

On the verge of phonetics and phonology: pre-sonorant voicing in Spanish

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Introduction

Pre-sonorant voicing, i.e. when a voiceless/devoiced obstruent assimilates to a following sonorant, has raised recurrent interest among phonologists mostly due to the apparent activity of a non-contrastively specified segment acting as a trigger in voicing assimilation.

- ▶ Pre-sonorant voicing is restricted to the word- (or syllable) final position.
- ▶ Pre-sonorant voicing occurs in languages with final devoicing, (partial) neutralisation.
- ▶ Pre-sonorant voicing is triggered either by sonorant consonants as well as vowels, or only by vowels or only by sonorant consonants.
- ▶ In a number of cases targets only subclasses of obstruents (mostly fricatives).
- ▶ Voiced obstruents are claimed to trigger more voicing than sonorants.
- ▶ There is no agreement among phonologists in the gradient or categorical nature of pre-sonorant voicing (or voicing assimilation in general).

/s/ voicing in Spanish

There is no /s/-/z/ contrast. Phonotactic restrictions: few potential devoicing and voicing assimilation (VA)/pre-sonorant voicing positions.

- ▶ Romero (1999) EMMA study with one speaker: no difference between within the word and across word-boundary; s+C[voice] inbetween single voiced and s+C[vless] "Spanish VA is not a categorical phenomenon". Voicing is consistently higher in labials than in velars and alveolars.
- ▶ Colina (2009) studies Ecuadorian S where final /s/ is unspecified and targetless vs. Northern Central Peninsular Spanish (NCPS) where it is unspecified, tries to capture the connection btw VA and Coda devoicing. Pre-vocalic /s/-voicing is gradient and variant.
- ▶ Schmidt-Willis (2011) study on Mexican Spanish: "the process is far from categorical". Does not treat pre-sonorant and pre-obstruent contexts separately. Does not consider the possibility of a categorical but optional process.
- ▶ Campos-Astorkiza (2012): VA is the result of gestural blending, still stress does not influence voicing, predicts that sonorants should trigger more VA than voiced obstruents.
- ▶ Strycharczuk (2012) studies Ecuadorian S: "/s/ voicing is optional but categorical for some speakers and gradient for others".

Research Questions

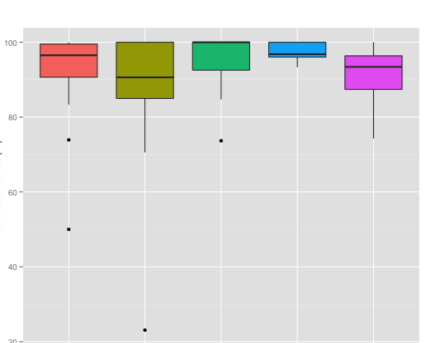
- ▶ Is there final devoicing in Spanish? (Experiment 1) If so, Spanish fits the above typology.
- ▶ Do sonorants trigger more /s/-voicing than voiced obstruents? (Experiment 2) If so, this supports gestural blending. (Note that voiced obstruents in this position are realised as narrow or wide approximants in Spanish.)
- ▶ Is /s/ voicing in NCPS categorical or gradient?

Methods

- ▶ 7 subjects (3 male, 4 female) aged 22-41 students and professors of the University of Oviedo
- ▶ Laboratory speech, 5 readings (first familiarisation and discarded)
- ▶ SpeechRecorder in randomised order, Sony ECM-MS907 microphone, M-Audio MobilePre USB preamplifier, 44100Hz
- ▶ Spectrograms segmented manually, voicing measurements done manually in Praat (v 5.3.12), Statistical analysis in R.

Experiment 1

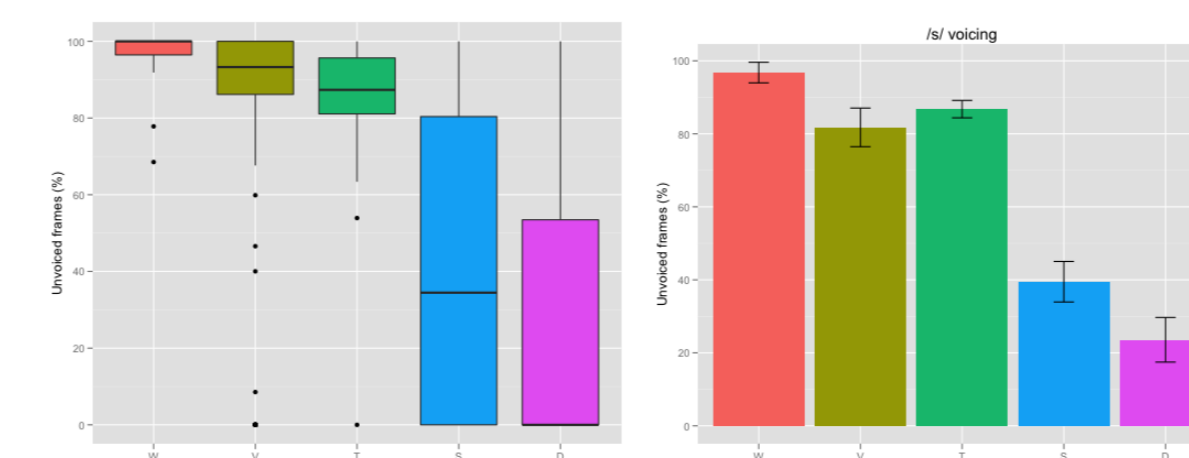
Test words: *pub*, *virtud*, *blog* and (*donut*, *ketchup*) in sentence-final position. All subjects:



All stops are realised as voiceless (90% or more unvoiced frames). Individual strategies for the "violating" final stops: fricativisation, deletion. Spanish IS a final devoicing language, fits the above typology.

Results Experiment 2

/s/ voicing in NCPS all subjects. (W=sentence-final position e.g. *autob{u}s*, V=intervocalic position e.g. *paso*, *las {o}peras*, T=before voiceless obstruent e.g. *espere*, *las potencias*, S=before sonorant consonant e.g. *esnobismo*, *las loter{ia}s*, D=before voiced obstruent e.g. *esbelta*, *las dotes*.)

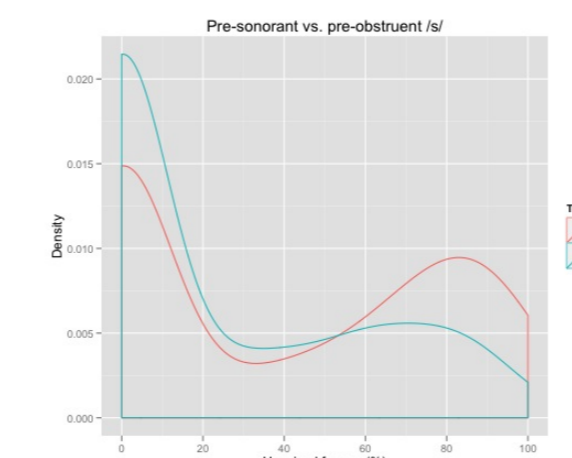


Variable 'position', i.e. within word (*mismo*) vs. across word-boundary (*las motos*) is not significant; $F(1,6) = 3.875$, $p = 0.097$.

Fricative length and unvoiced frames ratio: Pearson's $r = 0.30$

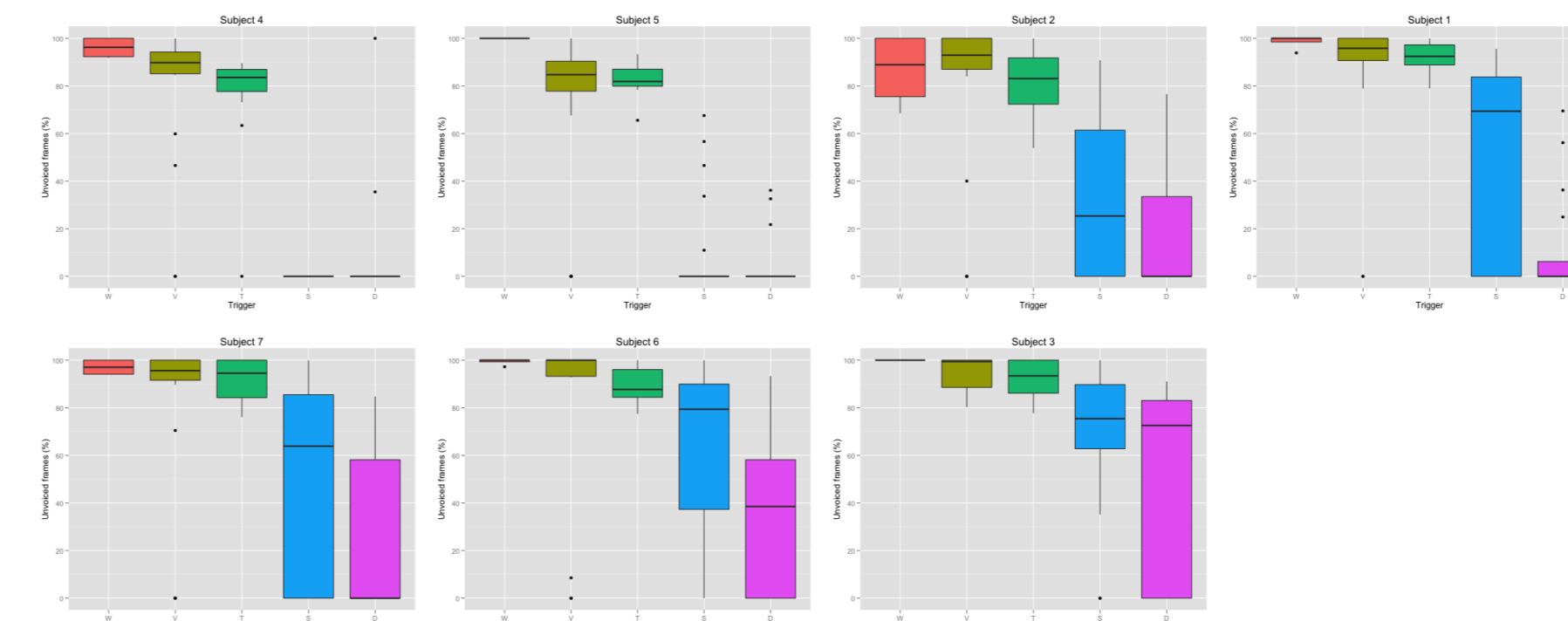
Variable 'trigger' (segment following /s/) is significant; Repeated Measures Anova $F(1.46,8.78) = 54.04$, $p < .001$.

Tukey's HSD: no significant difference between W, V and T triggers (as expected), D-S $p = .00023$



Bimodal distribution suggests an optional but categorical process.

/s/ voicing by subject:



Discussion

Sonorant consonants do not trigger more voicing. /s/ is more voiced before voiced obstruents, thus gestural blending is refuted.

Subjects 4 and 5 categorically voice /s/ before a sonorant or a voiced obstruent. Subjects 6 and 3 seem (categorically) not to voice before a sonorant, the others voice to some extent. Pre-sonorant voicing seems to be categorical for some speakers and gradient for others. But...

Schmidt-Willis (2011) 14-15 ms voicing is purely phonetic due to coarticulation; up to 37 ms even in the expected voiceless contexts is observed.

Voiceless: less than 16 ms voicing, *In between*: 16-35 ms (at least 40% voiced frames), *Voiced*: 35+ ms voicing.

In the expected voiceless context 15.35% of the cases contain 10-16 ms progressive voicing from the vowel to the sibilant.

Position	Voiceless	In between	Voiced
Expected voiceless	96.05% (15.35% coart. voicing)	3.15.%	0.8% (intervocalic)
Pre-sonorant	30.31%	11.42%	48.1%
Pre-voiced-obstruent	13.4%	13.4%	73.2%

This means that pre-sonorant voicing in NCPS points towards a categorical but optional process. Inter- and intra-speaker variation is due to the optional nature of the process, which on the whole produces a gradient effect.

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