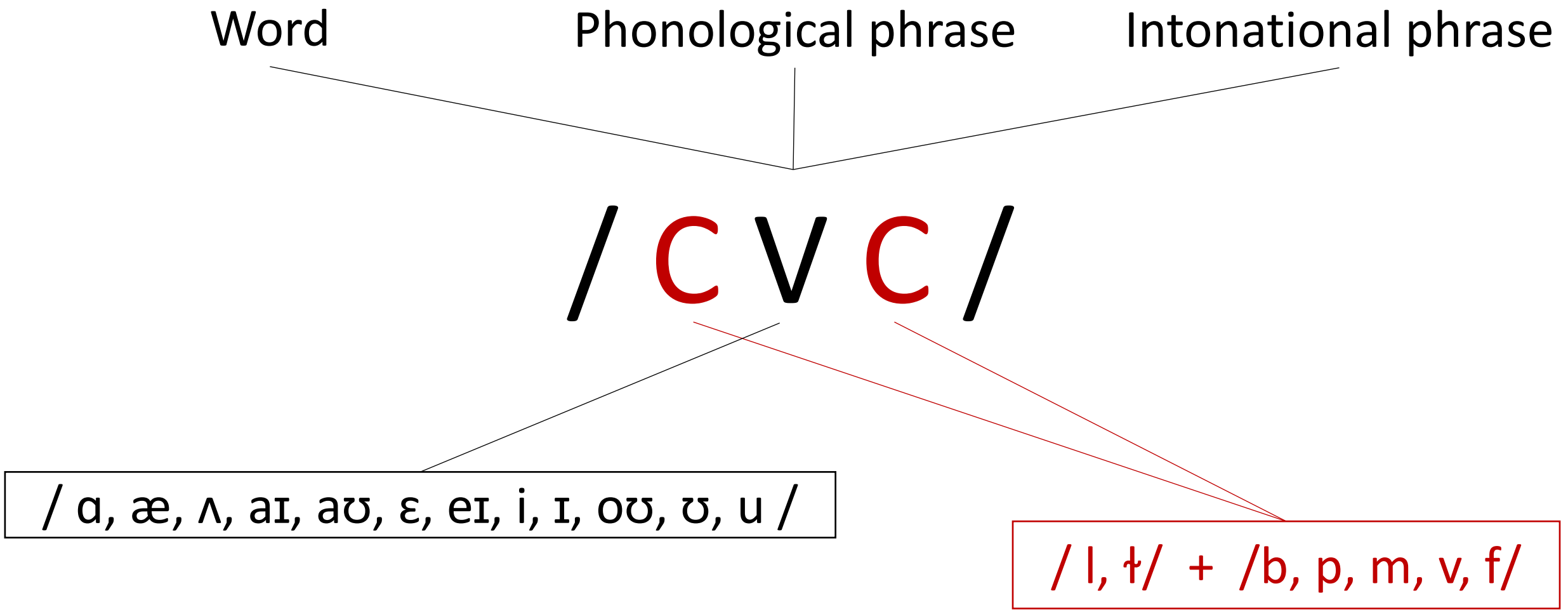
Data

/ C V C /

/ ɑ, æ, ʌ, aɪ, aʊ, ɛ, eɪ, i, ɪ, oʊ, ʊ, u /

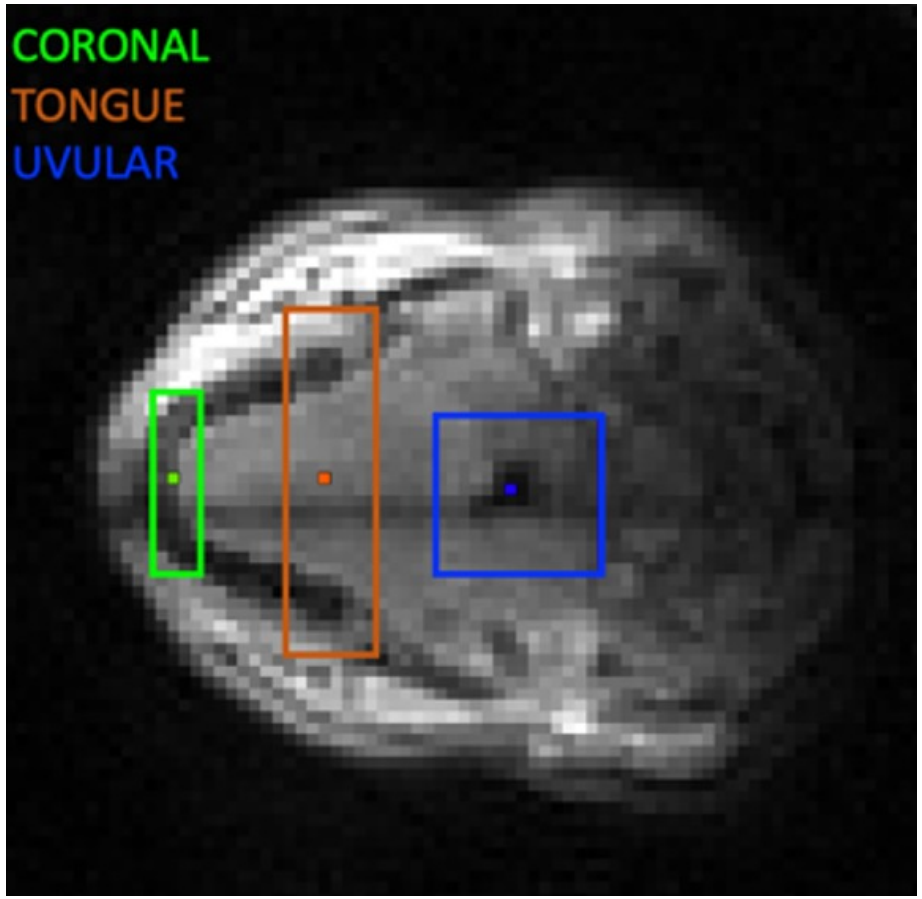
/ l, ɬ/ + /b, p, m, v, f/

Data

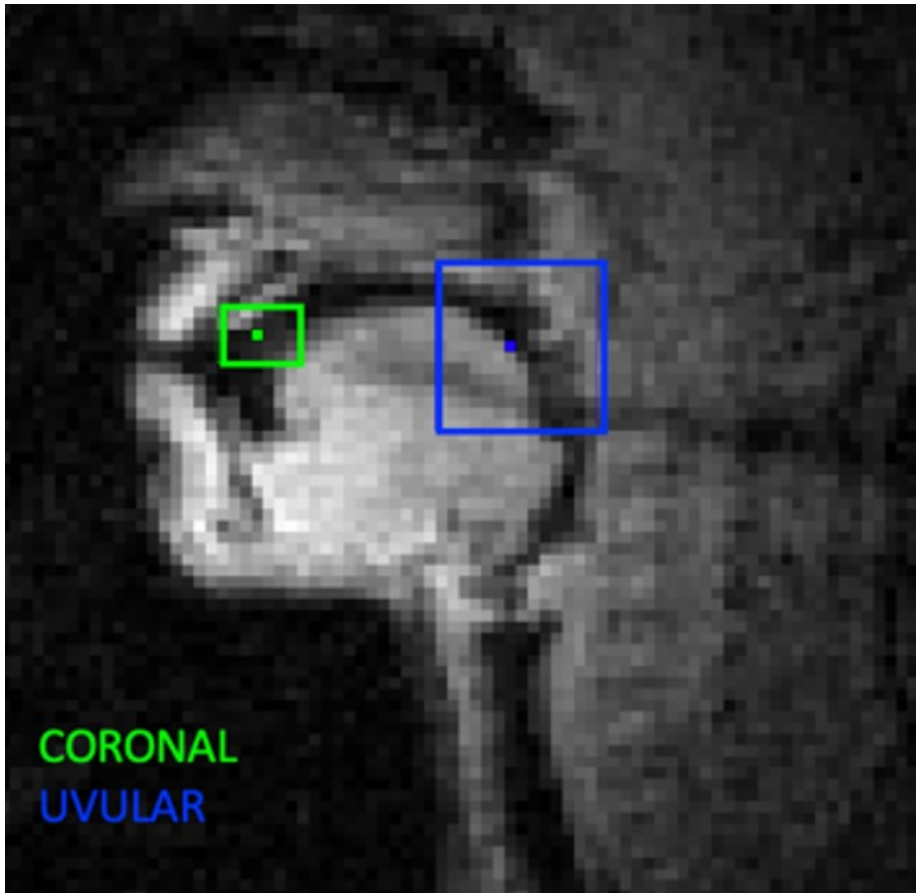

Word
Phonological phrase
Intonational phrase
/ C V C /
/ ɑ, æ, ʌ, aɪ, aʊ, ɛ, eɪ, i, ɪ, oʊ, ʊ, u /
/ l, ɬ/ + /b, p, m, v, f/

Regions of interest (ROI)

OBLIQUE

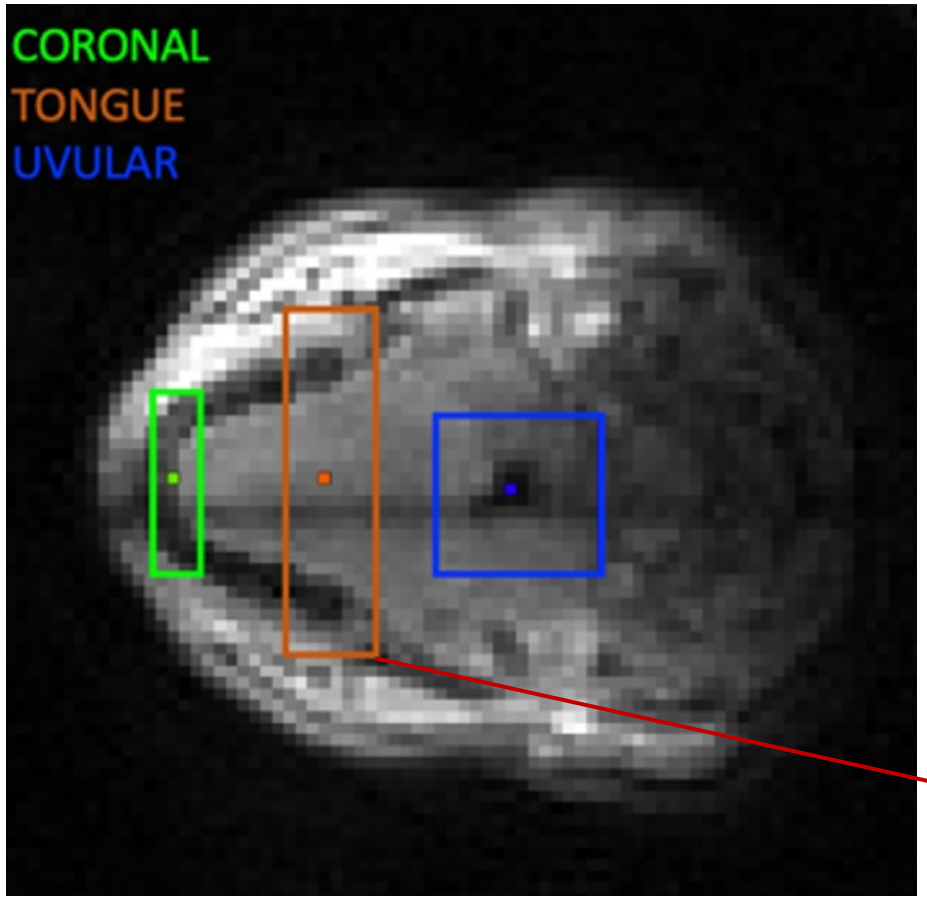


MIDSAGITTAL



Regions of interest (ROI)

OBLIQUE

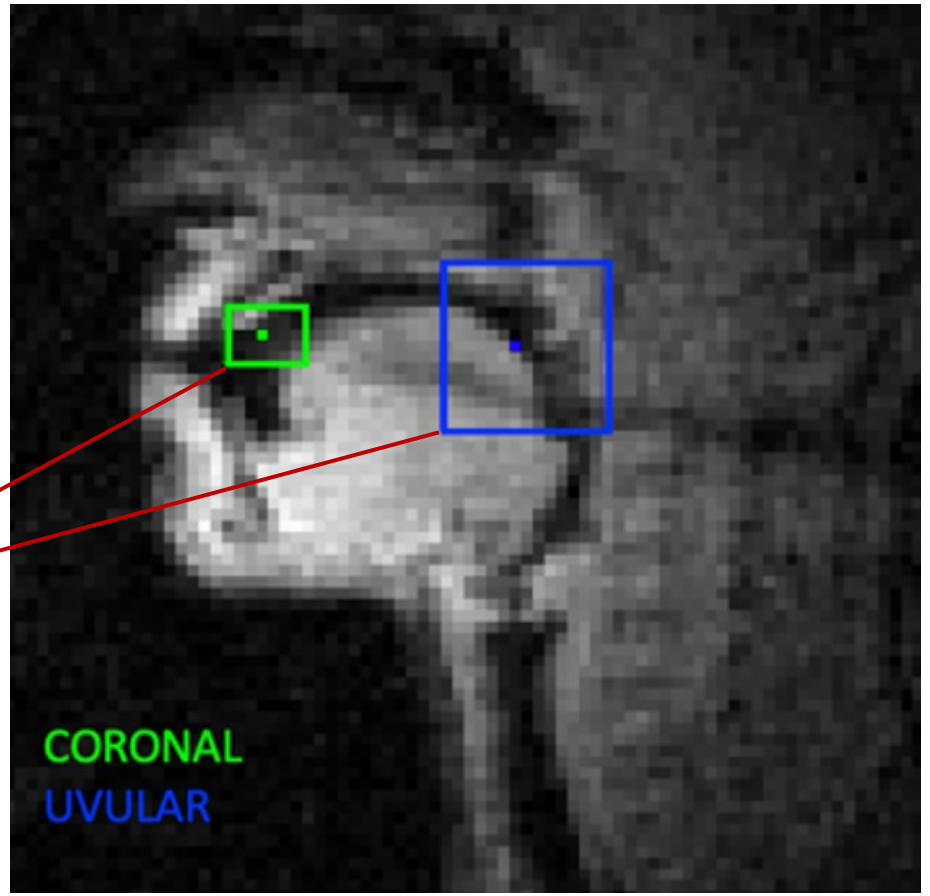


CORONA*UVULAR

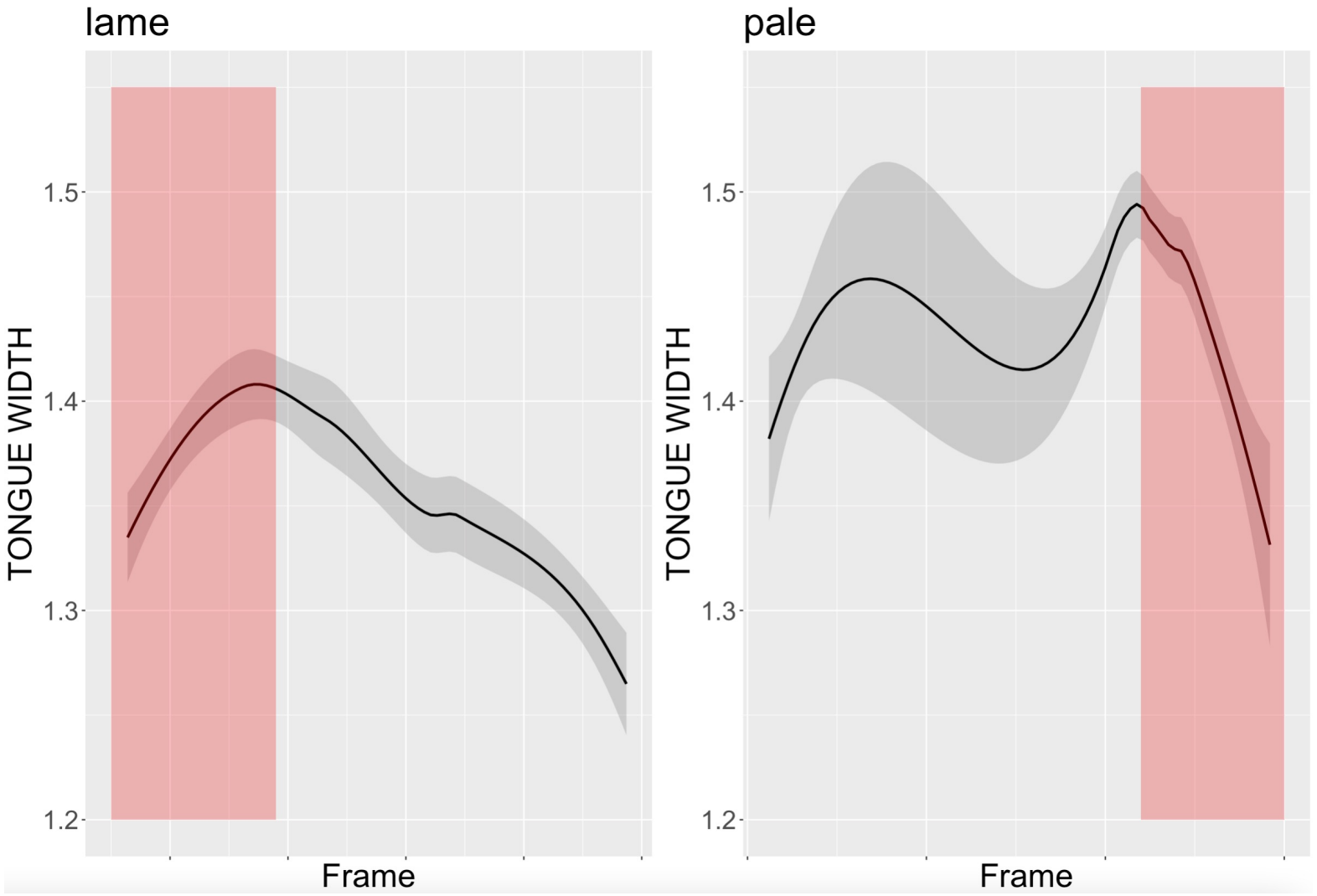
~

TONGUE WIDTH

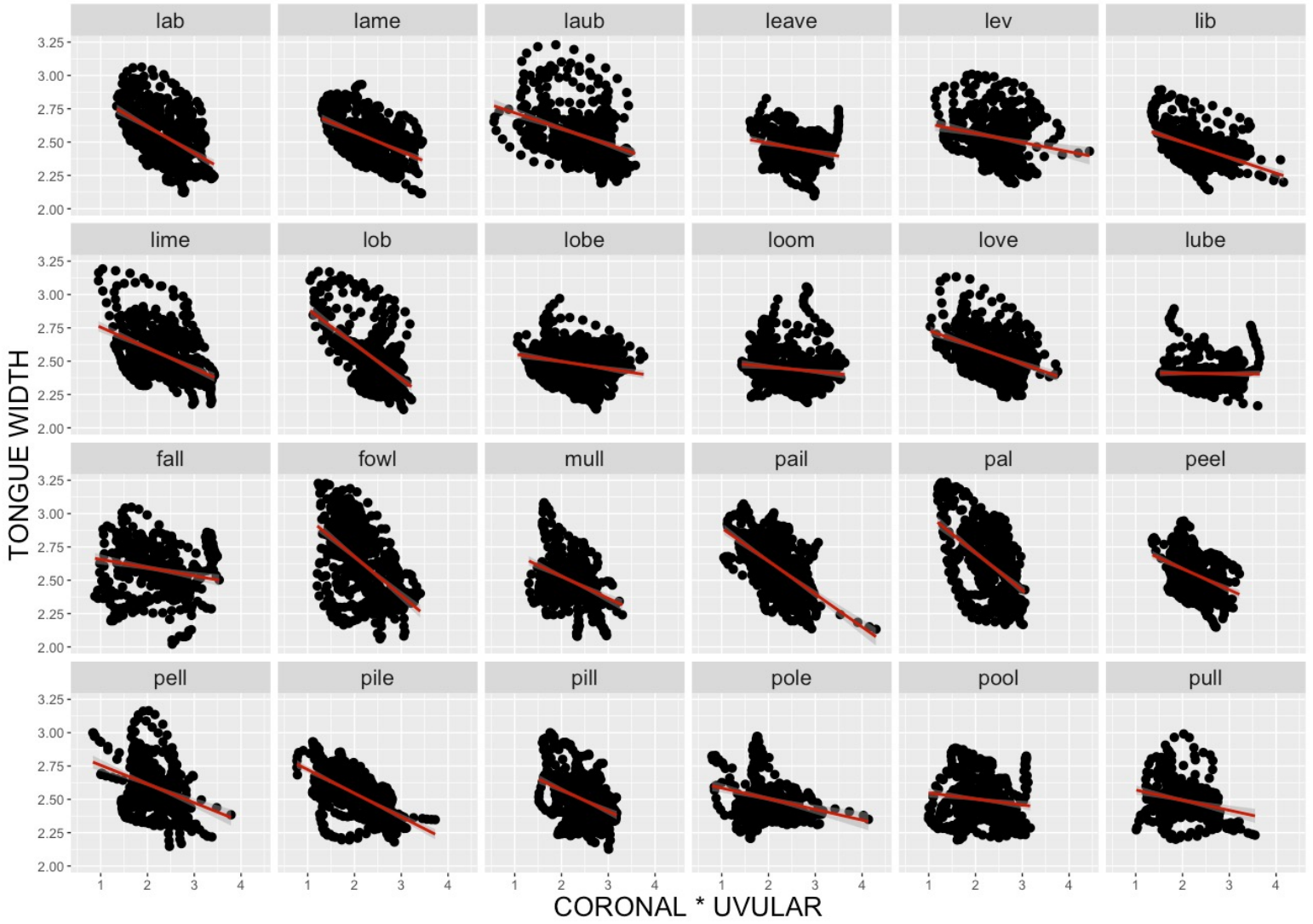
MIDSAGITTAL



Results



Results


lab
lame
laub
leave
lev
lib
lime
lob
lobe
loom
love
lube
fall
fowl
mull
pail
pal
peel
pell
pile
pill
pole
pool
pull
TONGUE WIDTH
CORONAL * UVULAR
3.25
3.00
2.75
2.50
2.25
2.00
1
2
3
4

References

[1] Browman, C. P., & Goldstein, L. (1995). Gestural syllable position effects in American English. Producing Speech: Contemporary Issues, 19–33.
[2] Blaylock, R.; 2021, VocalTract ROI Toolbox. https://github.com/reedblaylock/VocalTract-ROI-Toolbox.
[3] Fujimura, 0. & Kakita, Y. 1979. Remarks on quantitative description of the lingual articulation, In Frontiers of speech communication research (S. Ohman & B. Lindblom, editors). London: Academic Press.
[4] Katz, W., F.; Mehta, S.; Wood, M.; & Wang, J.; 2017. Using electromagnetic articulography with a tongue lateral sensor to discriminate manner of articulation, JASA, 141(1).
[5] Llorens Monteserin, M.; Byrd, D., Goldstein, L. & Narayanan, S.; 2017. Indexing tongue profile narrowing for English using 3D volumetric MR imaging. 174t Meeting of the ASA
[6] Stevens, K., N. 1998. Acoustic phonetics, The MIT Press, Cambridge, Massachusetts.
[7] Sproat, R., & Fujimura, O. (1993). Allophonic variation in English/l/and its implications for phonetic implementation. Journal of Phonetics, 21(3), 291–311.
[8] Ying, J.; Shaw, J., A.; Carignan, C., Proctor, M.; Derrick, D., & Best, C., T.; 2021. Evidence for active control of tongue lateralization in Australian English /l/, Journal of Phonetics, 86.

Thank you!

Poster Session A
Thursday, June 23rd