

The role of contrastiveness: Stress effects on derived 'VOT' in Sevillian Spanish

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I. Introduction

- Segments in prominent prosodic positions are often enhanced articulatorily and phonetically (Cho 2011; Cho 2016)
- Contrastiveness: Strengthening may be determined by implementation of languagespecific contrastive features (Cho & Jun 2000; Cho & McQueen 2005)
- Languages differ in how the phonetics of stops are enhanced
 - English: stress *increases* VOT duration in voiceless stops (e.g., Lisker & Abramson 1967)
 - **Dutch**: stress *decreases* VOT duration in voiceless stops and *increases* voicing duration in voiced stops (Cho & McQueen 2005)
 - **Spanish**: stress has *no effect* on VOT duration of voiceless stops and *increases* prevoicing duration in voiced stops (Simonet et al. 2014)
- Little prominence effect in languages with a single stop series (no contrastive voicing feature) (e.g., Plains Cree [Hodgson 2021], Sierra Norte de Puebla Nathatl [Kakadelis 2018], Blackfoot [Genee & Li 2023], Hawaiian [Davidson & Parker Jones 2023])
 Languages represent the voicing contrast with different features (e.g., [spread glottis], [voice]) (e.g., Honeybone 2005; Beckman et al. 2013), and enhancement of different features gives different phonetic outcomes
 Another possibility: changes due to stress are a byproduct of articulatory settings necessary for a following stressed vowel (Giavazzi 2010)

IIIa. Results: /C/ vs. /sC/

/C/: /a'tako/ → [a'tako] /ata'ko/ → [ata'ko] /sC/: /a'tasko/ → [a'ta(h)kho] /atas'ko/ → [ata(h)'kho] /sC/: /a'tasko/ → [a'ta(h)kho] /atas'ko/ → [ata(h)'kho] /sC/: /a'tasko/ → [a'ta(h)kho] /sC/: /a'tasko/ → [a'ta(h

- Preceding: CPP falls early for /sC/ words
- Following: CPP stays low for a long time in /sC/ words
- Acoustically: /sC/ words have early-onset breathiness before stop closure + long breathy period ('VOT') following stop closure ([h] 'split' across stop)



IIIb. Results: PreStress vs. StressedOnset (/sC/ words only)

The current study: How important is feature contrastiveness for phonetic enhancement under stress? Are sounds enhanced if they are acoustically similar to contrastive features, but not contrastive in that language?

Case study: Sevillian Spanish

Stop-h sequences derive from metathesis of coda
 /s/ → [h] and /p, t, k/

Ð	These stop-h sequences look like aspirated stops,
	but are realizations of underlying /s + p, t, k/
	clusters (Gilbert 2023)

- Metathesis occurs in all stress configurations, within words, and across morpheme and word boundaries
- Mixed results for effect of stress on rate and quantitative extent of metathesis, and sometimes in opposite direction than expected (Ruch 2008; Torreira 2012; Horn 2013)
- Question: Do Sevillian derived stop-h sequences show 'VOT' lengthening under stress, in the same way as contrastively aspirated stops in other languages?

II. Experiment Design



- Following: Low CPP initially, increases at similar rate in both stress conditions
- Acoustically: early low CPP reflects breathiness of long 'VOT'; CPP increase reflects increased strength of periodicity in the transition from VOT → following vowel
- **Preceding**: CPP falls earlier in StressedOnset than in PreStress condition
- Acoustically: breathiness starts earlier when the vowel before the closure is unstressed, followed by stop-h sequence in a stressed onset stop-h (earlier in [refreck] kho] than in [re'freck] kho])
- Higher peak CPP in StressedOnset Following interval: Longer intervals provide more time to establish strong periodicity? Stressed vs. unstressed vowels differ in voice quality? (Garellek & White 2015)



- 14 female Sevillian speakers ages 18-24 studying at the Universidad de Sevilla
- **Target words**: Trisyllabic verbs in pairs differing in stress, containing /t/, /k/, /st/, /sk/

	Sample target words					
	PreStress		StressedOnset			
/t/	contrato	[konˈtra ṯ o]	contrató	[kontraˈ t o]		
/st/	contrasto	[konˈtra(h) <u>t</u> ho] [konˈtra(h) <u>t</u> so]	contrastó	[kontra(h)ˈ <mark>t</mark> ho] [kontra(h)ˈ t so]		
/k/	ataco	[aˈta k o]	atacó	[ataˈ <u>k</u> o]		
/sk/	arrasco	[aˈra(h) <u>k</u> ho]	arrascó	[ara(h)ˈ <u>k</u> ho]		

Read in carrier sentences: 80 targets + fillers,
 randomized, two repetitions (only one analyzed here)

Measurements

- Cepstral Peak Prominence (CPP) (Hillenbrand & Houde 1996) used to capture degree of periodicity, corresponding to breathiness ([spread glottis])
- Taken every 5ms over intervals preceding and following the stop closure (PraatSauce, Kirby 2018)
- Captures breathiness missed by traditional VOT measurements, by including breathiness that overlaps surrounding vowels
- Tokens analyzed
 - PreStress (/C/: 171 Prec, 171 Following; /sC/: 184 Prec, 186 Following)
 - StressedOnset (/C/: 183 Prec, 183 Following; /sC/: 181 Prec, 181 Following)
 - Words excluded if Preceding or Following interval had unclear beginning or

Individual speakers differ in:

- a) Preceding: how early CPP falls and how much difference there is between the stress conditions
- **b)** Following: how quickly CPP increases, and to what maximum
 - → No apparent effect of stress, even at
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IV. Discussion

- Duration of breathiness *following* the stop closure is not conditioned by stress (Ruch 2008; Torreira 2012)
 - Metathesis: Temporal extent of metathesis is not conditioned by stress
 - **'VOT'**: Long-lag, derived 'VOT' does not lengthen under stress
 - Differs from languages where [spread glottis] is a contrastive feature in stop voicing contrasts (e.g., English, German, Jutland Danish [Puggaard-Rode 2021])

Representation matters for prosodic enhancement, even if sequences are similar on the surface

- Long-lag VOT does not lengthen in prosodically strong positions if it is not representationally relevant
- In Sevillian, [spread glottis] is not a feature of the stop



Metathesis

[ˈra**ph**a]

[kaˈ**th**aɲo]

[kaˈ<u>**ts</u>aɲo]**</u>

[ˈka<u>**kh</u>o]</u>**

Debucc.

['rahpa]

[kah'tano]

[ˈkahko]

raspa

casco

castaño

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- Lack of prosodic enhancement could be a cue to derived status, for learners
- Difference between stress conditions is *preceding* the stop closure
- CPP is lower and falls earlier when the /sC/ → [Ch] sequence is the onset of a stressed syllable ([refr<u>e(h)</u>'kho] > [re'fr<u>e(h)</u>kho])
- Overall lower CPP in StressedOnset words could reflect weaker periodicity in the vowel preceding the stop closure, which is unstressed (Garellek & White 2015)
 - Beyond overall lower CPP, is there an additional effect of breathiness?
- Why would CPP fall earlier in the StressedOnset condition? Cue to stress, cue to /s/ in an *unstressed* syllable (increasing saliency by spreading cues across syllables)?
- Are spectral properties of derived 'VOT' conditioned by stress, even if duration is not? (Tabain et al. 2016)