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Metathesis and stress in Sevillian Spanish /sC/ sequences

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Sevillian [hC] and [Ch] sequences

- Many Spanish varieties debuccalize coda /s/: /pasta/ → [pahta]

- Sevillian Spanish (Southern Spain):
  - Ongoing change from **[h]-stop** to **stop-[h]** ([hC] → [Ch]) in /sp st sk/ sequences (Ruch & Peters 2016, a.o)

	[h]-Stop (debuccalization)	Stop-[h] (metathesis)
/ˈpasta/	[pahta]	[ˈpatha]
/ˈtʃispa/	[ˈtʃihpa]	[ˈtʃipha]
/ˈkasko/	[ˈkahko]	[ˈkakho]

Sevillian [hC] and [Ch] sequences

- [hC] → [Ch] occurs…
  - Variably (Ruch & Peters 2016; Horn 2013)
  - Alongside other processes:

Debuccalization:	[pa**ht**a]
Deletion + Gemination:	[pa**t:**a]
Gemination + metathesis	[pa**t:h**a]

  - Regardless of stress (Horn 2013; Ruch 2009)

/ˈgasta/	→	[ˈ**ga**t͟ha]	(Preceded by stress)
/gasˈto/	→	[gaˈ**tho**]	(Followed by stress)
/distinˈθjon/	→	[dit͟hinˈ**θjon**]	(All unstressed)

  - Morpheme-internally, and across word and morpheme boundaries (Horn 2013; Ruch 2008)

/pasta/	→	[ˈpa**th**a]	‘pasta’	(Morpheme-internal)
/des’tapar/	→	[deˈ**th**apar]	‘to uncover’	(Morpheme boundary)
/mas patas/	→	[ma ˈ**ph**atas]	‘more paws’	(Word boundary)

Sevillian [hC] and [Ch] sequences

- Two possible analyses of surface [Ch] sequences:

  Analysis 1: [Ch] is a new series of aspirated stops /p^h t^h k^h/

  (O'Neill 2009; Gylfadottir 2015)

  Analysis 2: [Ch] is metathesized (or gesturally re-aligned) version of UR cluster /sC/

  (Ruch 2013; Ruch & Peters 2016; Parrell 2012; Torreira 2012)

Sevillian [hC] and [Ch] sequences

- Why is the metathesis change interesting?
  - Nature of underlying representation
  - Synchronic, gradual metathesis (Ruch 2013)
  - Affects syllable structure, which has implications for other areas of phonology

    e.g. Stress:

Cluster analysis	/pas.ta/ → [pa.tha]	HL → LL
Aspirated stop analysis	/pa.t^{h}a/ → [pa.tha]	LL → LL

→ This experiment: test underlying representation of [Ch] by looking at the interaction between metathesis and stress

Roadmap

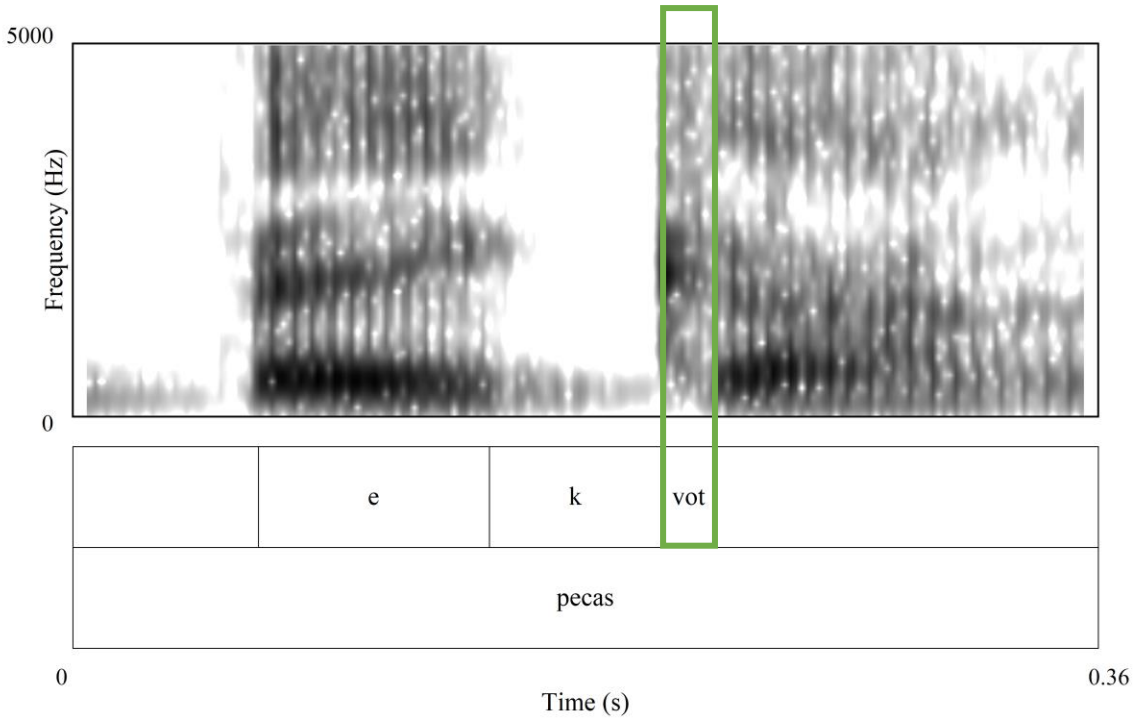
- Where and how [Ch] sequences arise
- The Spanish stress system, and how [Ch] sequences interact with it
- Experiment to test underlying representation of [Ch] using stress
- Ingredients of an analysis
- Comparison to other stress-segmental interactions

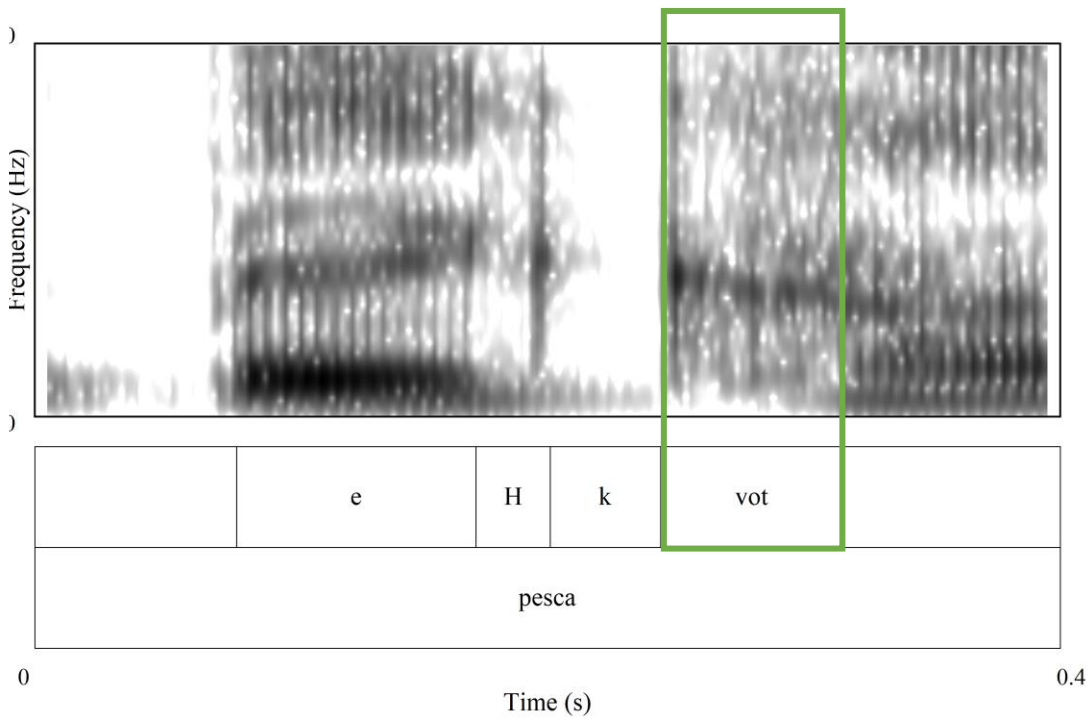
Where does [Ch] come from?

- Many Spanish varieties reduce coda /s/ to [h] (debuccalization)
- Sevillian Spanish allows sonorant codas /l, m, n, r/; reduces others
- Pressure towards open syllables (Catalán 1971; Malmberg 1965)

Steps:	/pasta/
Step 1: Debuccalization	pahta
Step 2: Gemination	paht(:)a
Step 3: Metathesis	pat(:)ha

What does [Ch] look like?





Spanish stress

- Constrained to right-aligned, three-syllable window
- Penultimate is default; can also be antepenultimate or final

Penultimate		Final		Antepen.	
[saˈbana]	‘savannah’	[kanˈsjon]	‘song’	[demoˈkratiko]	‘democratic’
[kapitaˈlista]	‘capitalist’	[marakuˈja]	‘passion fruit’	[ˈreximen]	‘regime, diet’

Spanish stress

- Stress is lexically contrastive for non-verbs within the three-syllable window, but probabilistically conditioned by weight (Bárkányi 2002)

		Antepenult	Penult	Final	
CV.CV ([…taka])	X**L**L	12.96%	**85.69%**	1.35	100%
CV.CVC ([…takan])	XL**H**	3.53%	15.26%	**81.21**	100%
CVC.CV ([…tanka]	X**H**L	.02%	**99.38%**	.59%	100%
CVC.CVC ([…tankan]	XH**H**	.56%	22.40%	**77.04%**	100%

- Unsettled debate: weight sensitive vs. analogy

Experimental work on Spanish stress

- Theoretical work argues for, or vehemently against, weight sensitivity (e.g. Harris 1992 vs. Roca 1991 i.a.; Piñeros 2016)

- Experimental work tries to disentangle weight sensitivity and analogy (e.g. Aske 1990; Bárkányi 2002; Eddington 2004; Face 2000; Fuchs 2018; Shelton 2007)
  - No consensus

Experimental work on Spanish stress

- **<u>Descriptive restriction</u>**: heavy penultimate or final syllable prevents antepenultimate stress (Harris 1983)

CV́.CV.CV vs. *CV́.CVC.CV

		Antepenult	Penult	Final	(Bárkányi 2002)
CV.CV ([…taka])	X**L**L	12.96%	**85.69%**	1.35	100%
CV.CVC ([…takan])	XL**H**	3.53%	15.26%	**81.21**	100%
CVC.CV ([…tanka]	X**H**L	.02%	**99.38%**	.59%	100%
CVC.CVC ([…tankan]	XH**H**	.56%	22.40%	**77.04%**	100%

- Fuchs (2018): experimental evidence that this restriction is active

Experimental work on Spanish stress

- Fuchs (2018)
  - Nonce word stress rating task
  - Task: judge written stimuli on a scale of 1-5
  - Finding: low ratings for words with antepenultimate stress and heavy penults

Condition/Stress	Antepenultimate	Penultimate
CV.CV.**CVC**.CV	[da.ˈti.pem.bo]	[da.ti.ˈpem.bo]
CV.CV.**CVG**.CV	[bu.ˈne.ðew.ta]	[bu.ne.ˈðew.ta]
CV.CV.**CGV**.CV	[lo.ˈma.fja.ɣo]	[lo.ma.ˈfja.ɣo]
CV.CV.CV.**rV**	[li.ˈko.ða.ro]	[li.ko.ˈða.ro]
CV.CV.CV.**ɲV**	[pa.ˈmu.ðo.ɲo]	[pa.mu.ˈðo.ɲo]
CV.CV.CV.**ʃV**	[la.ˈri.mu.ʃa]	[la.ri.ˈmu.ʃa]
CV.CV.**CV.CV**	[ro.ˈku.na.to]	[ro.ku.ˈna.to]

Perception experiment

- Use the restriction on antepenultimate stress with heavy penults to test representational status of stop-[h] sequences

- Compare words of the following types:

NoCoda:	CV.CV́.**CV**.CV
Stop-H:	CV.CV́.**CV.Ch**V
Coda:	CV.CV́.**CVN**.CV
CodaS:	CV.CV́.**CVS**.CV
CodaH:	CV.CV́.**CVH**.CV

Perception experiment

- Questions
  - In a word with antepenultimate stress, do listeners care what type of coda the penult has? (**NoCoda comparisons**)
  - In a word with antepenultimate stress, do listeners treat a penult ‘closed’ by Stop-H the same as a surface-heavy penult? (**Stop-H comparisons**)

	NoCoda	Stop-H
Test	NoCoda-Coda	Stop-H-NoCoda
	NoCoda-CodaS	Stop-H-Coda
	NoCoda-CodaH	Stop-H-CodaS
	NoCoda-Stop-H	Stop-H-CodaH
Filler	NoCoda-Filler1	Stop-H-Filler1
	NoCoda-Filler2	Stop-H-Filler2

Perception experiment

- Materials
  - 4 syllable nonce words with antepenultimate stress
  - 5 test conditions with different types of penult
    (NoCoda, Coda, CodaS, CodaH, Stop-H)
  - Balanced for final onset (/ptk/) and surrounding vowels (/aiu/)
  - Controlled for neighborhood density (based on NoCoda forms)

  - Fillers
  - Total: 45 test items + 36 fillers

Perception experiment

- Materials

Final Onset	V	NoCoda	Coda	Coda /s/	Coda [h]	Stop-H
/p/	/a/	giˈnakapo	giˈnakampo	giˈnakaspo	giˈnakahpo	giˈnakapho
/p/	/i/	tʃuˈnifipo	tʃuˈnifimpo	tʃuˈnifispo	tʃuˈnifihpo	tʃuˈnifipho
/p/	/u/	naˈlufupo	naˈlufumpo	naˈlufuspo	naˈlufuhpo	naˈlufupho

- Recorded by male speaker from Seville
- Preliminary acoustic and perception study showed that stress is produced and perceived where intended

Perception experiment

- Comparisons

	NoCoda	Stop-H
Test	NoCoda-Coda	Stop-H-NoCoda
	NoCoda-CodaS	Stop-H-Coda
	NoCoda-CodaH	Stop-H-CodaS
	NoCoda-Stop-H	Stop-H-CodaH
Filler	NoCoda-Filler1	Stop-H-Filler1
	NoCoda-Filler2	Stop-H-Filler2

- Task:
  - Two forms presented auditorily (e.g. NoCoda-Coda)
  - Binary forced-choice: Choose which would be the better word of Spanish
  - Counterbalanced for order of presentation
  - Trials randomized by participant

Perception experiment

- Hypotheses

Condition	**[Ch] analyzed as cluster /sC/**		
NoCoda-Coda	>	giˈnakapo > giˈnakampo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVC.</u>**CV
NoCoda-CodaS	>	giˈnakapo > giˈnakaspo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVS.</u>**CV
NoCoda-CodaH	>	giˈnakapo > giˈnakahpo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVH.</u>**CV
NoCoda-Stop-H	>	giˈnakapo > giˈnakapho	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CV.CH</u>**V

Condition	**[Ch] analyzed as aspirated stop /p^h t^h k^h/**		
NoCoda-Coda	>	giˈnakapo > giˈnakampo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVC.</u>**CV
NoCoda-CodaS	>	giˈnakapo > giˈnakaspo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVS.</u>**CV
NoCoda-CodaH	>	giˈnakapo > giˈnakahpo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVH.</u>**CV
NoCoda-Stop-H	=	giˈnakapo = giˈnakapho	CVˈCV**<u>CV.</u>**CV = CVˈCV**<u>CV.CH</u>**V

Perception experiment

- Hypotheses

Condition	**[Ch] analyzed as cluster /sC/**		
Stop-H-NoCoda	<	giˈna**kapho** < giˈna**ka**po	CVˈCV**CV.CH**V < CVˈCV**CV.**CV
Stop-H-Coda	=	giˈna**kapho** = giˈna**kam**po	CVˈCV**CV.CH**V = CVˈCV**CVC.**CV
Stop-H-CodaS	=	giˈna**kapho** = giˈna**kas**po	CVˈCV**CV.CH**V = CVˈCV**CVS.**CV
Stop-H-CodaH	=	giˈna**kapho** = giˈna**kah**po	CVˈCV**CV.CH**V = CVˈCV**CVH.**CV

Condition	**[Ch] analyzed as aspirated stop /p^h t^h k^h/**		
Stop-H-NoCoda	=	giˈna**kapho** = giˈna**ka**po	CVˈCV**CV.CH**V = CVˈCV**CV.**CV
Stop-H-Coda	>	giˈna**kapho** > giˈna**kam**po	CVˈCV**CV.CH**V > CVˈCV**CVC.**CV
Stop-H-CodaS	>	giˈna**kapho** > giˈna**kas**po	CVˈCV**CV.CH**V > CVˈCV**CVS.**CV
Stop-H-CodaH	>	giˈna**kapho** > giˈna**kah**po	CVˈCV**CV.CH**V > CVˈCV**CVH.**CV

Perception experiment

- Run on PCIbex (Zehr & Schwarz 2018)

- Participants
  - 27 Sevillians (20 female, 7 male) recruited through personal contacts

- Statistical analysis
  - Logistic mixed-effect regressions model likelihood of choice of base form
  - Separate models for each set of comparisons (NoCoda, Stop-H)

Results

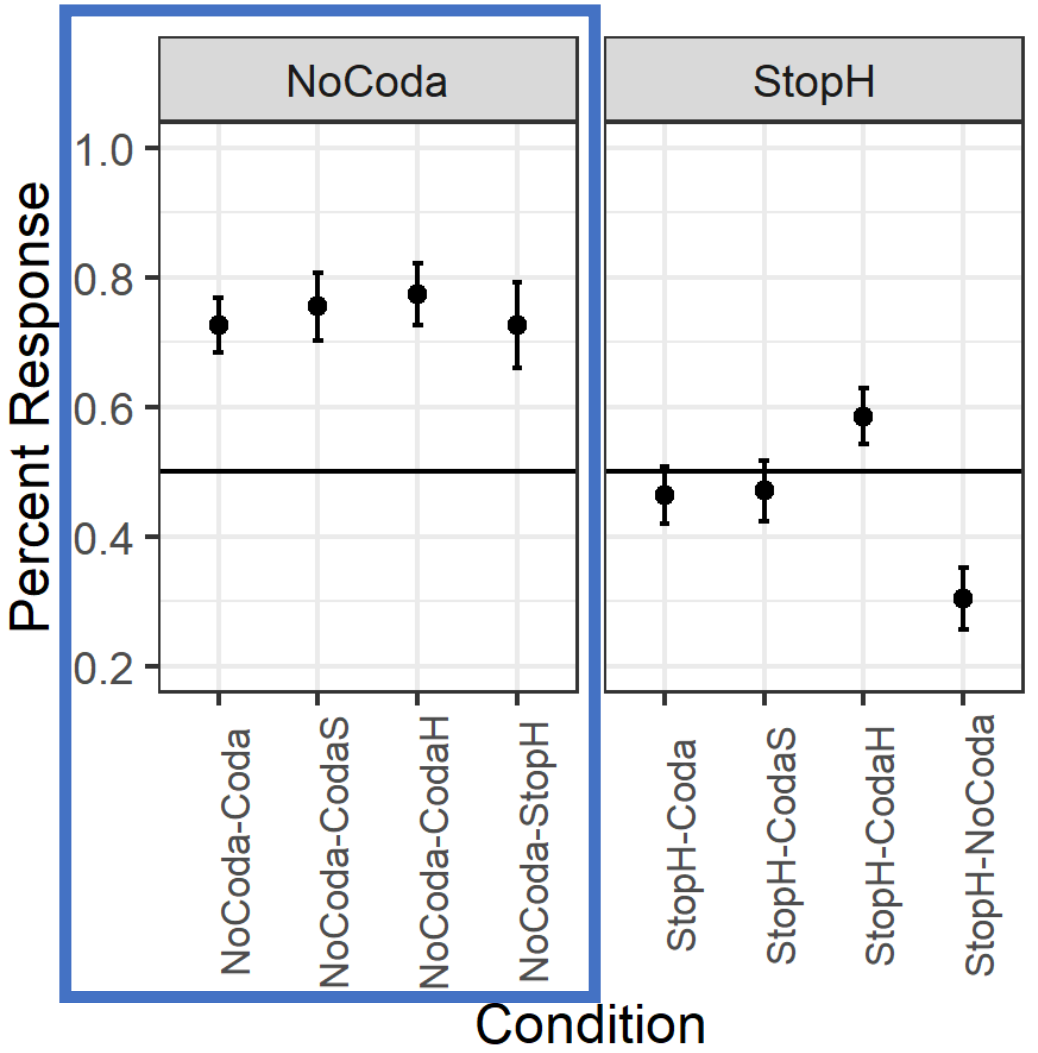
- NoCoda comparisons

- For words with antepenultimate stress:
  - Sevillians prefer a form with a light penult over any form with a heavy penult

    CV.CÝ.**<u>CV</u>**.CV > CV.CÝ.**<u>CVC</u>**.CV

  - Dislike all types of penult equally

    CV.CÝ.**<u>CVC</u>**.CV = CV.CÝ.**<u>CV.Ch</u>**V



Results

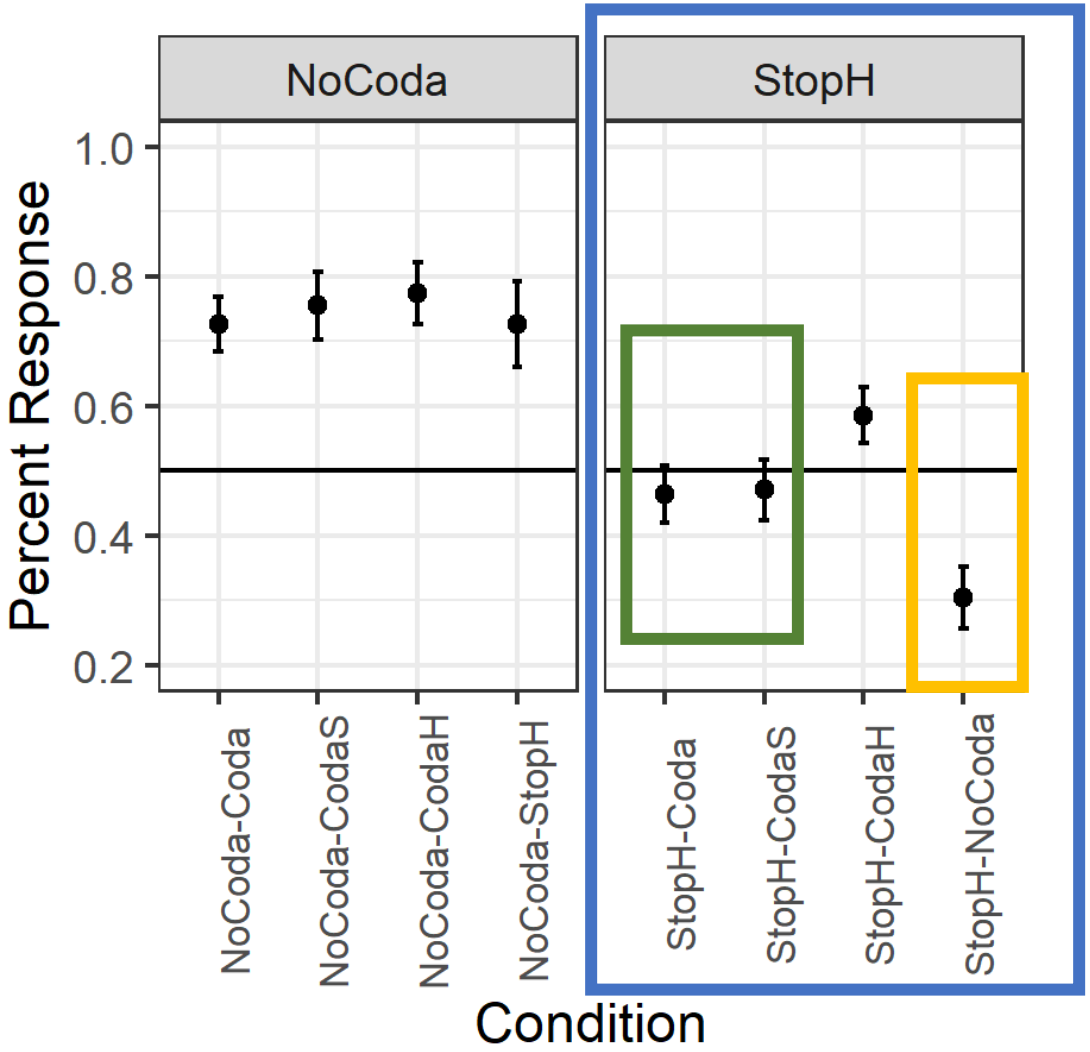
- Stop-h comparisons

- For words with antepenultimate stress:
  - Sevillians prefer NoCoda > Stop-H

    CV.CÝ.**CV.Ch**V < CV.CÝ.**CV**.CV

  - Treat StopH forms the same as Coda and CodaS

    CV.CÝ.**CV.Ch**V = CV.CÝ.**CVS**.CV



Results summary

- In words with antepenultimate stress:
  - Sevillians prefer words with underlyingly light penults over those with heavy penults
    - **Even when the penults are light on the surface**

  - Specifically, they prefer words with surface and underlying light penults over those ‘closed’ with [Ch] on the surface

/ginakapo/→ [giˈnakapo] (/LLLL/ → [LĹLL])

is better than

/ginakaspo/ → [giˈnakapho] (/LLHL/ → [LĹLL])

→ In [CVCV**<u>CV.CH</u>**V], penults are treated as heavy

Results summary

- Hypotheses

Condition	**[Ch] analyzed as cluster /sC/**		
NoCoda-Coda	>	giˈnakapo > giˈnakampo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVC.</u>**CV
NoCoda-CodaS	>	giˈnakapo > giˈnakaspo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVS.</u>**CV
NoCoda-CodaH	>	giˈnakapo > giˈnakahpo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVH.</u>**CV
NoCoda-Stop-H	>	giˈnakapo > giˈnakapho	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CV.CH</u>**V

Condition	**[Ch] analyzed as aspirated stop /p^h t^h k^h/**		
NoCoda-Coda	>	giˈnakapo > giˈnakampo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVC.</u>**CV
NoCoda-CodaS	>	giˈnakapo > giˈnakaspo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVS.</u>**CV
NoCoda-CodaH	>	giˈnakapo > giˈnakahpo	CVˈCV**<u>CV.</u>**CV > CVˈCV**<u>CVH.</u>**CV
NoCoda-Stop-H	=	giˈnakapo = giˈnakapho	CVˈCV**<u>CV.</u>**CV = CVˈCV**<u>CV.CH</u>**V

Results summary

- Hypotheses

Condition	[Ch] analyzed as cluster /sC/		
Stop-H-NoCoda	<	giˈna**kapho** < giˈna**ka**po	CVˈCV**CV.CH**V < CVˈCV**CV.**CV
Stop-H-Coda	=	giˈna**kapho** = giˈna**kam**po	CVˈCV**CV.CH**V = CVˈCV**CVC.**CV
Stop-H-CodaS	=	giˈna**kapho** = giˈna**kas**po	CVˈCV**CV.CH**V = CVˈCV**CVS.**CV
Stop-H-CodaH	=	giˈna**kapho** = giˈna**kah**po	CVˈCV**CV.CH**V = CVˈCV**CVH.**CV

Condition	[Ch] analyzed as aspirated stop /p^h t^h k^h/		
Stop-H-NoCoda	=	giˈna**kapho** = giˈna**ka**po	CVˈCV**CV.CH**V = CVˈCV**CV.**CV
Stop-H-Coda	>	giˈna**kapho** > giˈna**kam**po	CVˈCV**CV.CH**V > CVˈCV**CVC.**CV
Stop-H-CodaS	>	giˈna**kapho** > giˈna**kas**po	CVˈCV**CV.CH**V > CVˈCV**CVS.**CV
Stop-H-CodaH	>	giˈna**kapho** > giˈna**kah**po	CVˈCV**CV.CH**V > CVˈCV**CVH.**CV

Results summary

- The bottom line: stop-[h] sequences are treated as adding weight to preceding syllable
- Supports analysis of surface [Ch] as underlying /sC/ cluster
- Opaque interaction between stress and metathesis
  - Stress on the surface is constrained by a restriction that holds only on UR
- Listeners apply this opaque interaction productively to nonce words

Basics of an analysis

- Restriction on stress holds on the UR, not on the surface form
  - Requires serial analysis
- Stress precedes debuccalization and metathesis
- Penult must be heavy to block antepenultimate stress

UR		/ka.pi.ta.lis.ta/	
Step 1	Moraic structure	[ka.pi.ta.lis$_{\mu}$.ta]	LLLHL
Step 2	Stress	[ka.pi.ta.'lis$_{\mu}$.ta]	LLLH́L
Step 3	Debuccalization	[ka.pi.ta.'lih$_{\mu}$.ta]	LLLH́L
Step 4	Metathesis	[ka.pi.ta.'li.th$_{\mu}$a]	LLLĹL

Stress-segmental interactions

- Broader question about interaction between prosodic and segmental processes

  → e.g. epenthesis can *precede* or *follow* stress

- What about metathesis, and what does that tell us about metathesis as a process?

Stress-epenthesis interactions

- Epenthetic vowels are visible to stress (Egyptian Arabic)

Stress is penultimate:	/madrasa/	madrása
Epenthetic vowels are stressed:	/bint-na/	bint**í**na

  - **Epenthesis > stress**

- Epenthetic vowels are invisible to stress (Dakota)

Stress is peninitial:	/ma-ya-kte/	mayákte	
Epenthesis disrupts stress:	/puz/	púz**a**	(*puzá)

  - **Stress > epenthesis**

- Different epenthetic vowels can be visible and invisible to stress in the same language (Levantine Arabic)
- Serial derivation required to allow both orderings cross-linguistically and within a language

(Elfner 2009)

Stress-metathesis interactions

- Stress can compel metathesis to improve prosodic structure
  - **Uab Meto**: CV metathesis reduces lapse between root and word edge (Mooney 2021)
    /ˈme.po/ → [ˈm͡eop.-n-e] (*ˈme.po.-n-e)

- Stress can create the environment for metathesis
  - **Faroese**: [sk]-[ks] metathesis after stressed vowel (Seo & Hume 2001)
  - **Rotuman**: CV; unstressed final vowel increases overlap with preceding stressed vowel, eventually deletes (Blevins & Garrett 1998)
    /ˈfuti/ → [ˈfyt] $\acute{V}_1CV_2 \rightarrow \acute{V}_1V_2CV_2 \rightarrow \acute{V}_1V_2C$

- Stress can be blind to metathesis, and metathesis blind to stress
  - **Sevillian Spanish**: metathesis in /s ptk/ clusters regardless of stress, does not affect stress judgments
  - **Lithuanian**: metathesis of coronal fricative + [k] regardless of stress location (Seo & Hume 2001); stress is lexical (Dogil & Williams 1999)

- **Stress > metathesis**

Metathesis-stress interactions

- Can metathesis *precede* stress?
  - Possibly: Maltese metathesis (sonorant + V → V + sonorant) may affect stress assignment (Brame 1974)
  - Other examples?

- If not, why not?
  - Metathesis is conditioned by surface pressures (coarticulatory + perceptual), but epenthesis can be triggered by more abstract structural pressures?

Summary

- Further experimental evidence that Sevillian [Ch] sequences are still underlyingly /sC/ clusters
- Evidence that listeners apply an opaque interaction between stress and metathesis productively
  - Requires serial derivation
- Further questions about the nature of metathesis and how it differs from other phonological processes like epenthesis

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