Typologically rare sound changes: Final voicing

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Final obstruent devoicing

- Word- and syllable-final obstruent devoicing is a common sound pattern in the world's languages.
  - IE: Bulgarian, Camuno, Catalan, Dutch, Lithuanian, Polish, Russian, Zaza…
  - Non IE: Afar (Cushitic), Awara (Finisterre-Huon, Papua New Guinea), Ganza (Omotic, Ethiopia & Sudan)…

- A convergent phonological evolution fueled by many phonetic biases.

Active final obstruent devoicing: Czech

	INITIAL			MEDIAL			FINAL		
/b/	bát se	[**b**aːtsɛ]	‘to fear’	chleba	[xle**b**a]	‘bread.ACC’	chléb	[xlɛː**p**]	‘bread’
/p/	pád	[**p**aːt]	‘a fall’	čápi	[tʃaː**p**i]	‘stork.PL’	čáp	[tʃaː**p**]	‘stork’
/d/	dát	[**d**aːt]	‘give’	ledu	[lɛ**d**u]	‘ice.GEN’	led	[lɛ**t**]	‘ice’
/t/	tát	[**t**aːt]	‘melt’	letu	[lɛ**t**u]	‘flight.GEN’	let	[lɛ**t**]	‘flight’
/g/	gáza	[**g**aːza]	‘gauze’	kolega	[kole**g**a]	‘colleague’	gong	[goːŋ**k**]	‘gong’
/k/	kát se	[**k**aːtsɛ]	‘repent’	žáky	[ʒaː**k**i]	‘pupil.PL’	žák	[ʒaː**k**]	‘pupil’

TABLE 1. Final obstruent devoicing in Czech.

Static final obstruent voicelessness: Basque

	INITIAL		MEDIAL		FINAL	
/b/	**b**eldar	‘caterpillar’	za**b**al	‘wide’	—	
/p/	**p**eldo	‘wild mint’	za**p**al	‘crushed’	za**p**	[sound of hit, knock]
/d/	**d**u	‘have.3SG.PRS’	a**d**ar	‘horn, branch’	—	
/t/	**t**u	‘saliva, spit’	a**t**al	‘section, piece’	ba**t**	‘one’
/g/	**g**ehi	‘more, a lot’	e**g**arri	‘thirst’	—	
/k/	**k**e	‘smoke, steam’	e**k**arri	‘to bring’	zuti**k**	‘standing, upright’

TABLE 2. Final obstruent voicelessness in Basque.

Final obstruent voicing

- Final obstruent voicing is claimed to be non-existent (Kiparsky 2006).

- Why is final obstruent devoicing a common sound pattern?
- Why is final obstruent voicing cross-linguistically rare / unattested?

- Two different approaches.

Lack of final voicing

Traditional markedness accounts (Wetzels and Mascaró 2001) and OT (Kager 1999)

- Consequence of universal markedness constraints prohibiting voicing in word- or syllable-final position.
- Explicit prediction that final obstruent voicing does not exist (Kiparsky 2006, 2008).

Phonetic-historical accounts (Evolutionary Phonology; Blevins 2004, 2017)

- Consequence of phonetically-based devoicing tendencies in word- or syllable-final position.
- Allow for rare cases of final-obstruent voicing under specific conditions (Blevins 2006).

Emergentist vs. markedness approaches

- Evolutionary Phonology:
- Nothing prohibits sound patterns of final obstruent voicing in synchronic grammars.
- Final obstruent voicing is expected to be rare:
  - Many phonetic factors yield final devoicing.

- Nevertheless, phonetic and non-phonetic pathways to final obstruent voicing are conceivable.
- Examine any sound pattern that might instantiate it.

Potential cases of final voicing: Somali

- A possible process of word-final voicing of obstruents (Blevins 2006).

- There is a great deal of phonetic variation in the realization of final obstruents.

- Kiparsky (2006, 2008) chooses to analyze Somali final stops as lenis unaspirated, in contrast to aspirated stops that occur syllable-initially.

Potential cases of final voicing: Lezgian

- Lezgian (Nakh-Daghestanian) has plain voiceless, voiceless aspirated, voiced and glottalized stops.
- Plain voiceless stops alternate with voiced stops word-finally.
- Yu (2004) provides acoustic and phonological evidence for a synchronic process of final obstruent voicing and lengthening.
- However, Kiparsky (2006, 2008) offers an alternative:
  - Final voiced stops are taken as basic.
  - He analyzes them as phonologically voiced geminate stops.
  - He proposes degemination and devoicing in syllable onsets.

Lakota language

- a.k.a. Lakhota, Teton or Teton Sioux.
- A Siouan language (Siouan-Catawban).
  - Spoken in the Great Plains of North America.
- Mississippi Valley subgroup.
- North Dakota and South Dakota.
- Endangered language.
  - Approx. 2000 speakers.
- Part of a dialect continuum:
  - Western Dakhóta (Yankton-Yanktonai).
  - Eastern Dakhóta (Santee-Sisseton).
  - Assiniboine Nakhóta.
  - Stoney Nakhóta.

*d in the Lakota-Dakota dialect continuum

LAKȞÓTA	YANKTONAI	YANKTON	SISSETON	SANTEE	ASSINIBOINE	GLOSS
loté	**d**oté	**d**oté	**d**oté	**d**oté	**n**oté	‘throat’
-ke**l**	-ke**d**	-ke**d**	-ke**d**	-ke**d**	-ke**n**	‘kind of’ (ADV SUFF)
blaská	**bd**aská	**bd**aská	**bd**aská	**bd**aská	**mn**aská	‘to be flat & solid’
a**gl**éška-**l**a	a**gd**éška-**n**a	a**kd**éška-**n**a	a**hd**éška-**n**a	a**hd**éška-**d**a	a**kn**éška-**n**a	‘lizard’

TABLE 3. Some phonological differences across the Lakota-Dakota dialect continuum.

Lakota vowel contrasts

		FRONT	CENTRAL	BACK
HIGH	oral	i		u
	nasalized	<iŋ> [ĩ]		<uŋ> [ʊ̃]
MID	oral	e		o
LOW	oral		a	
	nasalized		<aŋ> [ə̃]	

Lakota consonantal contrasts

	BILAB	DENT	ALV	POST-ALV	VELAR	GLOT
OBSTRUENTS						
Stops & affricates						
voiceless unaspirated	p	t		č = [tʃ]	k	
voiceless aspirated (or Th cluster)	ph	th		čh	kh	
voiceless with velar aspiration (or Tȟ cluster)	pȟ	tȟ			kȟ	
voiceless ejective (or T? cluster)	p’	t’		č’	k’	’ = [ʔ]
voiced	b				(g)	
Fricatives					(POST)VELAR	
voiceless			s	š = [ʃ]	ȟ = [x], [χ]	h
voiceless glottalized (or S? cluster)			s’	š’	ȟ’ = [x’], [χ’]	
voiced			z	ž = [ʒ]	ǧ = [ɣ], [ʁ]	
SONORANTS				PALATAL		
Nasals	m		n			
Lateral		l				
Approximants	w			y = [j]		

Lakota stops

- Three contrastive voiceless oral stop: /p, t, k/.
- Only one contrastive voiced oral stop: /b/.
  - ↳ Voicing is contrastive for pre-vocalic bilabial stops in Lakota.

- Native roots: *bá* ‘to blame somebody’, *bú* ‘make a deep noise’, etc.
- At least one loan: *bébela* ‘baby’ (<< Fr. *bébé*).

- [g] is a predictable allophone of /k/ /_l, m, n, w.
  - cf. *spakéli* < Engl. [spə'gɛɾi] ‘'spaghetti’ vs. *magnéta* < Engl. *magnet* ‘magnet’.

The /b/ vs. /p/ contrast in Lakota

a. ***bá*** ‘to blame sb.’ (not widely known) vs. ***pa***- ‘by pushing’
b. ***bé****b****e****la*** ‘baby’ (<< Fr. *bébé*) vs. -***pi*** PLURAL
c. ***bú*** ‘make a deep noise’ vs. ***pu***- ‘by pressure’
d. *á****b****e****la*** ‘scattered’, *á****b****e****ya*** ‘scattering’ vs. *a****p****é* ‘leaf’
e. *ka****b****ú* ‘to play the drum’ (*ka*- ‘by hitting’, *bu* ‘make a deep noise’) vs. *ka****p****úza* ‘to become dry in the wind’ (*ka*- VBZ, *púzA* ‘to be dry’)
f. *hi****b****ú* ‘I am coming’ (archaic form of 1SG of *hiyú* ‘to start coming’) vs. *i****p****áblaye* ‘rolling pin’

/k/ with predictable [k] and [g] allophones

a. prevocalic [k]: *a**k**ábu* ‘to drum on sth.’, ***k**ibá* ‘to regret’, -*la**k**e* ‘very, really’, *spa**k**éli* ‘spaghetti’ (<< Eng.)
b. presonorant syllable-initial [g]: ***g**lalú* ‘to fan one’s own’, ***g**má* ‘walnut’, ***g**núni* ‘to lose one’s own’ (< *ki-núni*), ***g**wéza* ‘rippled, ridged’, *ma**g**néta* ‘magnet’ (<< Eng.), *ša**g**gláša* ‘English’ (<< Fr. *les Anglais*)

Lakota syllable types

	MONOSYLLABLE	INITIAL	MEDIAL	FINAL
OPEN				
CV	*šá* 'red'	*sá.pA* 'black'	*thǒ́.sa.pA* 'dark blue'	*ša.šá* 'red' (INAN.PL)
CCV	*tké* 'heavy'	*tke.yá* 'heavily'	*wó.tke.ya* 'to hang things'	*tke.tké* 'heavy' (INAN.PL)
CLOSED				
CVC	*sáb* 'black' (CONT)	*sab.sá.pA* 'black' (INAN.PL)	*ǧí.sab.ye.la* 'very dark brown'	*yu.šáb* 'making sth./sb. dirty' (cf. *šápA*, *šáb* 'dirty')
CCVC	*gléb* 'vomiting' (CONT)	*gleb.khí.yA* 'to make sb. vomit'	*í.ksab.ya* [ʔiksabja] 'to be a burden for sb.'	*a.gléb* 'vomiting on sth.' (CONT)

Final stop voicing in Lakota

Lakota has a true synchronic process of syllable-final stop voicing, as described by Rood and Taylor (1985, 1996):

/p/, /t/, /k/ → [b], [l], [g]
in syllable-final position.

Under:

- Truncation
- Reduplication

	MEDIAL ONSET	WORD-FINAL (CODA)	MEDIAL CODA
/p/	*tópa* 'four'	*tób* (CONT) 'four'	*tóbtopa* 'by fours'
/t/	*napótA* 'to wear sth out with the feet'	*napól* (CONT) 'to wear sth out with the feet'	*napólpotA* 'wearing sth out with the feet'
/k/	*šókA* 'to be thick'	*šóg* (CONT) 'to be thick'	*šogšókA* 'to be thick'

Understanding truncation as prosodic morphology

- Truncation: If a Lakota form ends in /…VC_fV_f/, where C_f is a possible coda consonant, then…
  - …VC_fV_f → …VC_f when it is the first member of a complex word.
  - VC_fV_f → …VC_f in isolation, provided that V_f is unstressed (optional).

- Coda voicing constraints: In syllable coda position…
  - Fricatives devoice: ǧ → ȟ, ž → š, z → s.
  - Oral stops and affricates voice: p → b, t → l, k → g, č → l.

Understanding truncation as prosodic morphology

- Dissimilation (in reduplication only / morphophonemic): Heterosyllabic lateral + coronal consonant clusters dissimilate.
  - l.T → g.T, where T is a coronal consonant.

- Optional resyllabification (fast speech, variable): In $VC_1.C_2V$ where C_1C_2 is a possible syllable onset.
  - $VC_1.C_2V$ → $V.C_1C_2V$ (with regressive devoicing).

BASE	5a.ii SIMPLE WD. TRUNCATION	5a.i COMPLEX WD. TRUNCATION	5b CODA VOICING	5c CLUSTER DISS.	5d RESYLLAB. (OPTIONAL)	2ND BASE OF COMPLEX WD.
okáspA ‘to sink’	n.a. (…CCV#)	n.a. (…CCV#)	n.a.	n.a.	n.a.	n.a.
tȟağé ‘saliva’	n.a. (…ˊV#)	*tȟaȟ.glá.tȟA* ‘to chew cud’	ğ → ȟ	n.a.	n.a.	*gla.tȟÁ* ‘to chew one’s own’
šaké ‘nail, claw’	n.a. (…ˊV#)	*šag.tȟúŋ* ‘to have claws’	k → g	n.a.	*ša.ktȟúŋ*	*tȟúŋ* ‘to have sth.’
sápA ‘black’	*sáb*	*sab.sá.pA* ‘black’ (INAN.PL)	p → b	n.a.	*sa.psá.pA*	RED
čhápa ‘beaver’	*čháb*	*čhab.síŋ.te* ‘beaver tail’	p → b	n.a.	*čha.psíŋ.te*	*siŋté* ‘tail’
ȟótA ‘gray’	*ȟól*	*ȟol.ȟó.tA* ‘gray’ (INAN.PL)	t → l	n.a.	n.a.	RED
šókA ‘thick’	*šóg*	*šog.šó.kA* ‘thick’ (INAN.PL)	k → g	n.a.	*šo.kšó.kA*	RED
tȟóka ‘enemy, alien’	*tȟóg* ‘different, foreign’	*tȟog.ʼí.yA* ‘to speak a foreign language’	k → g	n.a.	*tȟo.kʼí.yA*	*iyÁ* ‘to speak’

BASE	SIMPLE WD. TRUNCATION	COMPLEX WD. TRUNCATION	CODA VOICING	CLUSTER DISS.	RESYLLAB. (OPTIONAL)	2ND BASE OF COMPLEX WD.
lúta ‘red, scarlet’	—	*lul.yÁ* ‘to dye sth. red’	t → l	n.a.	n.a.	*-ya* CAUS
		lug.lú.ta ‘red’ (INAN.PL)	t → l	ll → gl	*lu.glú.ta* (?)	RED
šéča ‘dry’	*šél*	*šeg.šé.ča* ‘dry’ (INAN.PL)	č → l	lš → gš	*še.kšé.ča*	RED
pȟéta ‘fire’	*pȟél*	*pȟel.čhó.la* ‘without a fire’	t → l	n.a.	n.a.	*čhóla* ‘without’
wáŋčala ‘only once’	—	*wáŋčagčana* ‘only once each time’	n.a.	lč → gč	*wáŋ.ča.kčana*	RED
ležA ‘to urinate’	*léš*	*leš.lé.žA* ‘to urinate often’	ž → š	n.a.	*le.šlé.žA* (?)	RED
		leš.mná ‘smell of urine’	ž → š	n.a.	n.a.	*mná* ‘to smell’
máza ‘metal’	—	*mas.kȟó.ka* ‘can’	z → s	n.a.	n.a.	*kȟoká* ‘keg’
čháğa ‘ice’	*čháȟ*	*čhaȟ.sní.yaŋ* ‘ice cream’	ğ → ȟ	n.a.	n.a.	*sniyÁŋ* ‘to cool sth. off’

Dataset for the study

- Recorded in WAVE format with a high quality shotgun microphone in a sound-proof booth for *The New Lakota Dictionary* (Ullrich 2011).

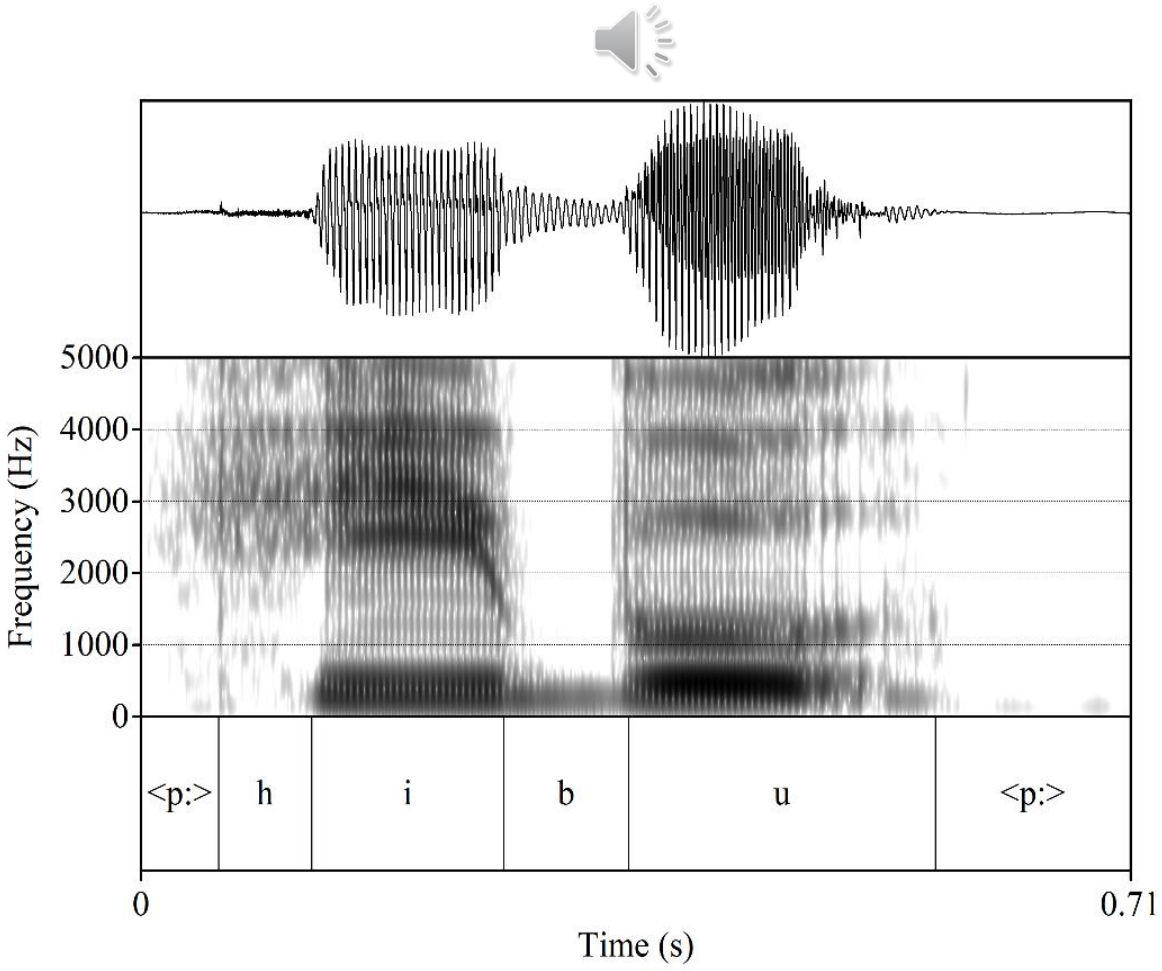
- NLD: 52,000 sound files from eight native speakers.
- 28,000 dictionary headwords.

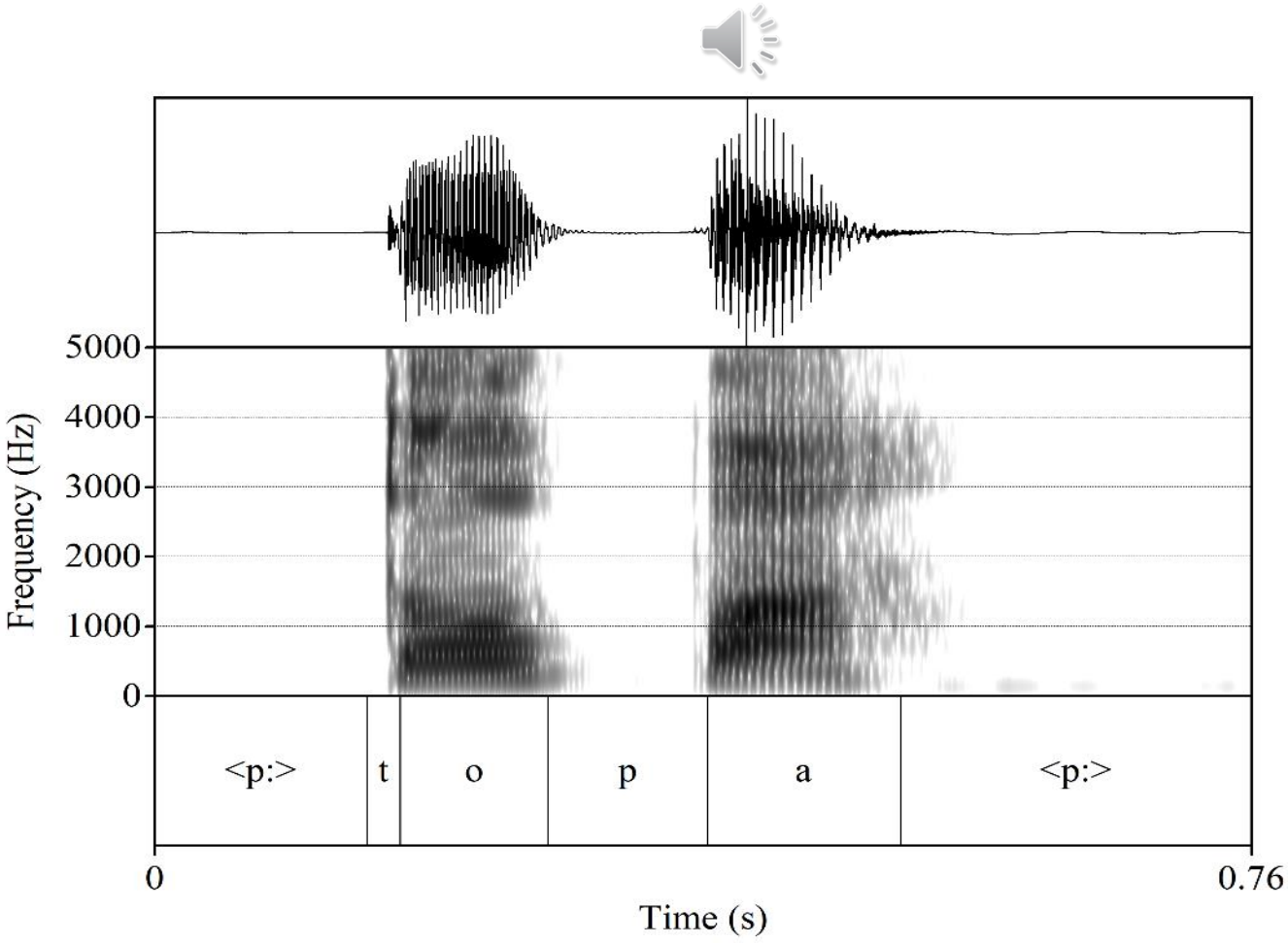
- Main male and female speakers:
  - Ben Black Bear, Jr. (Rosebud Reservation).
  - Iris Eagle Chasing (Cheyenne River Reservation).

Dataset for the study

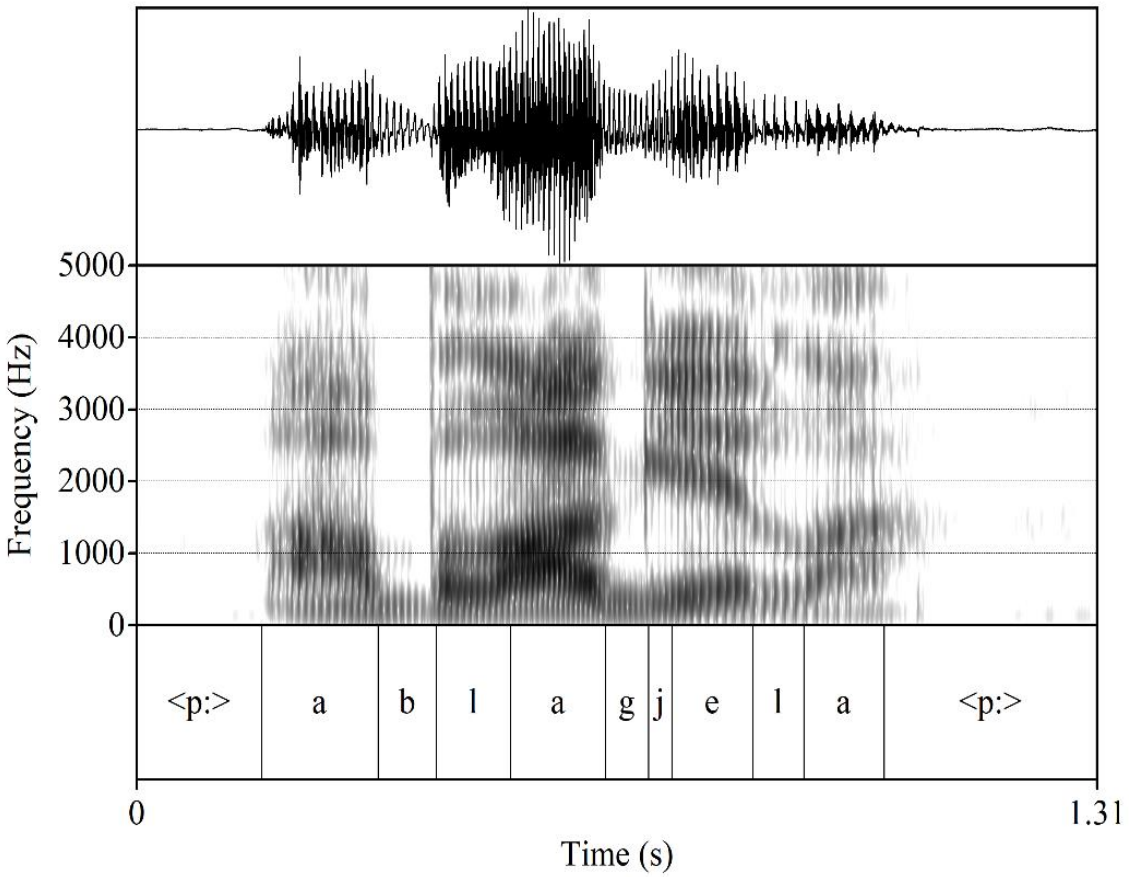
- 611 words: 304 distinct words with two tokens each (M/F, +3).
- 1215 oral stops (excluding ejectives and glottal stops).
- Words were orthographically transcribed (NLD orthography).
- *WebMAUS* (Kisler et al. 2017) → “Language independent (SAMPA)”
- Subsequently hand-corrected as needed.

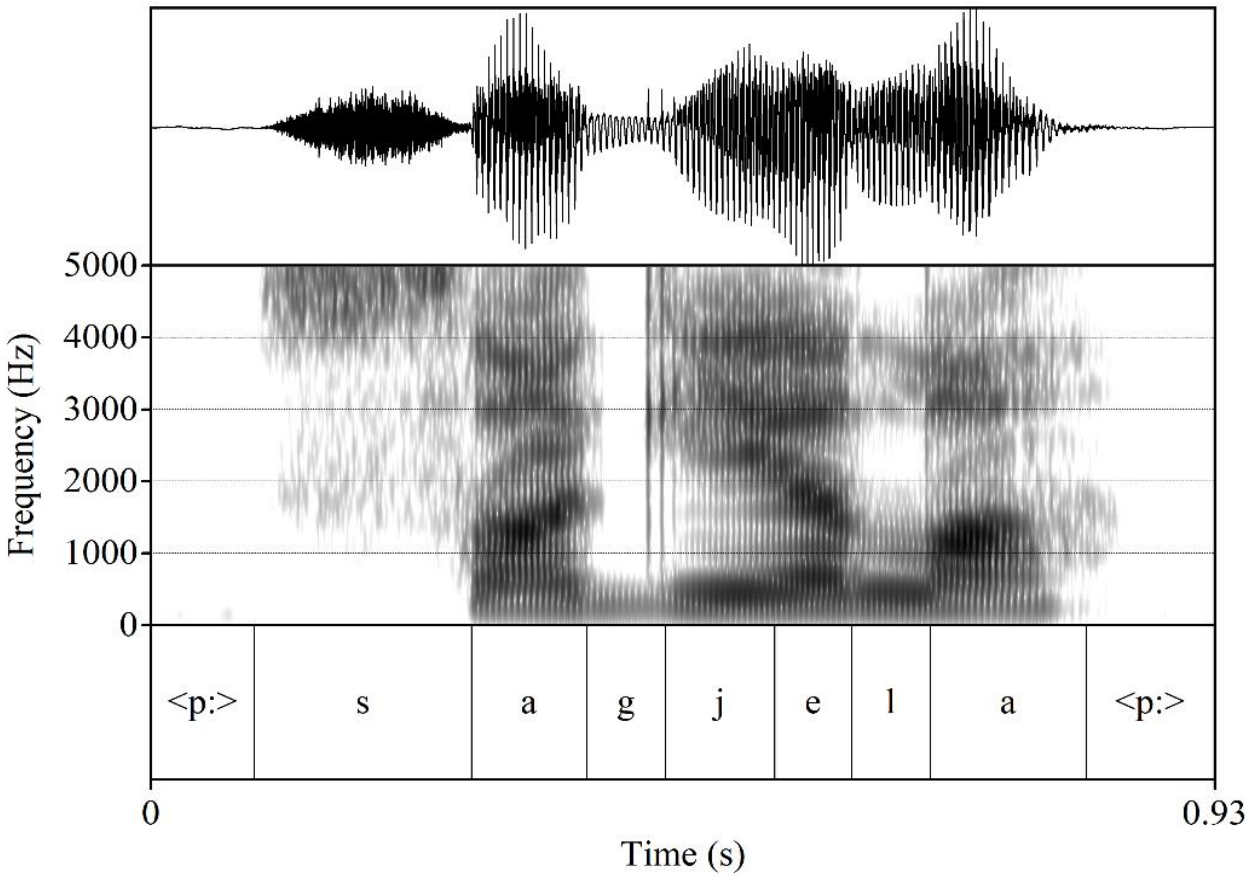
Spectrograms: *hibu* 'I'm coming', *topa* 'four'



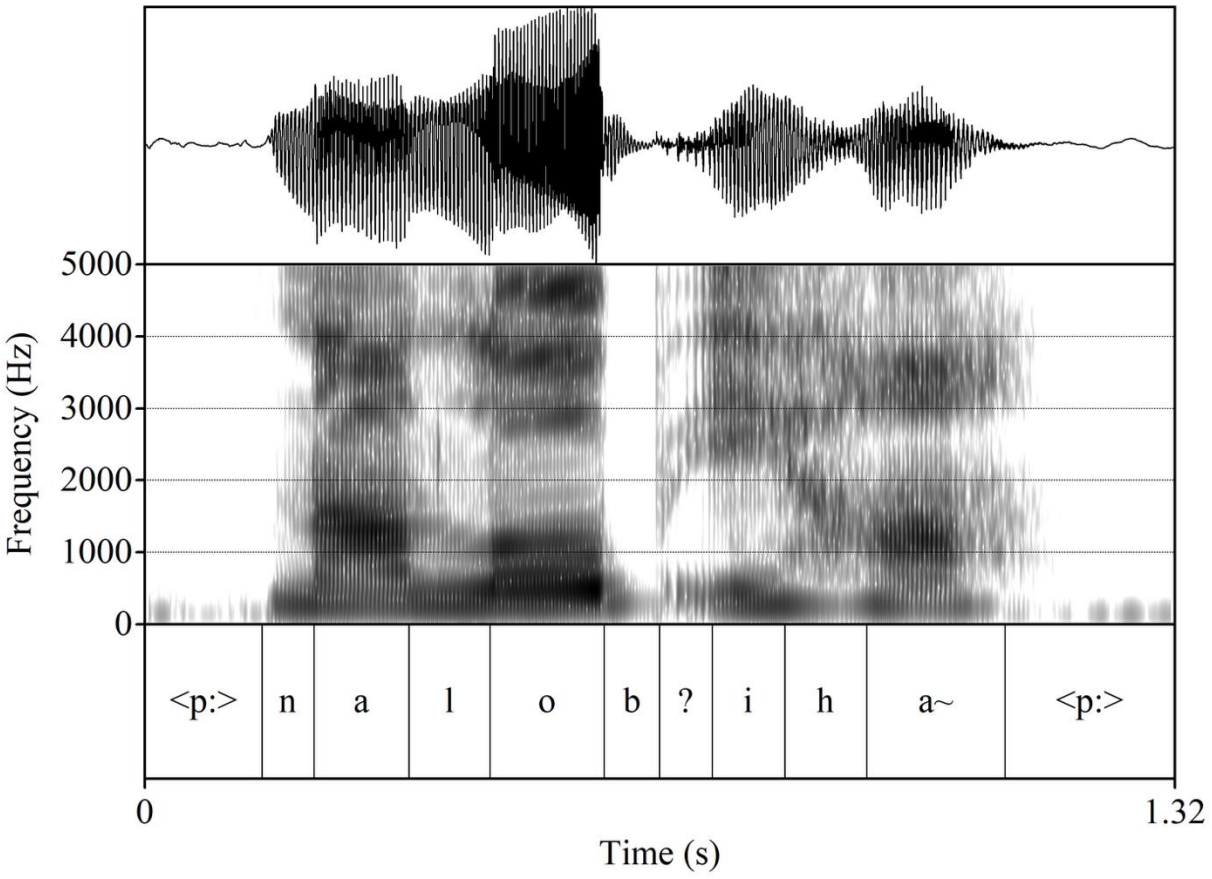


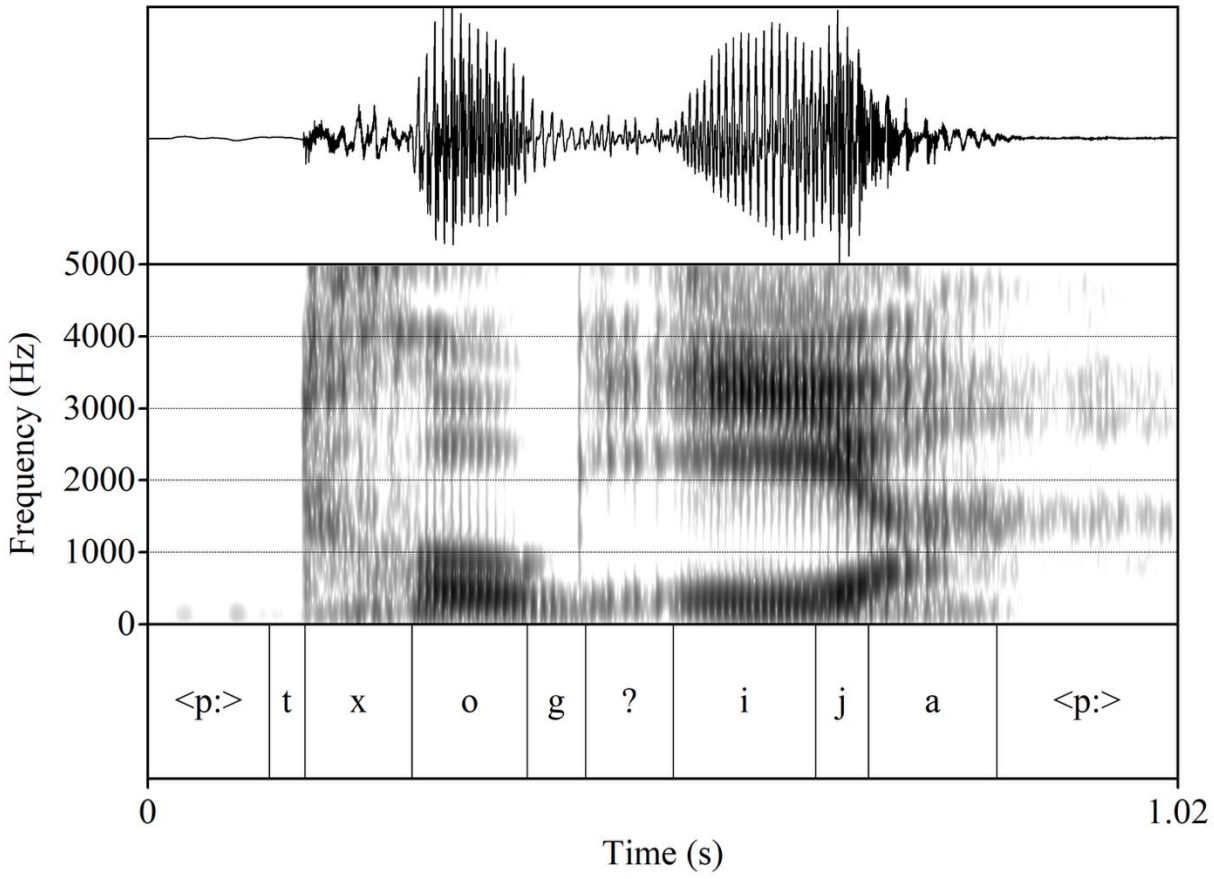
Spectrograms: *ablágyela* 'quietly, peacefully', *sagyéla* 'in a dried stiff condition'



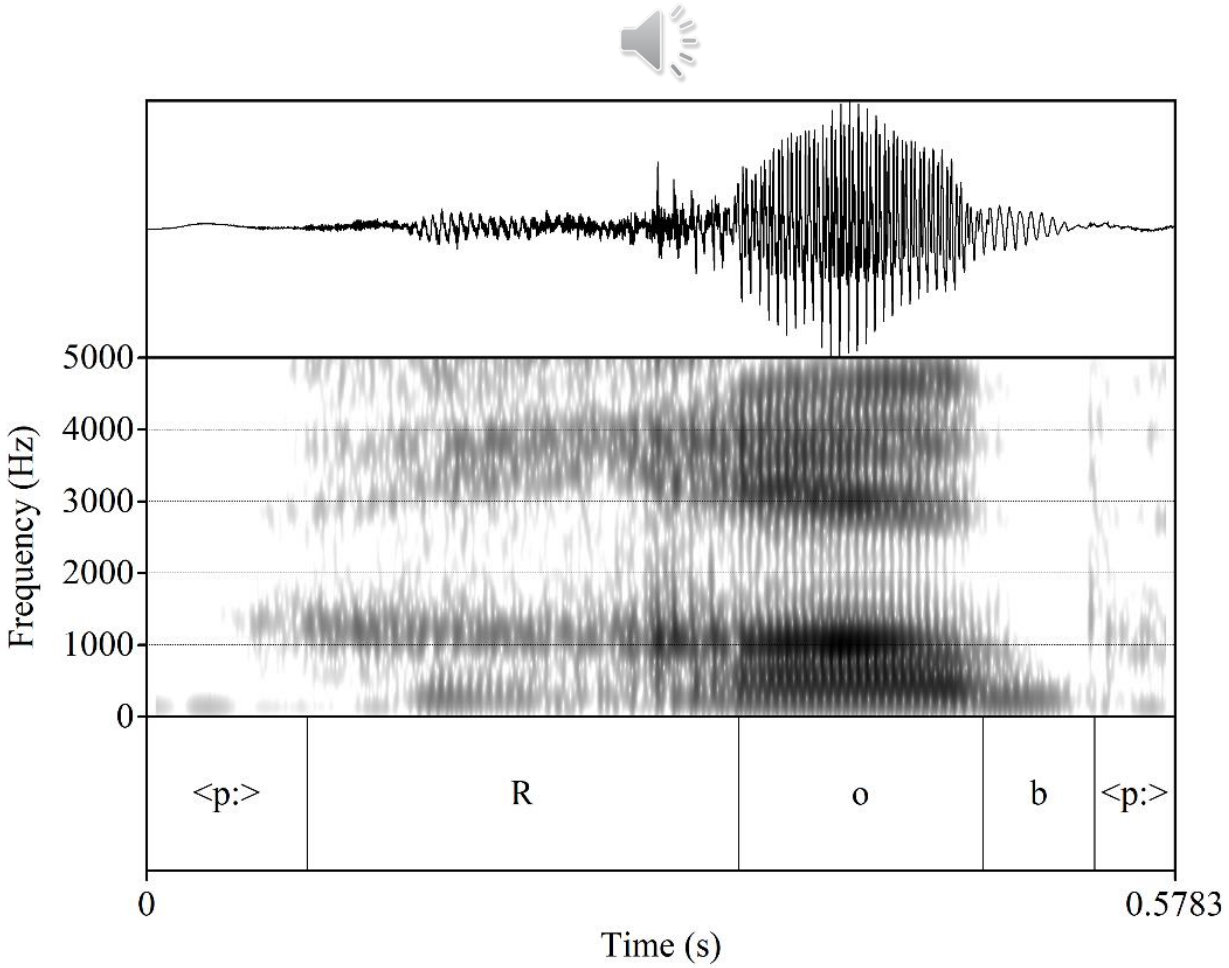


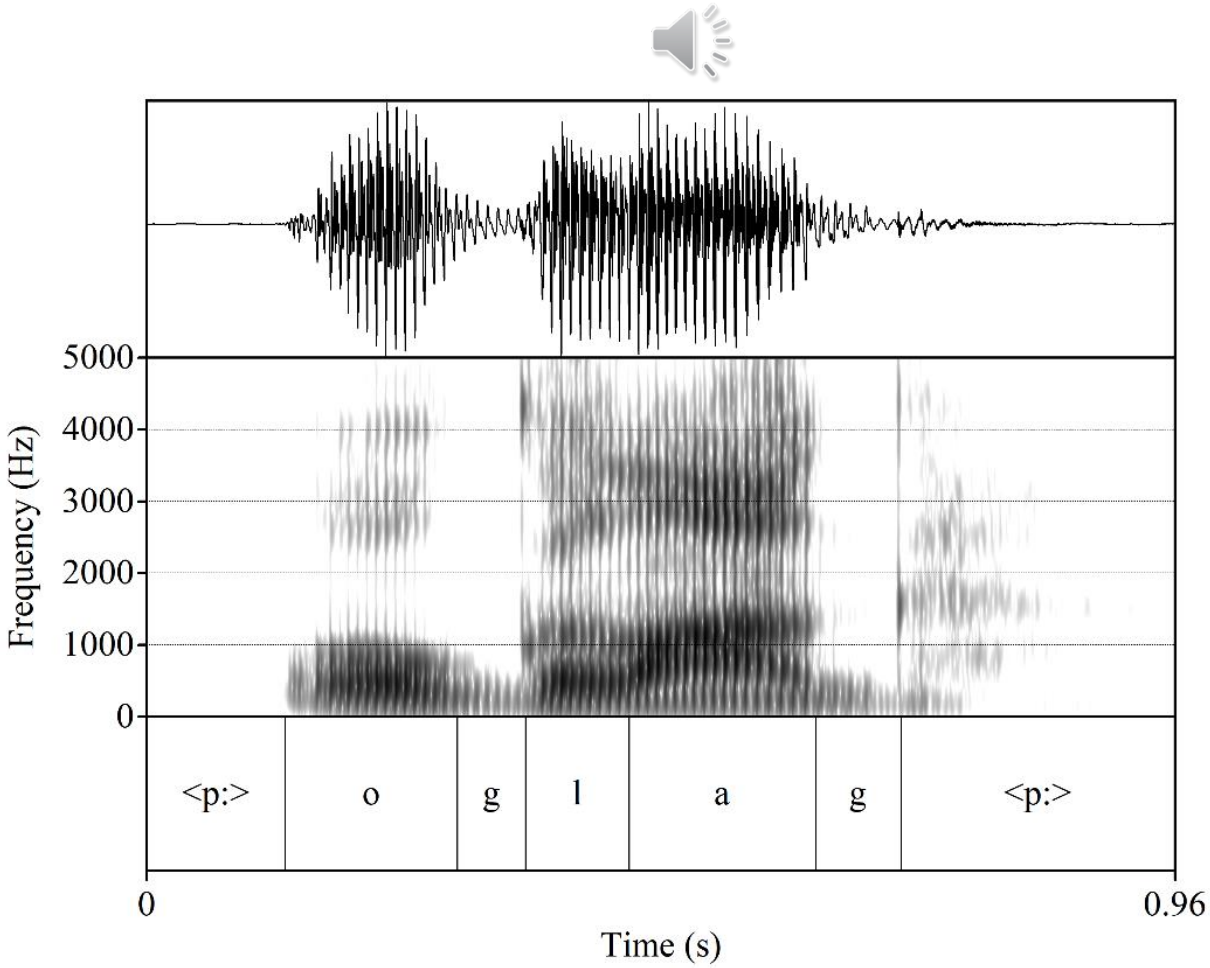
Spectrograms: *nalób ihÁŋ* 'to step into smth muddy', *tȟog'íyA* 'to speak a foreign language'





Spectrograms: *ğób* 'snoring', *oglág* 'relating'





Acoustic studies

1- Voicing

2- Duration

3- Amplitude

1- Stop voicing. Methods: Data.

- 1215 oral stops.
  - Over 300 intervocalic, 225 of these used for training.
  - 841 non-intervocalic oral stops were subject to analysis.

- Non-intervocalic phonological contexts:
  - Word-initial
  - Medial coda*
  - Word-final

1- Stop voicing. Methods: Auto-correlation.

- Auto-correlation (AC) peaks calculated with EMU (Harrington 2010).

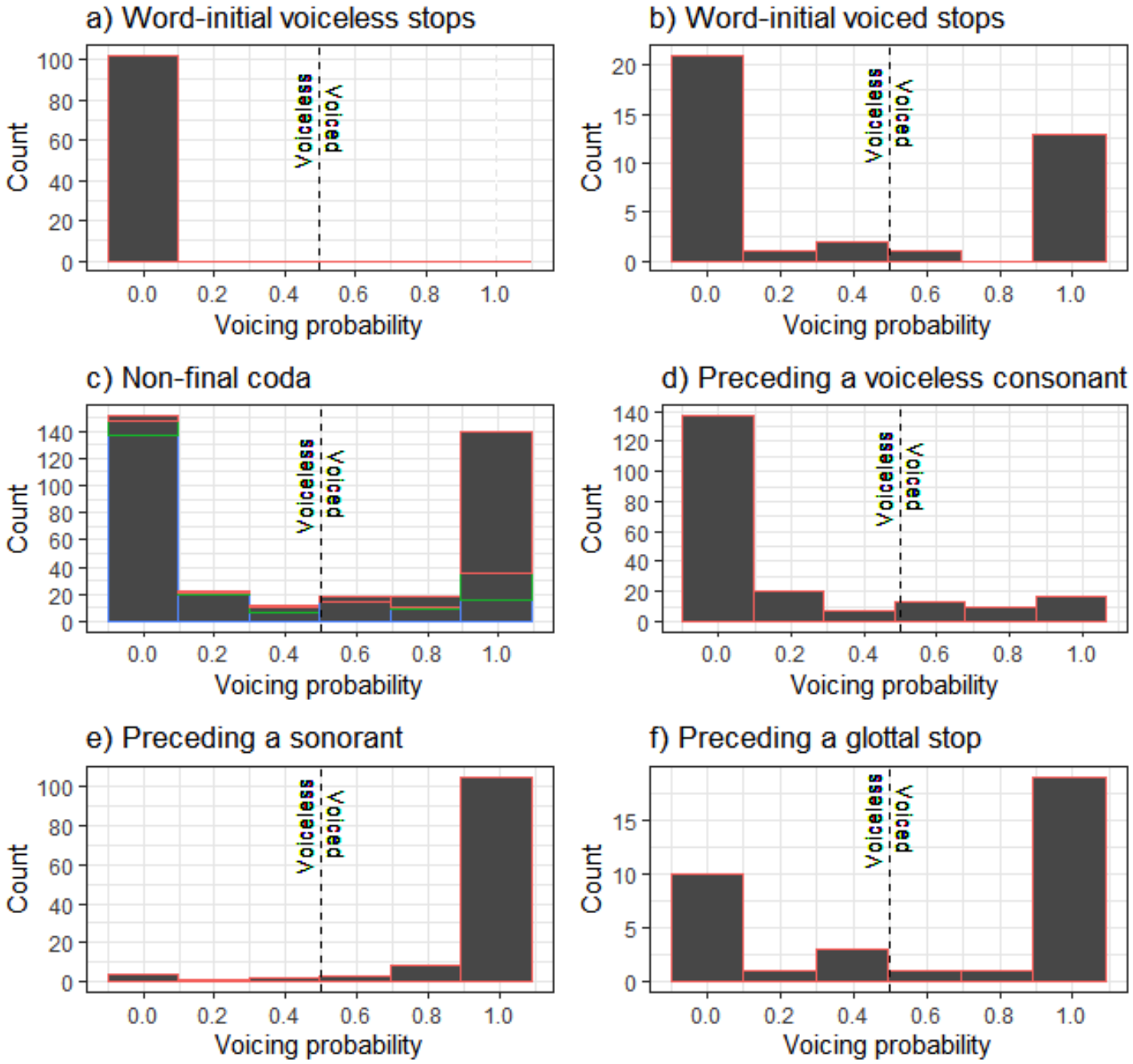
- A voicing coefficient between 0 and 1 at each time point (10 ms.):
  - 0 -> no correlation (voiceless).
  - 1 -> perfect correlation (voiced).

1- Stop voicing. Methods: Statistical model.

- Median of the AC coefficients of all time points within a stop.
- Binomial logistic regression: AC coefs. to predict the voicing label.
- Trained on intervocalic stops.
- Hosmer and Lemeshow goodness of fit: Very good fit ($p = 0.9916$).

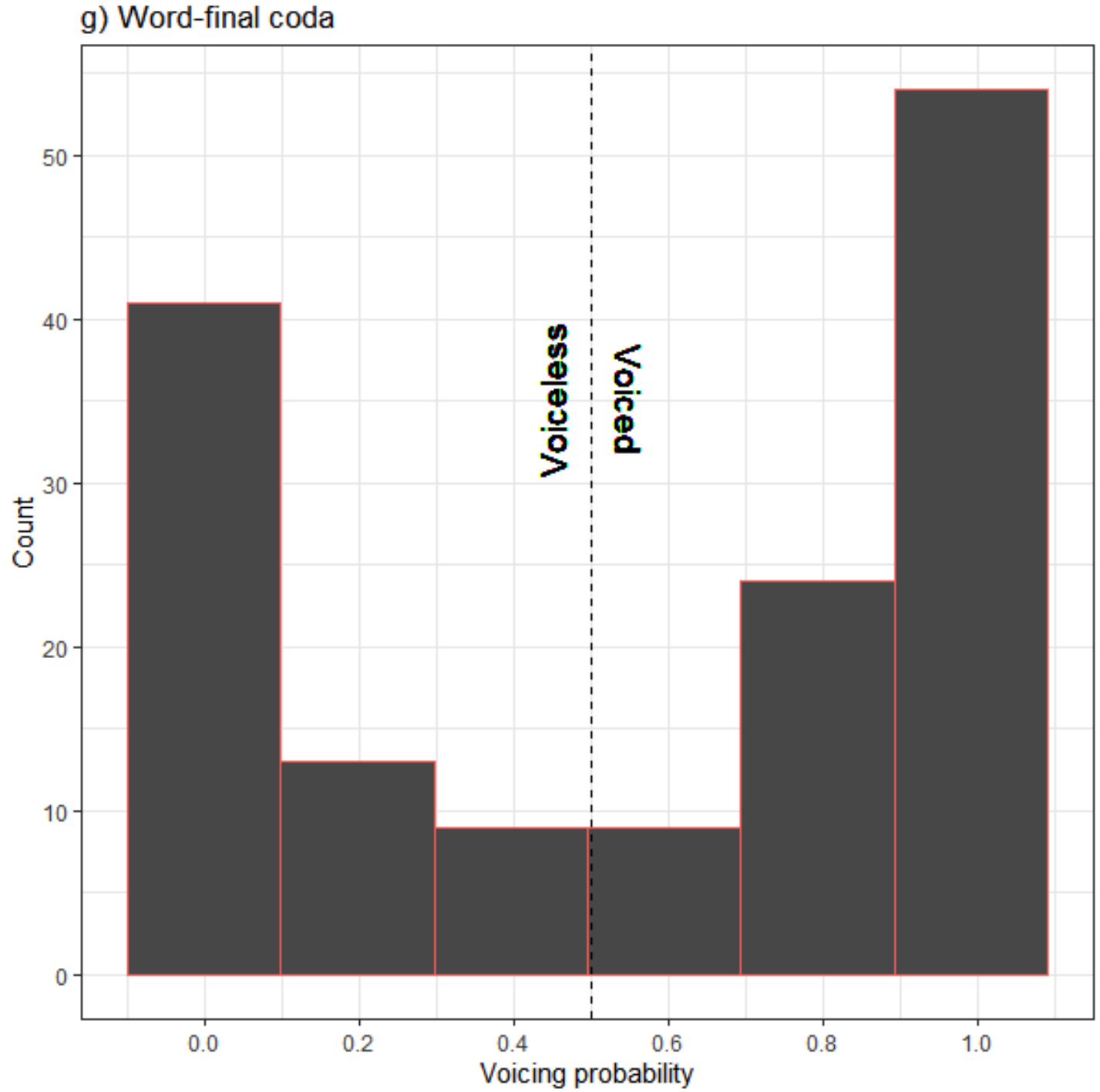
Voicing of initial and medial stops

- Optional phrase-initial devoicing.
- Regressive devoicing of oral stops followed by voiceless segments.
- Pre-sonorant oral stop voicing.



Voicing of final stops

- Word-final voicing.
- Gradient phrase-final devoicing.



2-Duration

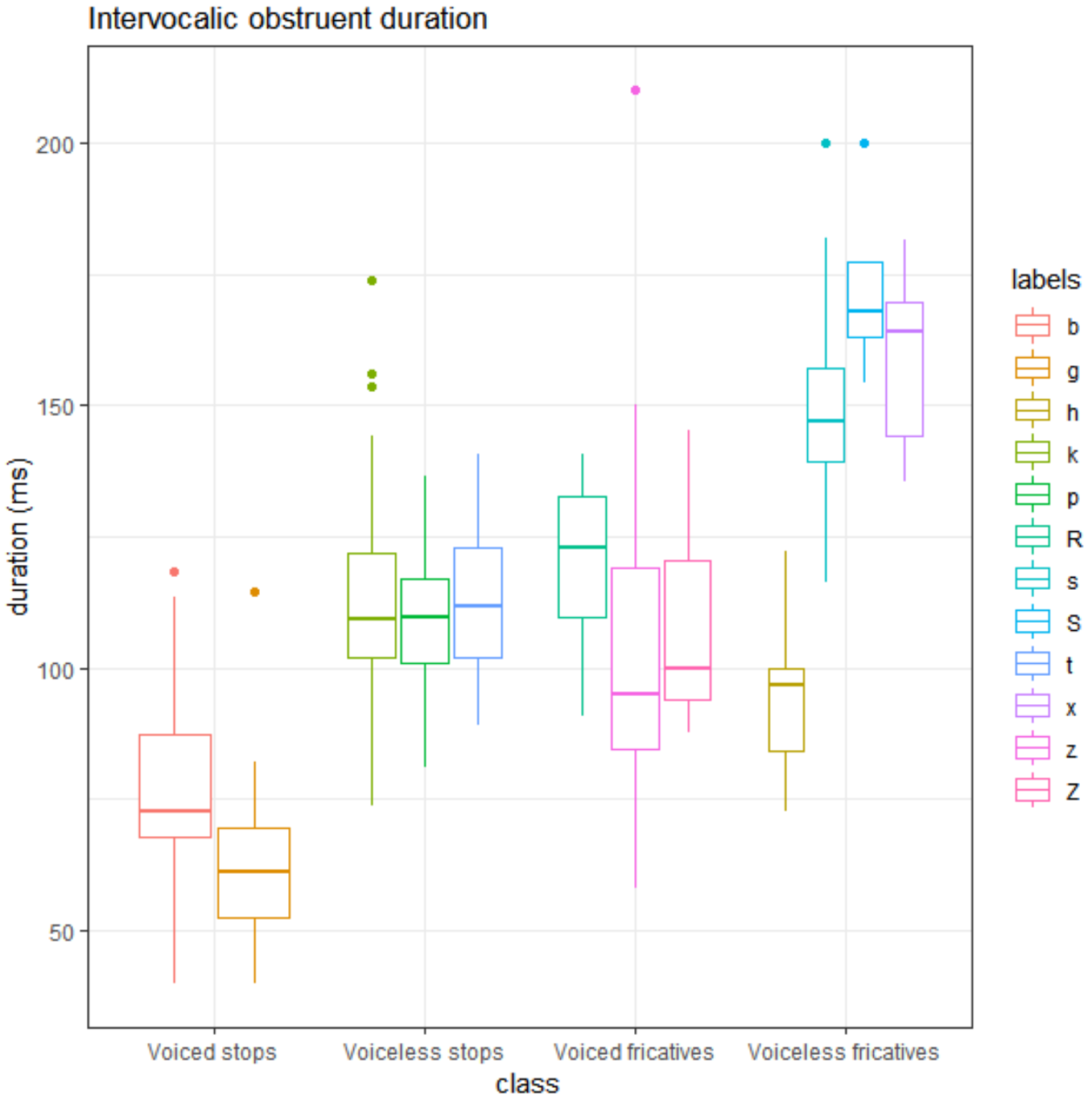
- Aim: To show that voiced stops have closure (are not taps or flaps).
- Expectation: Stops should have longer duration than taps or flaps, but shorter than other segments.
- All required segments only co-occur intervocalically.

- Methodology:
  - Manually hand correct all segment labels in the dataset.
  - Subtract the start point from the end point of each segment of interest.

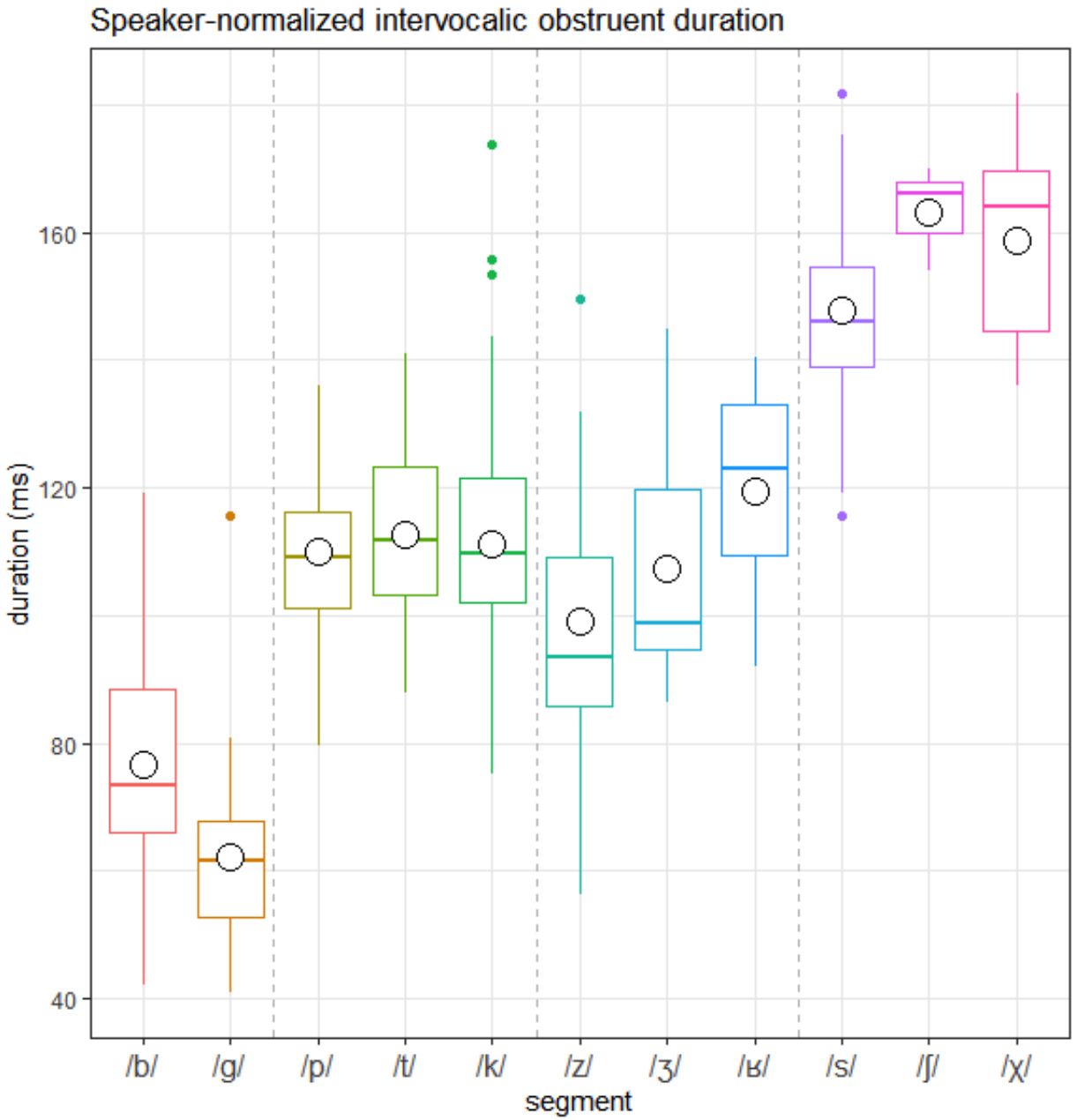
Duration of [b, g]

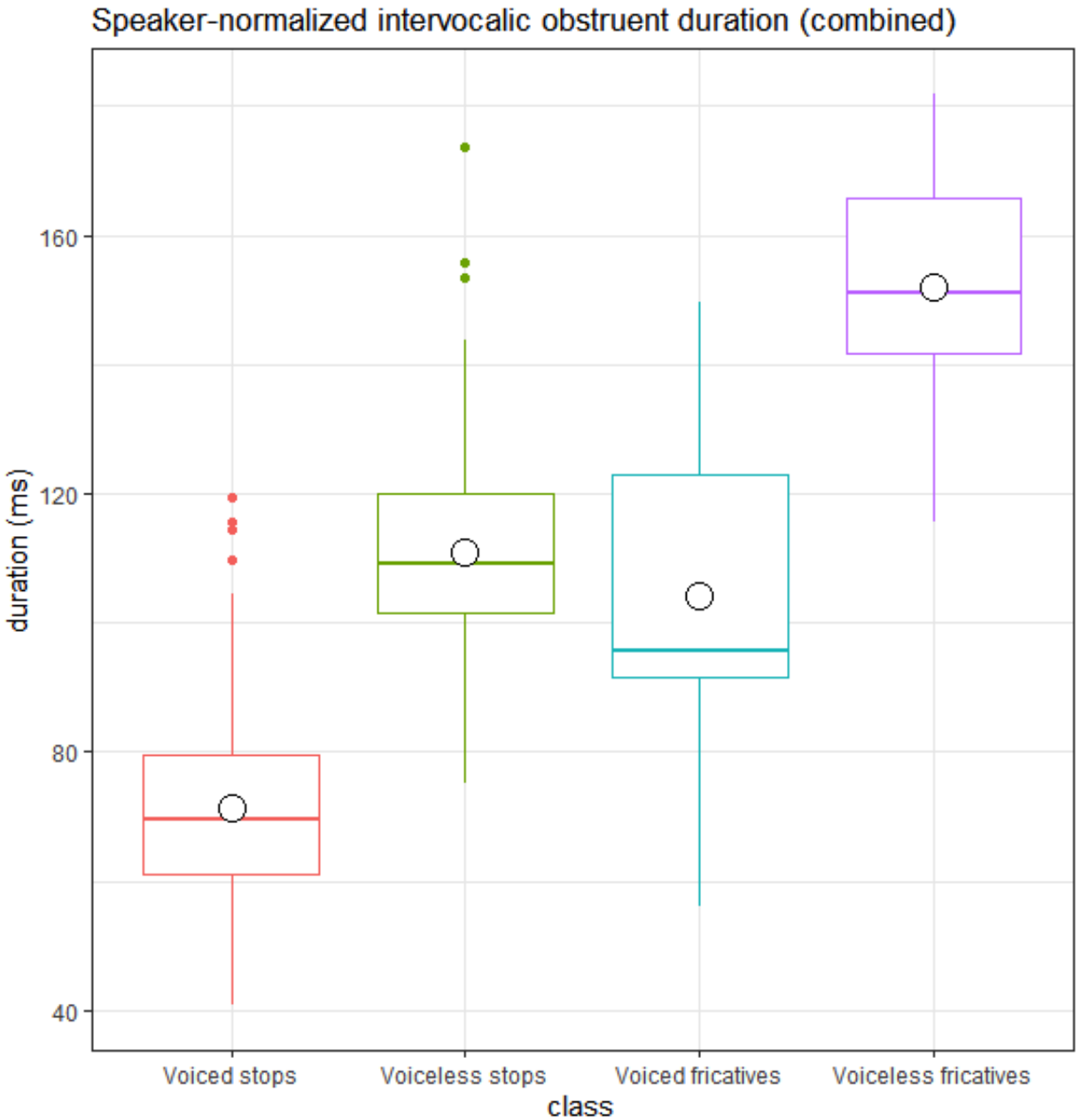
- Voiced stops have the shortest closure durations among obstruents, with their IQRs ranging from ~50 ms. (lowest for [g]) to ~85 ms. (highest for [b]).
  - Very rarely shorter than 50 ms.

- Flaps or taps would be expected to show much shorter closure durations (averaging around 20ms.).



Voiced stop duration





Comparison of the duration of different obstruents against [b] and [g]

Linear Hypothesis	Estimate	Std. Error	*z* value	*Pr*(> |*z*|)
g - b == 0	-13.6356	3.9749	-3.430	< 0.001
k - b == 0	35.0904	3.0892	11.359	< 0.001
p - b == 0	32.5055	3.3951	9.574	< 0.001
R - b == 0	40.5085	9.1923	4.407	< 0.001
s - b == 0	72.6519	4.2175	17.226	< 0.001
S - b == 0	87.2562	10.5256	8.290	< 0.001
t - b == 0	35.7116	4.2953	8.314	< 0.001
x - b == 0	83.1465	5.7934	14.352	< 0.001
z - b == 0	24.7052	4.6610	5.300	< 0.001
Z - b == 0	31.0778	5.2792	5.887	< 0.001
k - g == 0	48.7260	3.6550	13.331	< 0.001
p - g == 0	46.1411	3.8593	11.956	< 0.001
R - g == 0	54.1441	9.3850	5.769	< 0.001
s - g == 0	86.2875	4.6902	18.398	< 0.001
S - g == 0	100.8918	10.6962	9.432	< 0.001
t - g == 0	49.3471	4.6953	10.510	< 0.001
x - g == 0	96.7821	6.0956	15.877	< 0.001
z - g == 0	38.3407	5.0317	7.620	< 0.001
Z - g == 0	44.7133	5.6074	7.974	< 0.001

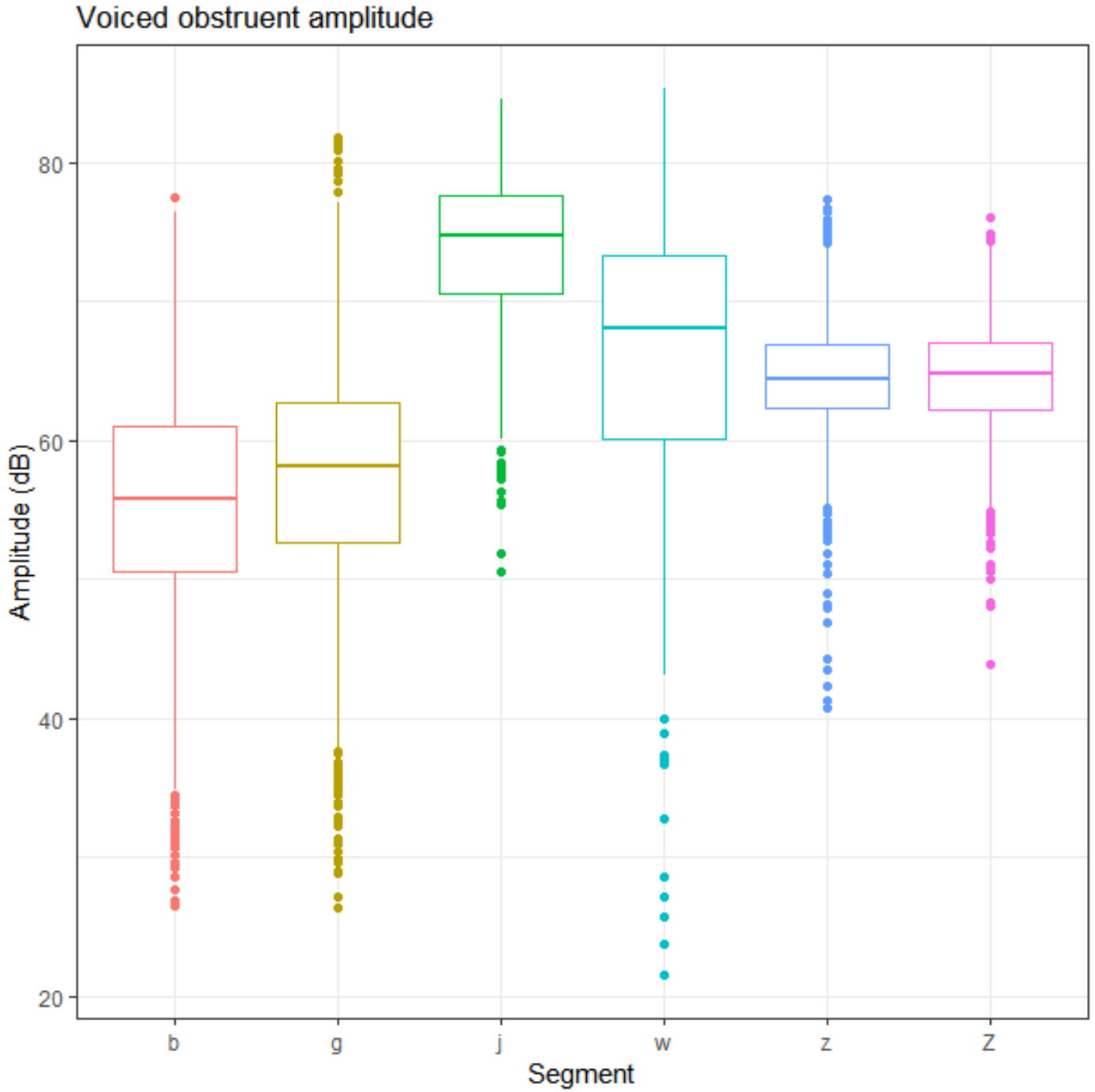
3-Amplitude

- Aim: Show that stops are stops (and not fricatives or glides).
- Expectation: Stops should have less spectral energy than fricatives.
- Data: Consonants that result from the proposed stop coda voicing process.
- Comparison between stops (299 tokens) & fricatives (219 tokens).

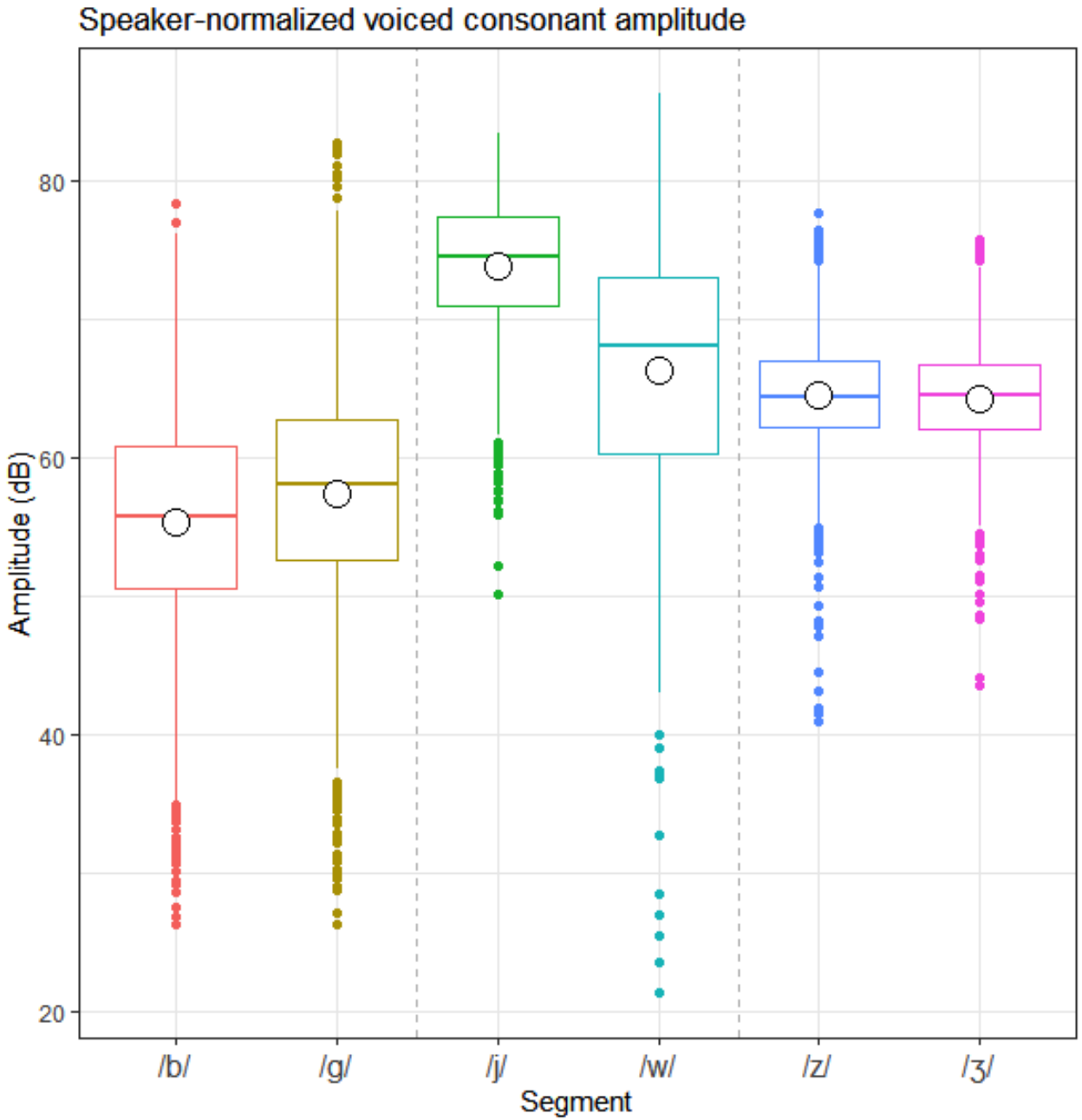
- Methodology:
  - High-pass filter (350 Hz).
  - Root mean square analysis (rms).

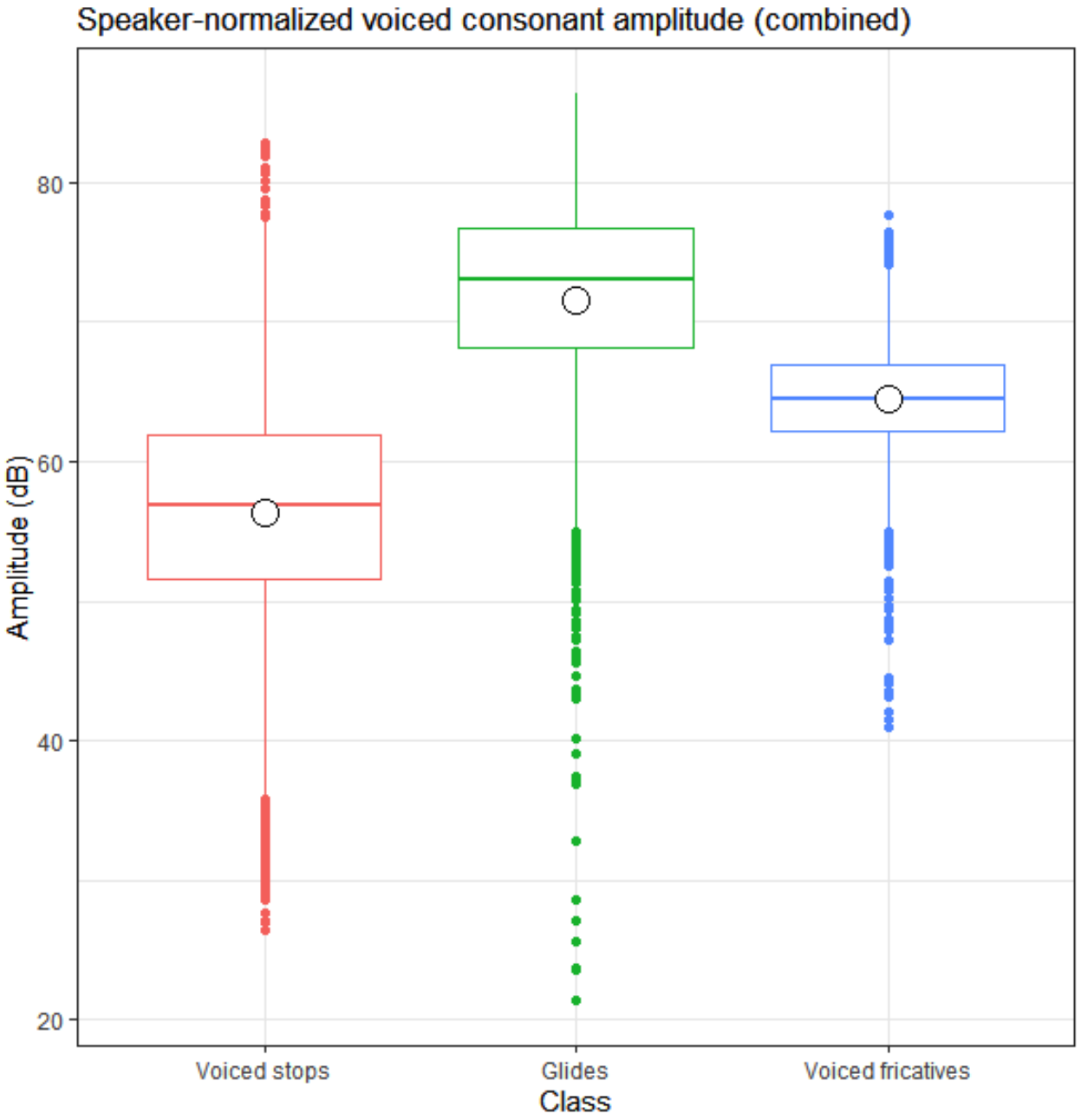
Amplitude of [b, g]

- [b] and [g] form a category of low energy sounds, consistent with their production as (voiced) oral stops.
- They are distinct from (voiced) fricatives and approximants.



Voiced stop amplitude





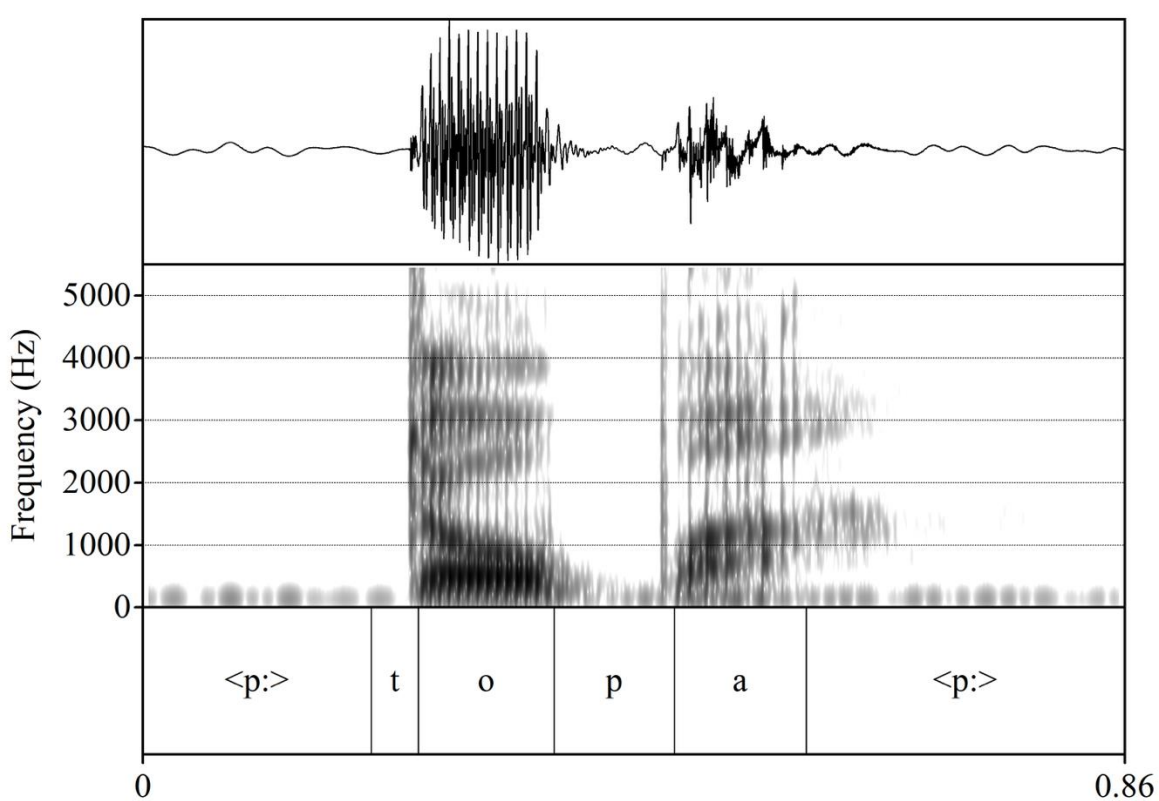
Comparison of the intensity of voiced consonants against [b] and [g]

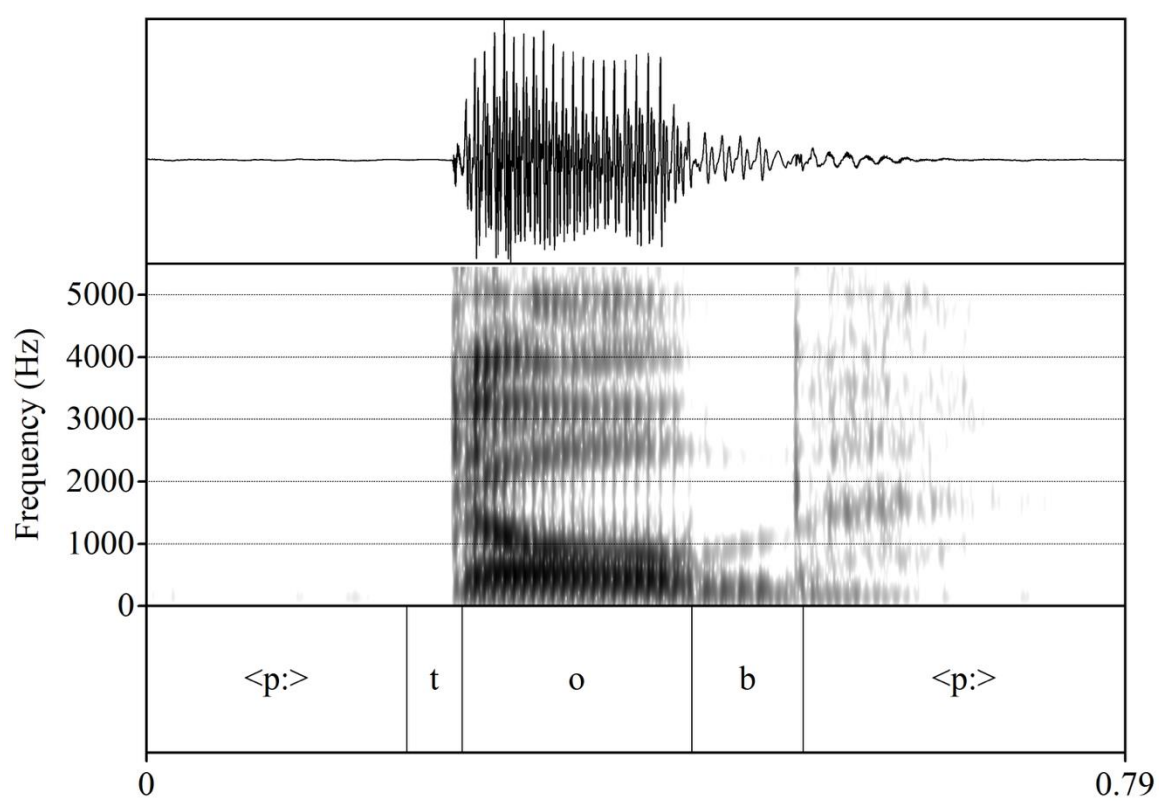
Linear Hypothesis	Estimate	Std. Error	*z* value	*Pr*(> |*z*|)
g - b == 0	2.1099	1.1627	1.815	0.074548
j - b == 0	18.1264	1.6735	10.832	< 0.001
w - b == 0	12.0250	1.4124	8.514	< 0.001
z - b == 0	8.2392	0.8380	9.832	< 0.001
Z - b == 0	9.0625	1.1301	8.019	< 0.001
j - g == 0	16.0165	2.5464	6.290	< 0.001
w - g == 0	9.9151	2.0854	4.755	< 0.001
z - g == 0	6.1294	1.5069	4.067	< 0.001
Z - g == 0	6.9526	1.7378	4.001	< 0.001

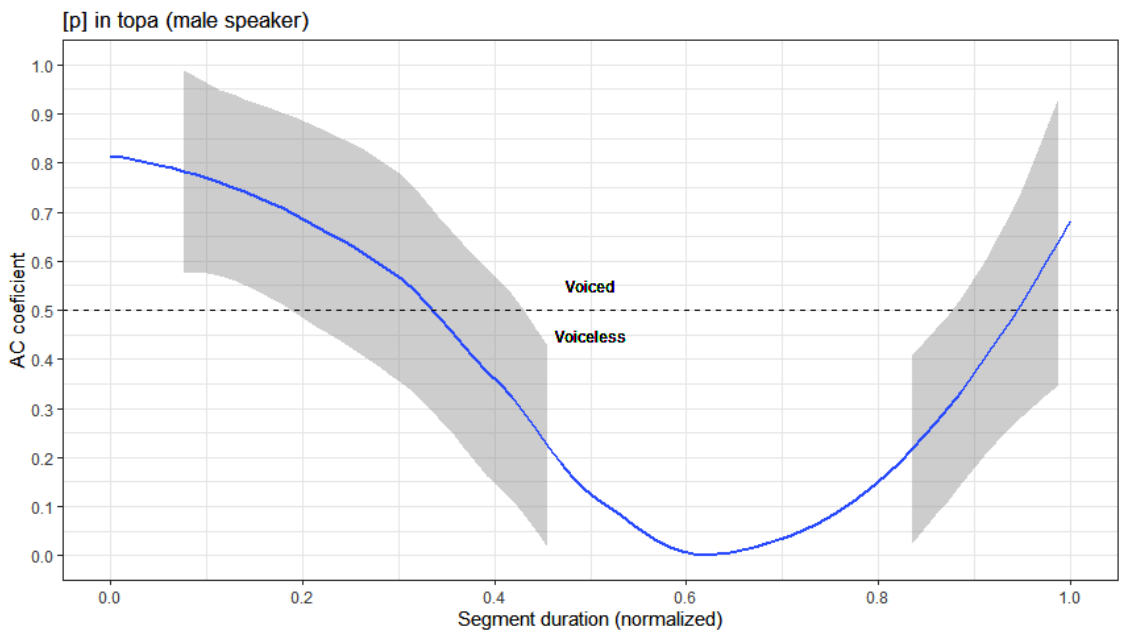
Final voicing as alternation

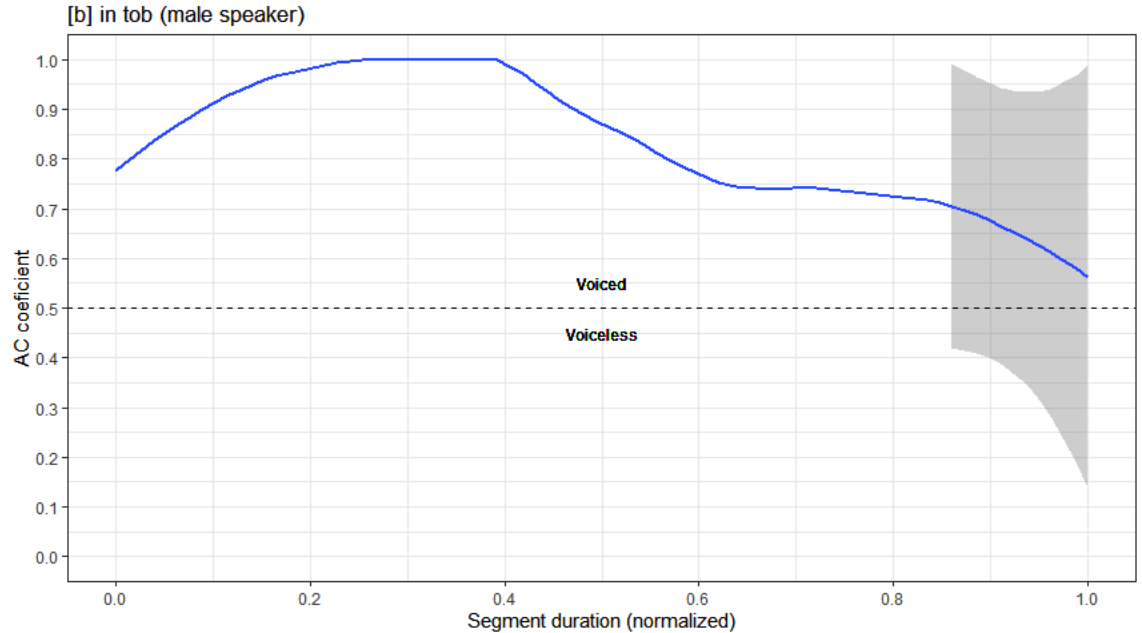
- Truncation results in /k, p/ pronounced as [g, b] in coda position.

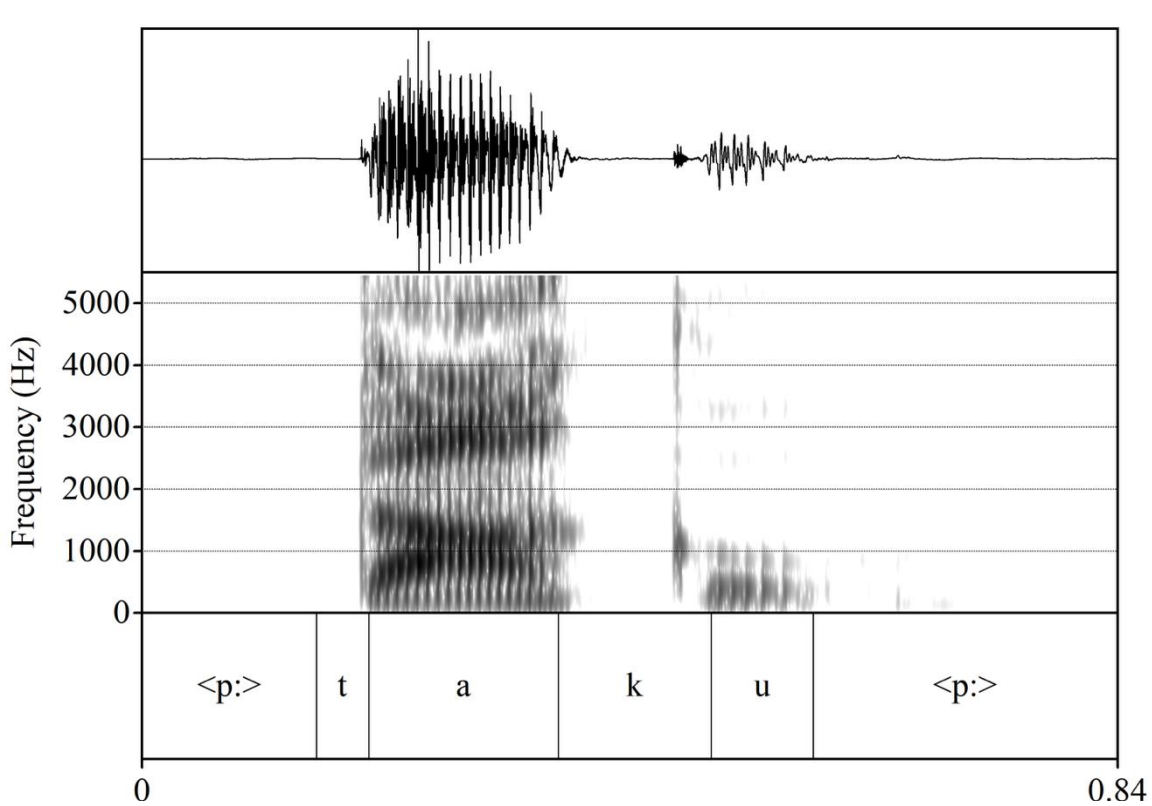
- How does voicing alternation look like in morpheme-alternant pairs?
  - Intervocalic instances of /k/ and /p/: Typically voiceless.
  - Phrase-finally and pre-consonantally: Often voiced.
    - Even in non-voicing contexts (word-final, before voiceless consonants).


Frequency (Hz)
5000
4000
3000
2000
1000
0
<p:>
t
o
p
a
<p:>
0
0.86

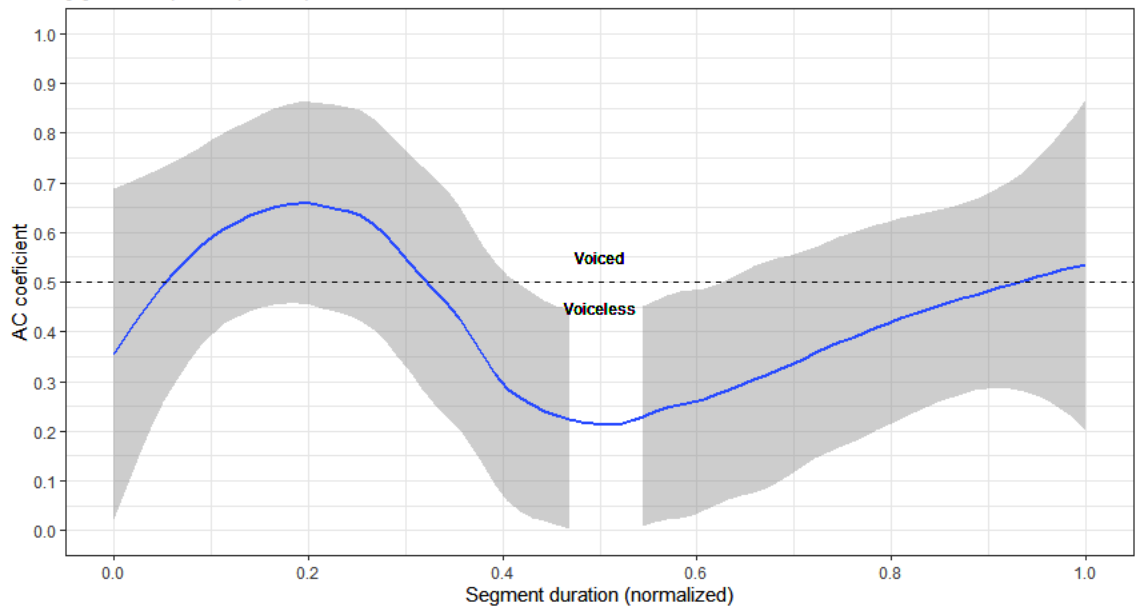

Frequency (Hz)
5000
4000
3000
2000
1000
0
<p:>
t
o
b
<p:>
0
0.79

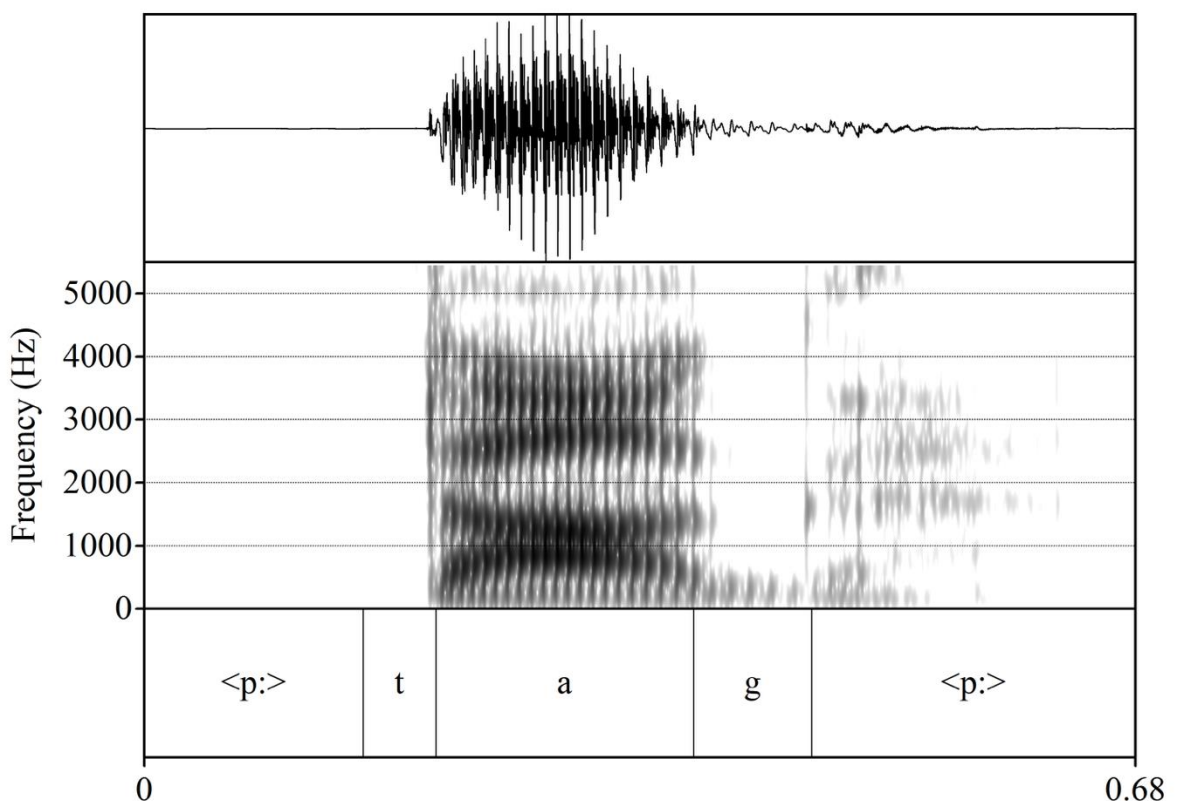

[p] in topa (male speaker)
AC coeficient
Voiced
Voiceless
Segment duration (normalized)


[b] in tob (male speaker)
AC coeficient
Voiced
Voiceless
Segment duration (normalized)

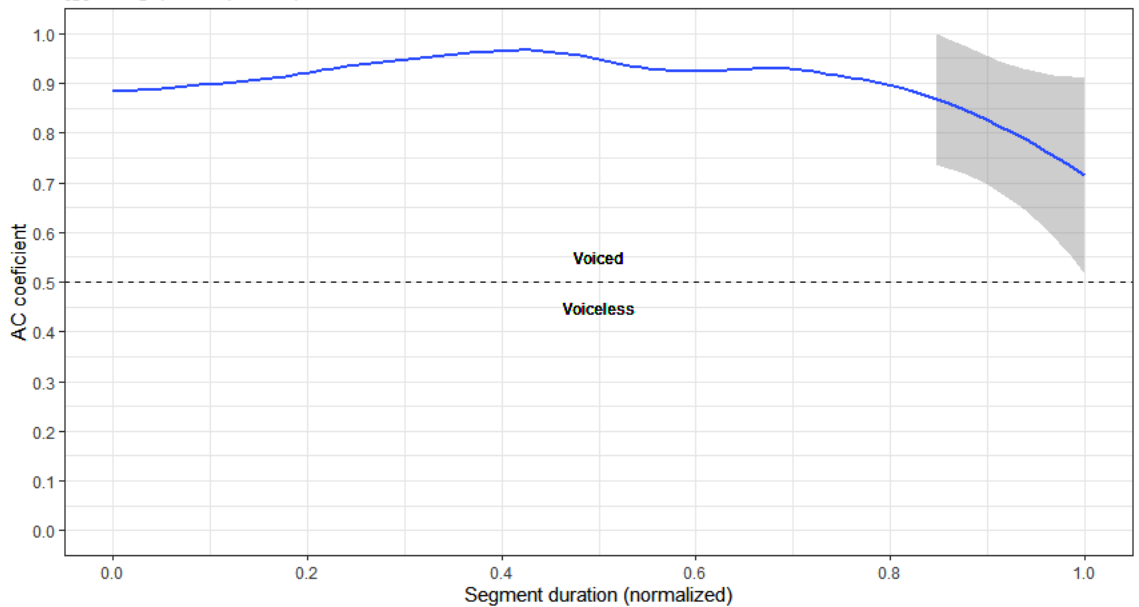


[k] in taku (male speaker)

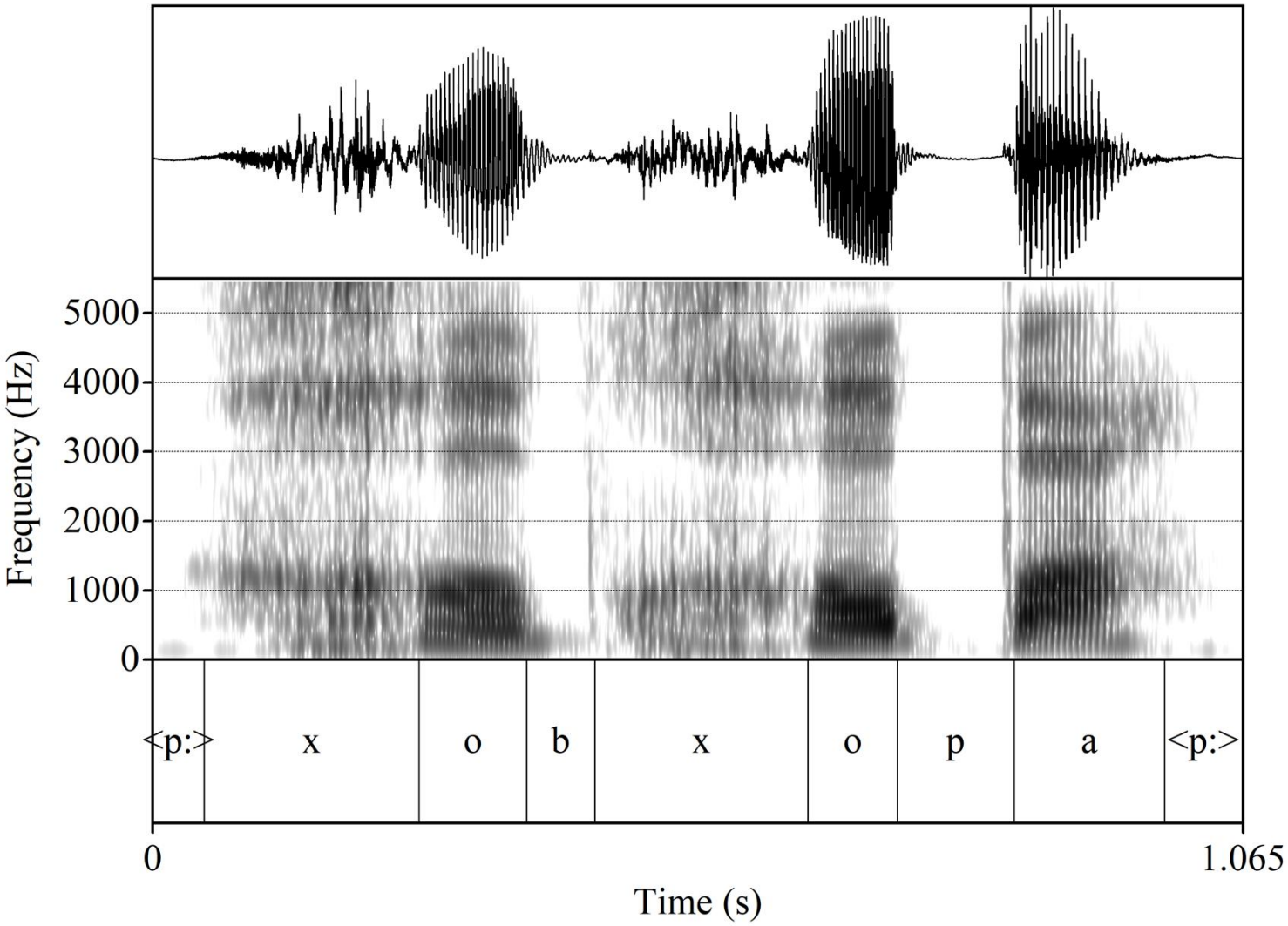


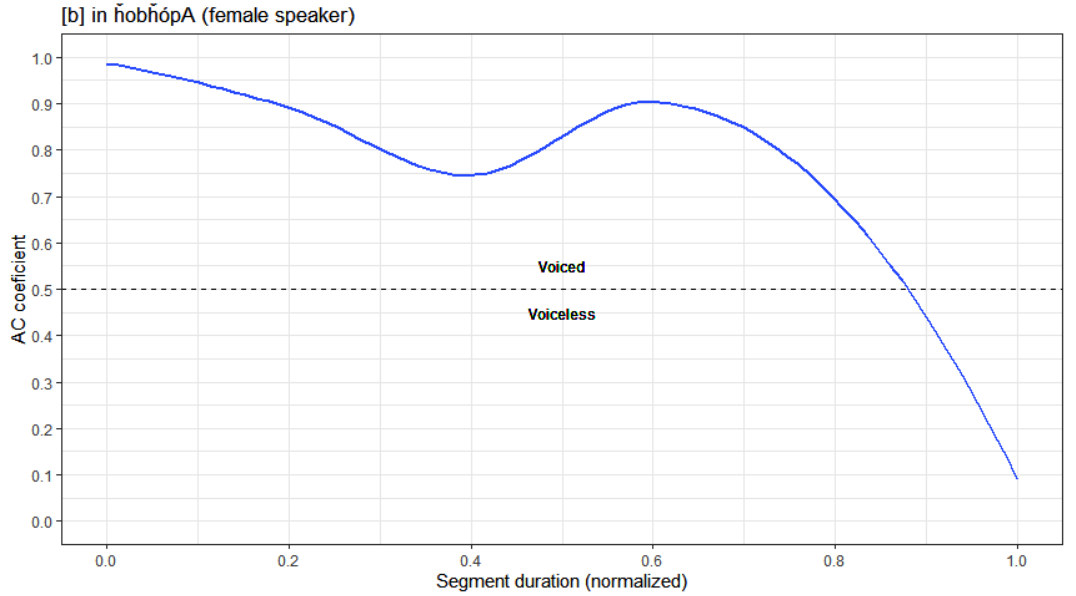


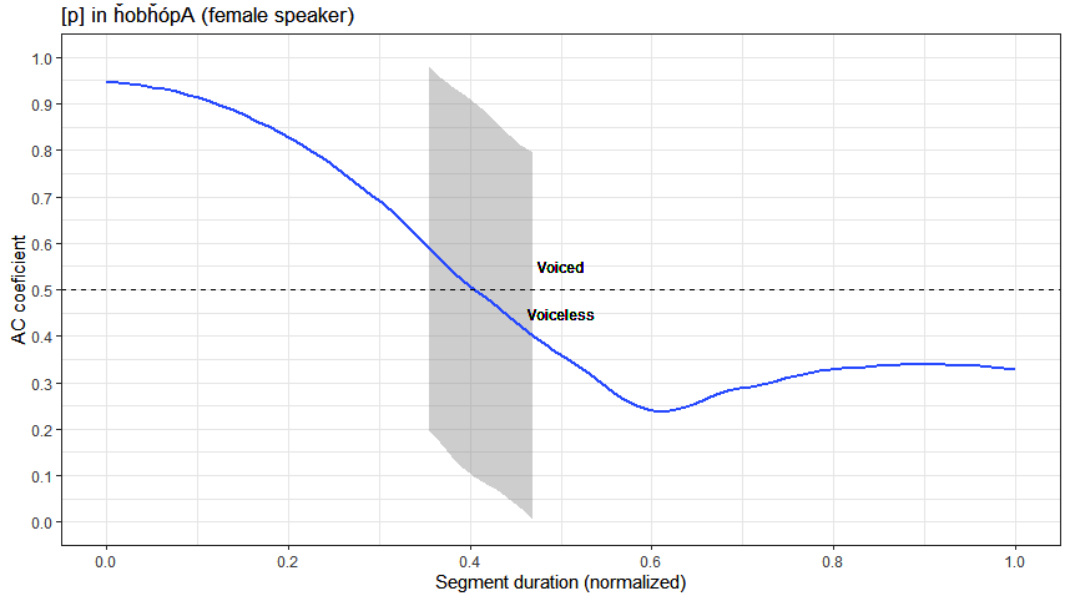
[g] in tag (male speaker)



Reduplication







How did final obstruent voicing develop diachronically?

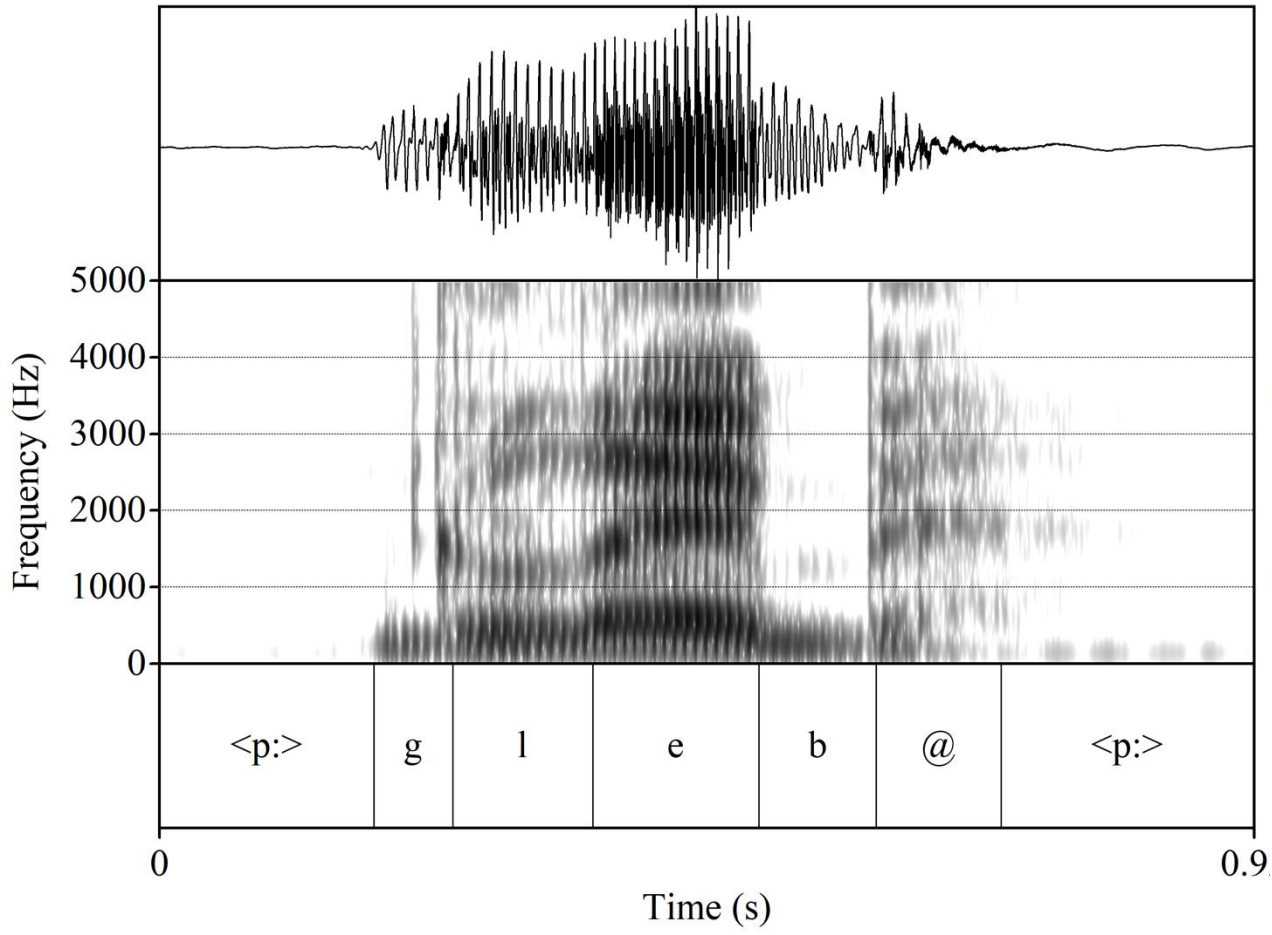
Kiparsky (2006):

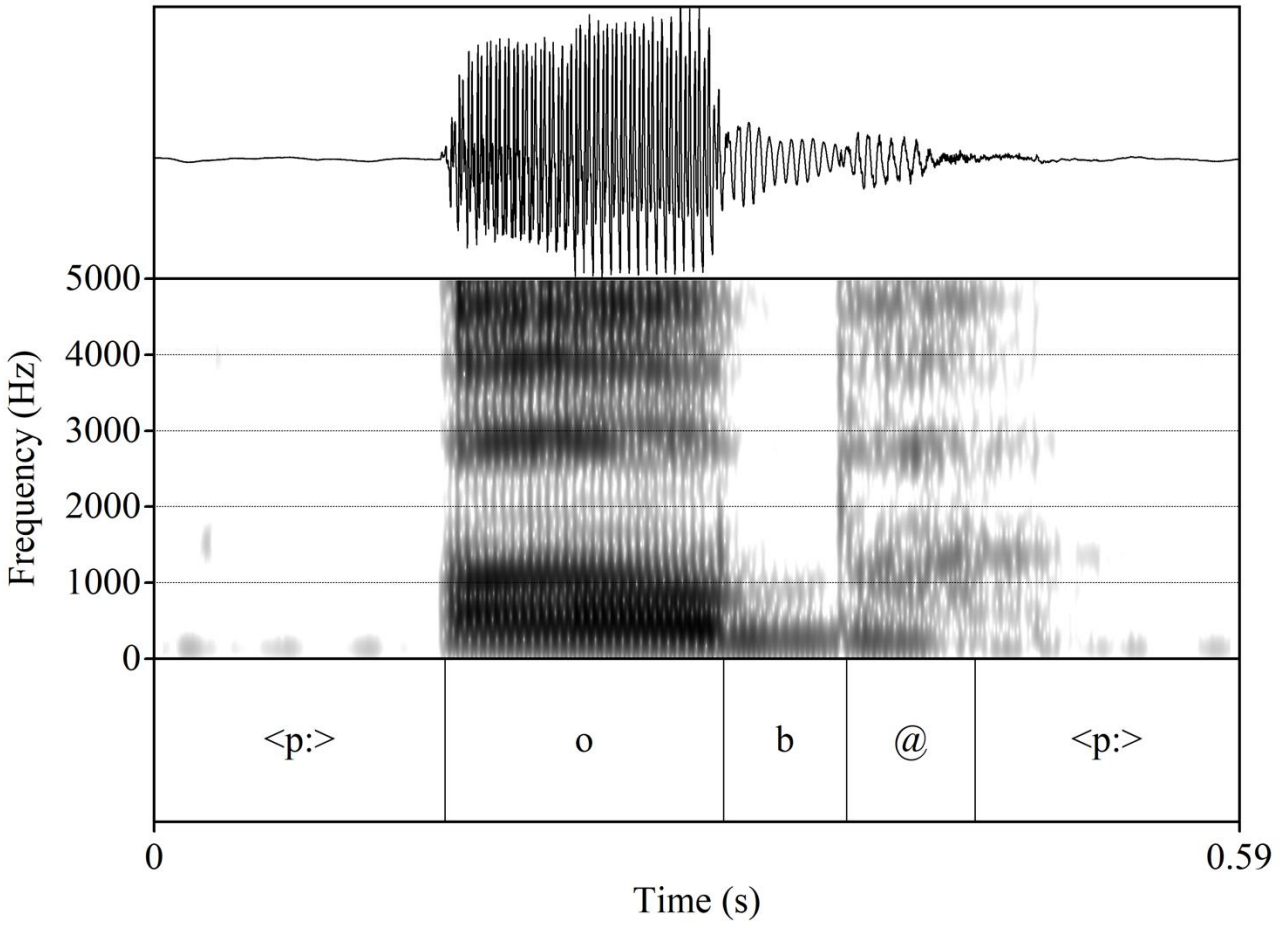
- Were there no grammatical markedness constraint against final obstruent voicing, it could easily evolve by the succession of two independently common sound changes:
  - (i) intervocalic voicing VTV > VDV
  - (ii) final vowel loss VDV# > VD#
- Since he finds no clear cases of this…

↳ phonological markedness constraints.

Well…

Final vowel devoicing, with anticipation of the voicing gesture to the previous obstruent





Proto-Siouan consonants

	LABIAL	DENTAL	PALATAL	VELAR	GLOTTAL
STOPS					
voiceless					
unaspirated	*p	*t		*k	
(postaspirated)	(*ph)	(*th)		(*kh)	
(preaspirated)	(*hp)	(*ht)		(*hk)	
(glottalized)	(*p’)	(*t’)		(*k’)	*’ = [ʔ]
FRICATIVES					
voiceless		*s	*š	*x	*h
(glottalized)		(*s’)	(*š’)	(*x’)	
RESONANTS					
sonorant	*w	*r	*y		
obstruent	*W = [b]?	*R = [d]?			

Proposed sound change(s)

- Intervocalic stop voicing concomitant with vowel reduction due to the anticipatory coarticulation of the final vowel gesture.

- We suggest Lakota /l/ < Proto-Lakota *d.

- The synchronic alternation of /p/, /t/, /k/ with [b], [l], [g] reflected a uniform historical voicing of oral stops /p/, /t/,/k/ > [b], [d], [g].
  - The *d > l sound change obscured it.

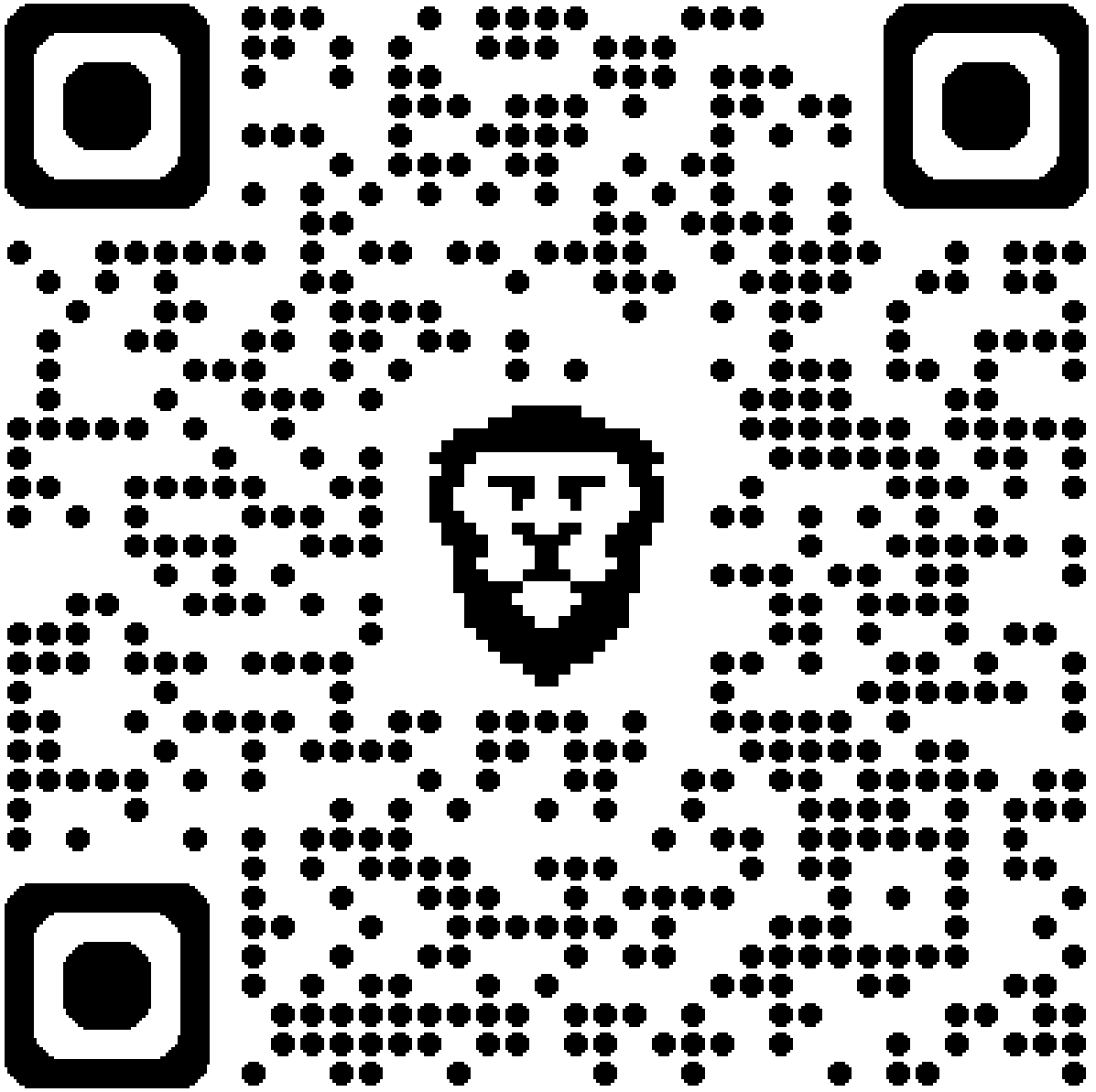
Conclusions

- Lakota oral stops /p/ and /k/ are synchronically voiced in coda position.
- Devoicing processes:
  - phrase-final gradient devoicing.
  - assimilation to voicelessness before voiceless obstruents and /h/.
  - devoicing with optional fusion with a following glottal stop.
- Acoustically, voiced coda stops have the expected closure durations, absence of fricative noise, release bursts, and low energy levels.
- In sum, there is acoustic evidence that Lakota has a synchronic sound pattern of oral stop coda voicing, supporting the impressionistic descriptions of earlier researchers.

Today's paper:

Blevins, J., A. Egurtzegi & J. Ullrich. 2020. Final obstruent voicing in Lakota: Phonetic evidence and phonological implications. *Language* 96.2, 294–337.

Open access here:
https://egurtzegi.github.io/papers/BlevinsetalReduced.pdf

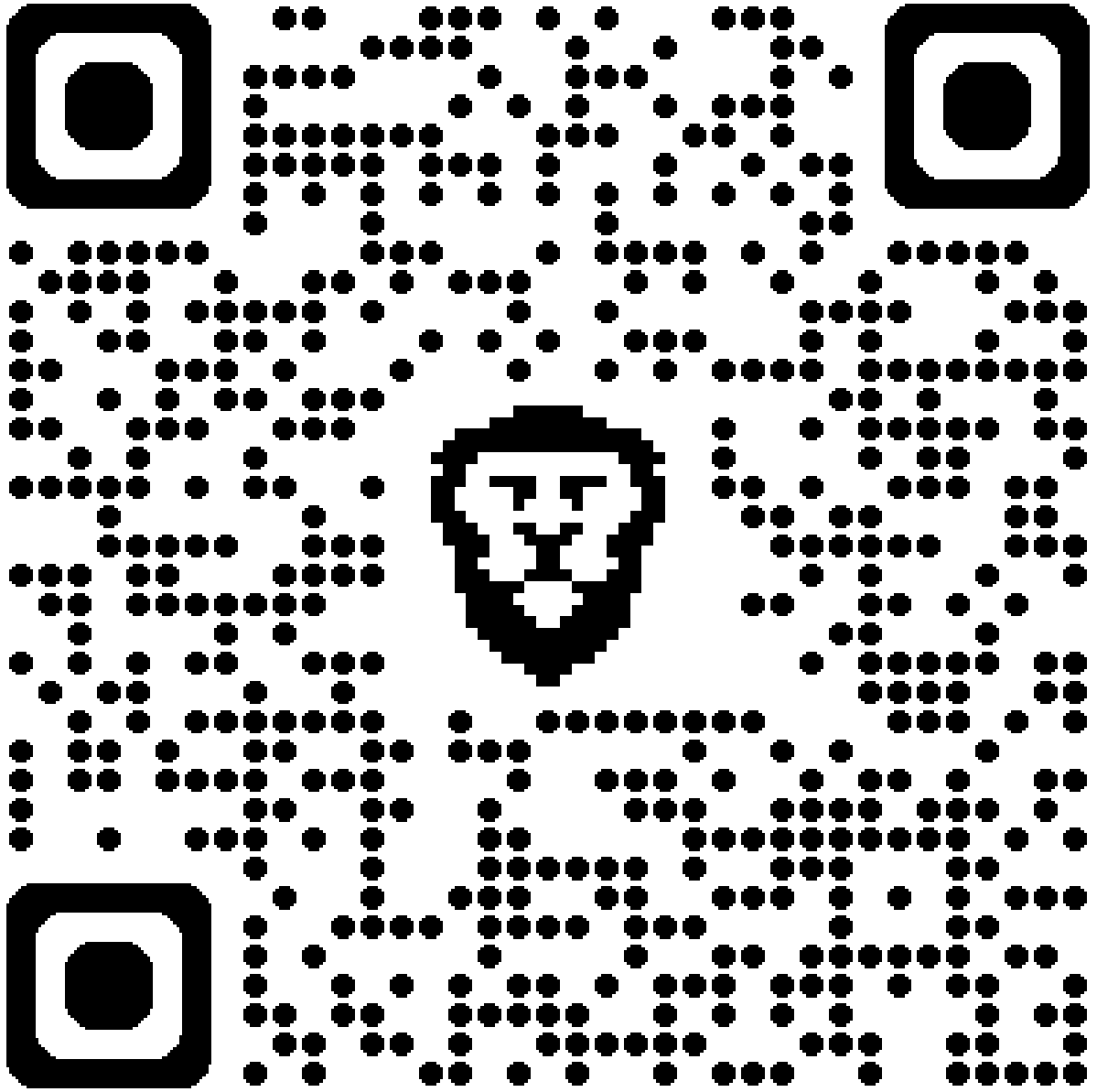


All papers are freely accessible here: egurtzegi.github.io/publications

Next paper:

Egurtzegi, A. & G. Elordieta. 2023. A history of the Basque prosodic systems. *Diachronica* 40.1, 30-72.

Open access here: https://www.jbe-platform.com/content/journals/10.1075/dia.20066.egu



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