


Gradient effects and contrast preservation in Spanish lenition

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The Spanish of Gran Canaria

- ❑ advanced weakening
 - ❑ voicing, approximantisation and deletion of post-vocalic /p t k/
 - ❑ approximantisation and deletion of post-vocalic /b d g/
- ❑ partial phonemic overlap
- ❑ phonological effects
 - ❑ syllable-final consonant deletion
 - ❑ derived vs. underlying contexts of lenition

The Spanish of Gran Canaria

UR	context	example	voiceless stop	voiced stop	approximant	∅
/p/	word-medial	<i>guapo</i> ‘pretty’	[ˈgwa.po]	[ˈgwa.bo]	[ˈgwa.β̞o]	[ˈgwa.o]
	word-initial	<i>se parece</i> ‘is similar’	[se.pa.ˈre.se]	[se.ba.ˈre.se]	[se.β̞a.ˈre.se]	[se.a.ˈre.se]
	deletion	<i>después</i> ‘afterwards’	[de.ˈpwe]	[de.ˈbwe]	[de.ˈβ̞we]	
/b/	word-medial	<i>cabeza</i> ‘head’			[ka.ˈβ̞esa]	[ka.ˈesa]
	word-initial	<i>la vela</i> ‘the candle’		[la.ˈbe.la]	[la.ˈβ̞ela]	[la.ˈela]
	deletion	<i>las velas</i> ‘the candles’	[la.ˈpe.la]	[la.ˈbe.la]	[la.ˈβ̞ela]	

Research questions

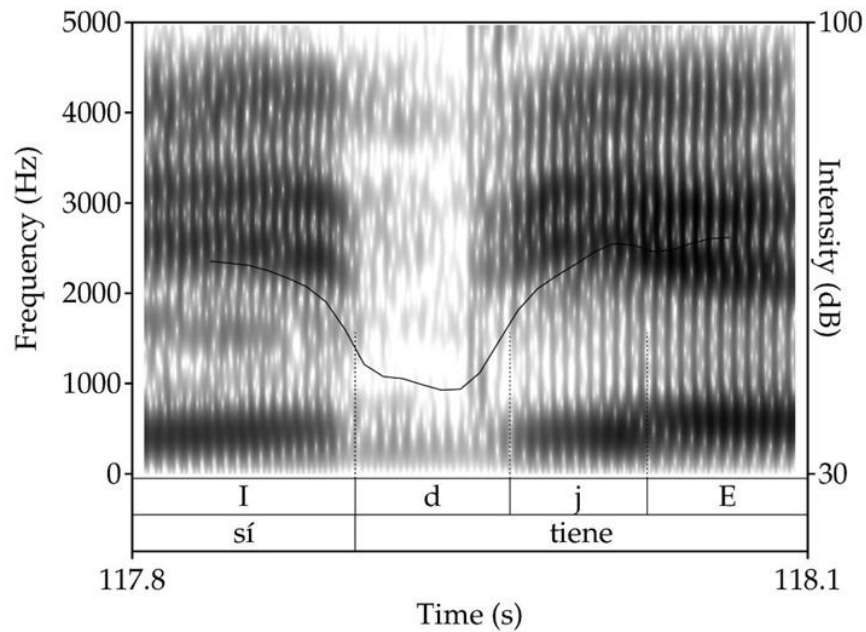
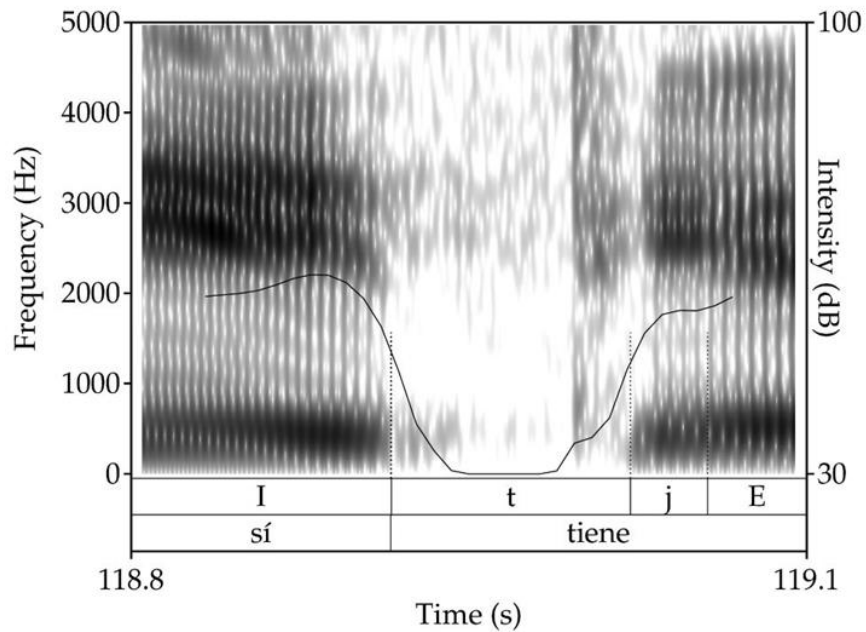
- ❑ How systematic are the differences between surface sounds?
- ❑ Are underlying contrasts preserved?
- ❑ Which factors influence surface variation?
- ❑ Is harmonics-to-noise ratio a suitable parameter for analysing lenition?

The corpus

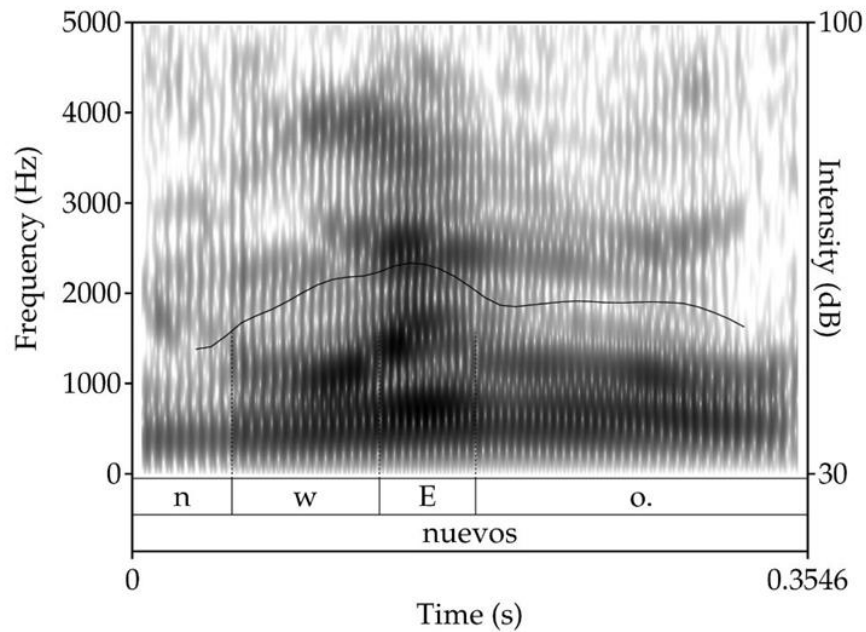
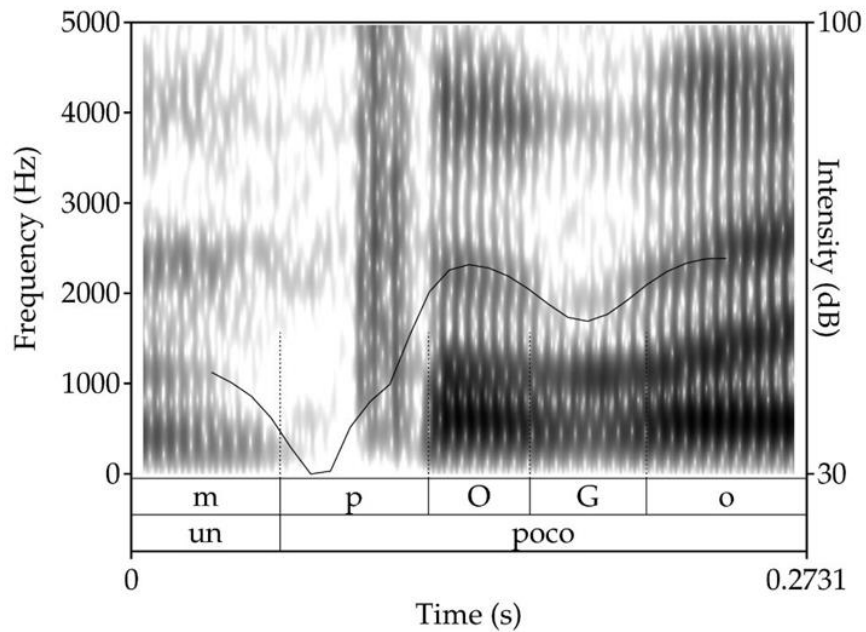
- 44 native speakers from the north of Gran Canaria (18 females)
- aged 16-79
- semi-structured interviews
- Zoom H4N digital recorder + Shure SM10a headworn microphone, 44,100 Hz
- 4,481 sentences, 111,317 phones
- **16,454** post-vocalic /p t k b d g/
- 13,668 lenited segments and 2,786 deletions



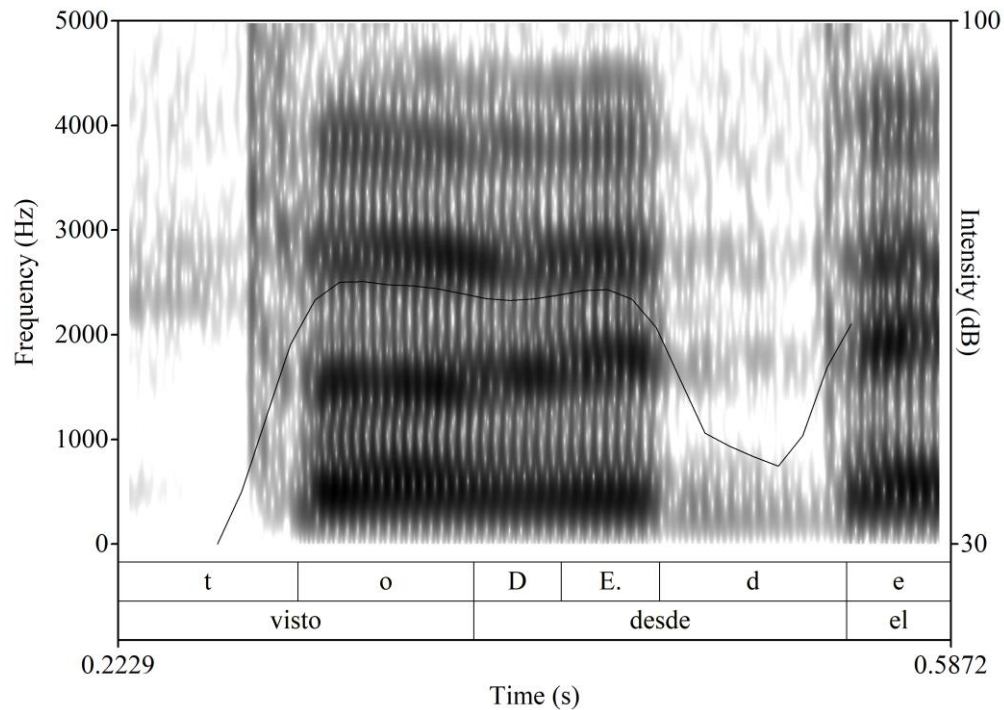
Examples from the corpus



Examples from the corpus



Examples from the corpus



Measurements

- ❑ **intensity difference** (max intensity of the preceding vowel - min intensity of the target segment)
 - ❑ Martínez & Regueira (2008), Figueroa & Evans (2015)
- ❑ **relative sound duration** (C/VC duration)
 - ❑ Dalcher (2008), modified version
- ❑ **harmonics-to-noise ratio** (degree of acoustic periodicity of a sound, 20dB equals 99% of periodicity vs noise)
 - ❑ Bárkányi & Kiss (2010)

Expectations

- ❑ smaller intensity difference => **greater lenition**
- ❑ shorter relative duration => **greater lenition**
- ❑ higher harmonics-to-noise ratio => **greater lenition**

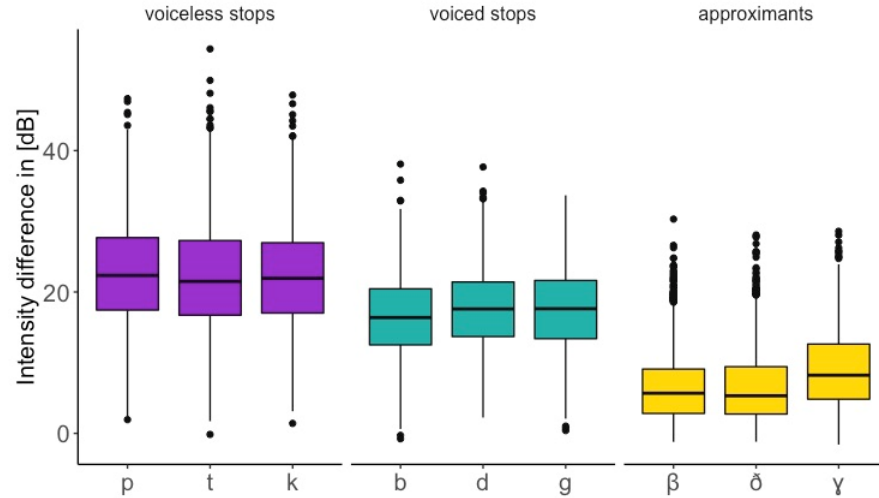
Factors promoting lenition:

- ❑ underlying /bdg/
- ❑ no deletion contexts
- ❑ unstressed syllables
- ❑ function words
- ❑ word-internal position
- ❑ preceding low and mid vowels
- ❑ following vowel or liquid
- ❑ dorsals

Statistics

- ❑ Linear mixed models
- ❑ Dependent variables
 - ❑ intensity, HNR and duration
- ❑ Selected fixed effects
 - ❑ Sound output groups (voiceless stops, voiced stops, approximants)
 - ❑ Underlying output groups (voiceless stops, voiced stops)
- ❑ Random structure: participant, item and their random slopes

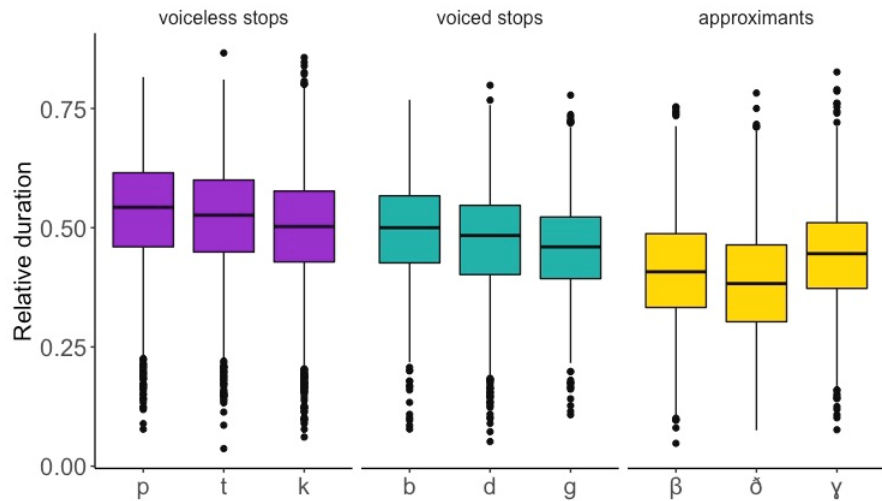
Results



voiceless stops vs. voiced stops:
 $\beta = 5.09$, $t = 36.53$, $p < 0.001$
voiced stops vs. approximants:
 $\beta = 7.45$, $t = 51.11$, $p < 0.001$

Fig.1: Intensity difference of surface sounds

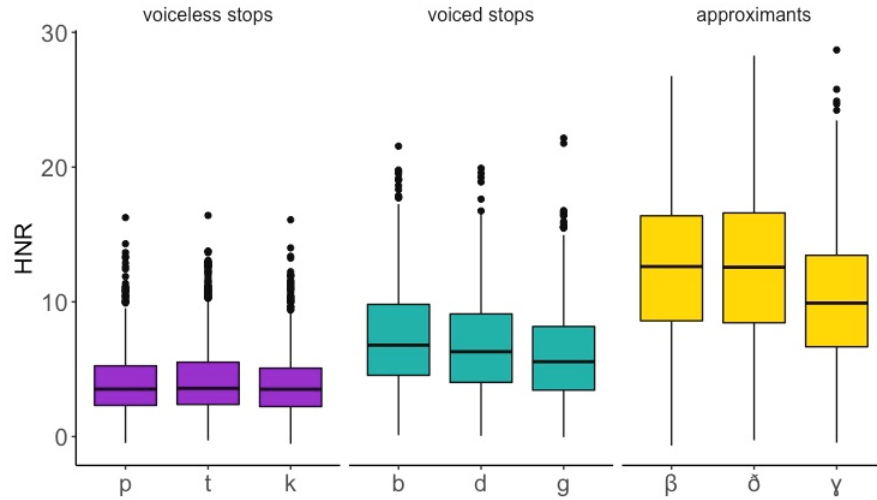
Results



voiceless stops vs. voiced stops:
 $\beta=0.009$, $t = 1.951$, $p = 0.140$ (n.s.)
voiced stops vs. approximants:
 $\beta = 0.019$, $t=3.583$, $p < 0.01$

Fig.2: Relative duration of surface sounds

Results



voiceless stops vs. voiced stops:
 $\beta = -1.88$, $t = -18.70$, $p < 0.001$;
voiced stops vs. approximants:
 $\beta = -4.14$, $t = -40.80$, $p < 0.001$

Fig.3: HNR of surface sounds

Results

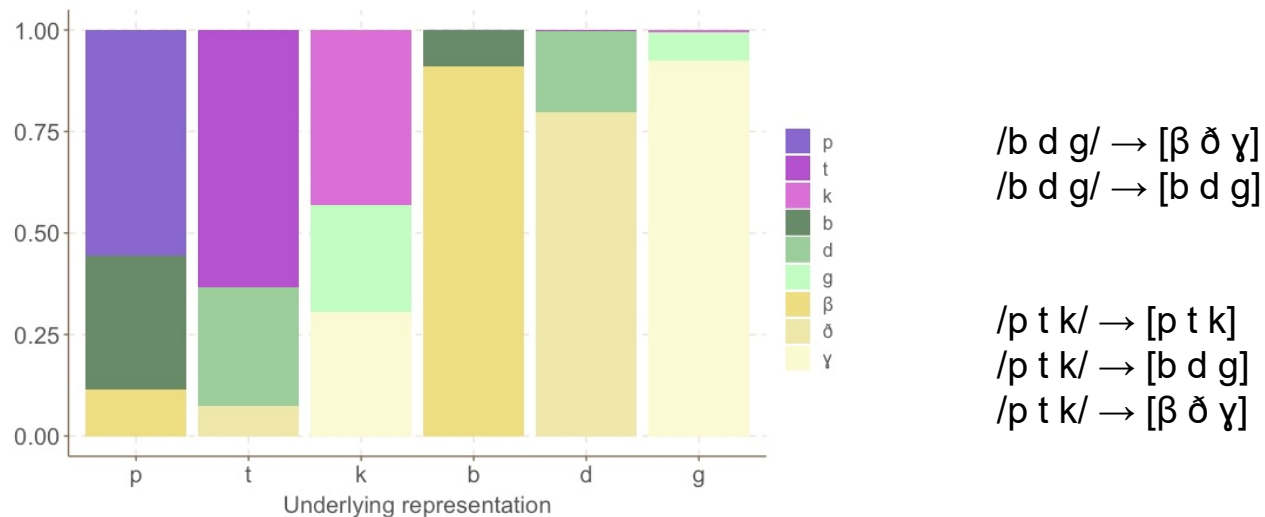


Fig.4: Frequency of occurrence of surface realisations of underlying /p t k b d g/

Results

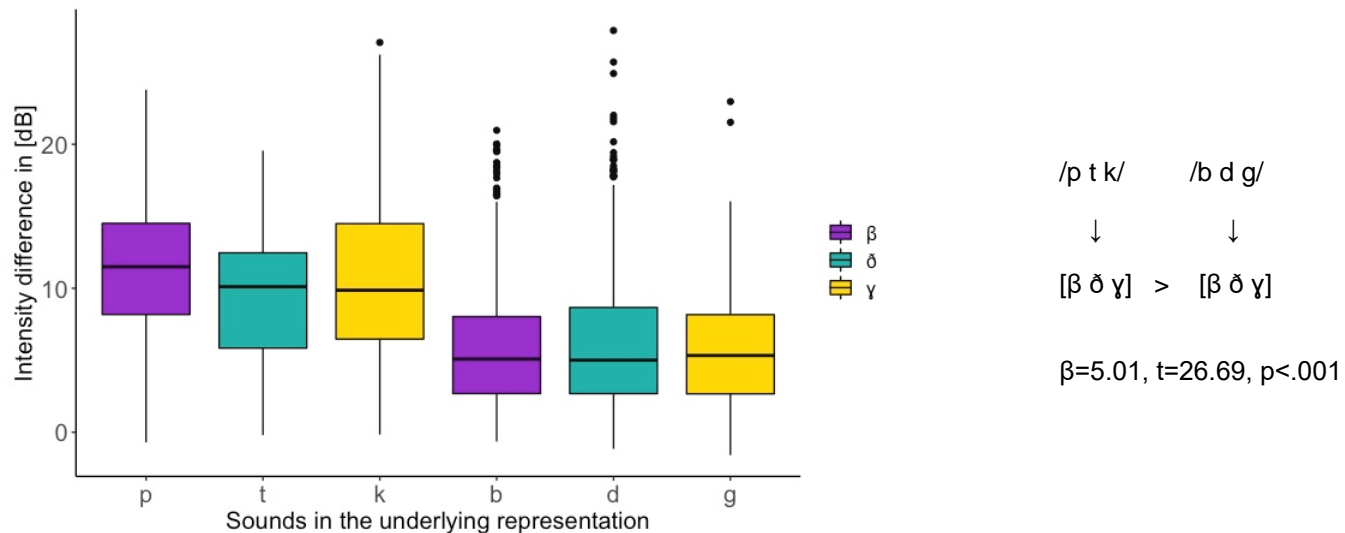
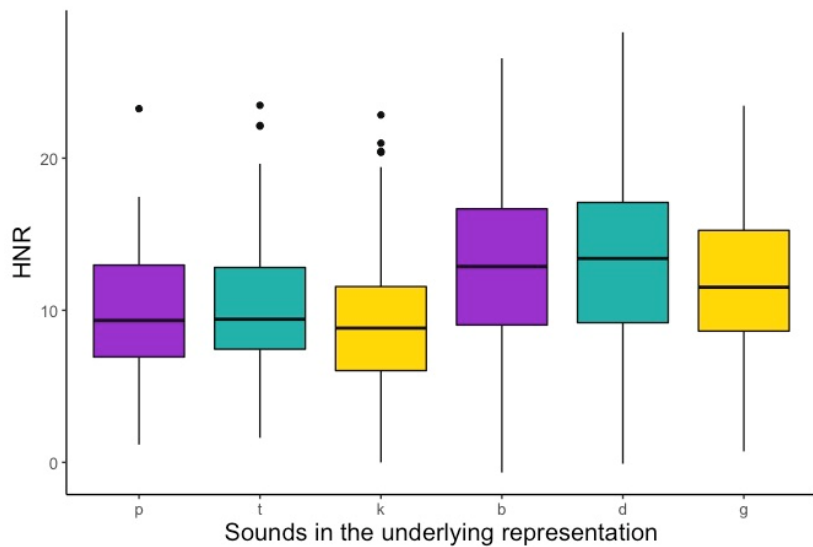


Fig.5. Intensity difference in approximants derived from underlying /p t k/ and those derived from /b d g/

Results



/p t k/ /b d g/

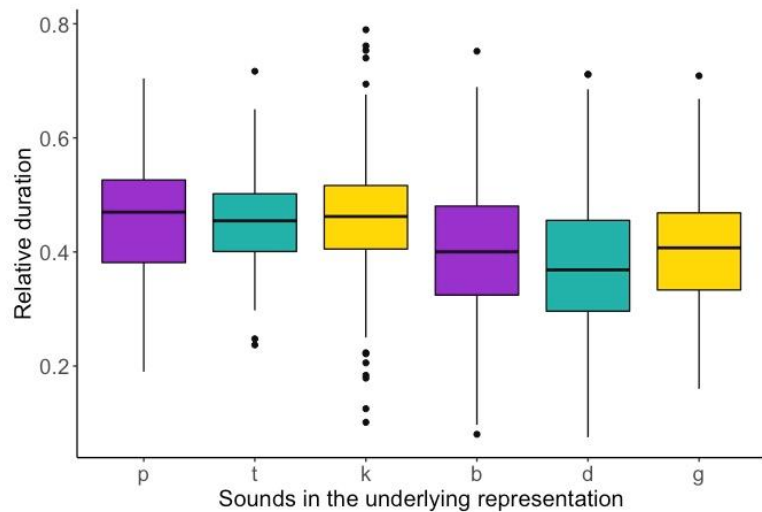
↓ ↓

[β δ γ] < [β δ γ]

$\beta = -2.86$, $t = -14.78$, $p < .001$

Fig.6. HNR in approximants derived from underlying /p t k/ and those derived from /b d g/

Results



/p t k/ /b d g/

↓ ↓

[β δ γ] > [β δ γ]

$\beta=0.077$, $t=16.36$, $p<.001$

Fig.7. Duration of approximants derived from underlying /p t k/ and those derived from /b d g/

Discussion

Six groups of sounds depending on the UR and on the phonological context:

0: [p t k] in post-deletion contexts

1: [p t k] in underlyingly postvocalic contexts

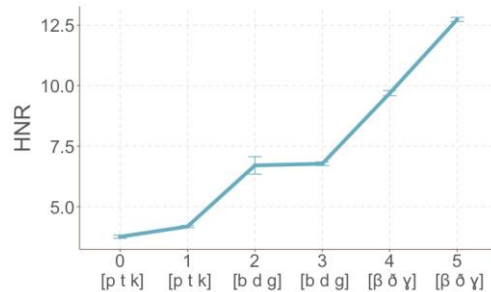
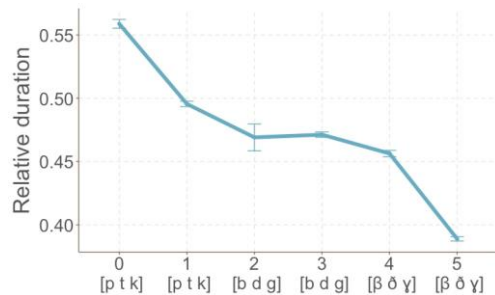
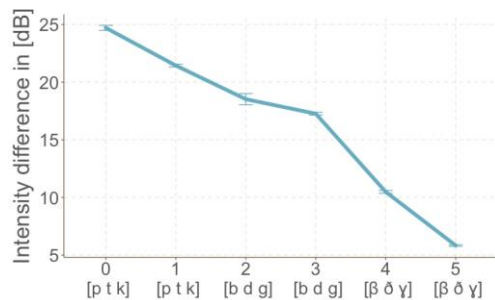
2: [b d g] in post-deletion context

3: [b d g] (coming from /p t k/ or /b d g/ in underlyingly postvocalic contexts)

4: [β ð ɣ] (as allophones of /p t k/ in any position or allophones of /b d g/ post-deletion)

5: [β ð ɣ] (as allophones of /b d g/ in underlyingly postvocalic contexts)

Results



Six different variants depending on the UR and on the phonological context

Our proposal based on the acoustic results: feature [aperture]

Fig.8. Intensity, HNR and duration of six surface variants of underlying /p t k b d g/ identified in the study

Answers to research questions

- ❑ How systematic are the differences between surface sounds?

There are significant differences in intensity, HNR and duration

- ❑ Are underlying contrasts preserved?

There are six different variants depending on the UR and the phonological context (consonant deletion): two types of [p t k], two types of [b d g] and two types of [β̣ ǰ̣ γ̣].

Answers to research questions

- ❑ Which factors influence surface variation?

lexical stress (unstressed syllable), position (word-medial), word type (function word), preceding vowel (/a/), UR (voiced stops), place of articulation (velar)

- ❑ Is harmonics-to-noise ratio a suitable parameter for analysing lenition?

HNR can be successfully used to predict lenition degree.


Summary

- ❑ Given systematic contrast preservation in the data despite gradient effects, traditional featural distinctions based on voicing and continuancy are insufficient to address weakening phonologically.
- ❑ Our proposal: **aperture**



Thank you!!!

Slides available at www.karolinabros.eu
For more details, see our publication:



*Phonological contrasts and gradient effects in ongoing lenition in the Spanish of Gran Canaria (to appear in *Phonology* 38: 1-40)*