The Life Cycle of Valencian Vowel Harmony

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Background

- Valencian Catalan has a stressed system of 7 vowels ([i e ɛ a ɔ o u]). This inventory is generally reduced to 5 elements in unstressed positions ([i e a o u]).
- In unstressed syllables, underlying [−ATR] vowels /ɔ́/ and /ɛ́/ raise to [o] and [e], respectively (cf. Wheeler 2005, e.g.):

Stressed			*Unstressed*		
pistola	[pistɔ́la]	'gun'	pistoler	[pistolér]	'gunman'
tela	[tɛ́la]	'cloth'	teler	[telér]	'loom'

Background

- Some Valencian varieties exhibit a process of **vowel harmony** by which word-final low vowels assimilate totally to a preceding [−ATR] vowel (/ɔ́/ or /ɛ́/). Typically, both vowels (/ɔ́/ and /ɛ́/) trigger the process.

Canals variety

/ɔ́/+/a/:	pistola	[pistɔ́lɔ]	'gun'
/ɛ́/+/a/:	tela	[tɛ́lɛ]	'cloth'

Background

- However, there are varieties in which only one of the mid-open vowels causes assimilation:

Borriana variety

/ɔ́/+/a/:	pistola	[pistɔ́lɔ]	'gun'
/ɛ́/+/a/:	tela	[tɛ́la]	'cloth'

Background

- When conditions for vowel harmony are not met, final /a/ is realized as [a], more or less raised and colored (varieties with final neutralization to [ɛ] or to [ɔ] are also attested):

Borriana variety

/á/+/a/:	sala	[sála]	'room'
/ó/+/a/:	directora	[direktóra]	'director (FEM)'
/é/+/a/:	cera	[séra]	'wax'

Background

- Vowel harmony is quite common in the Southern Valencian dialect.
- The distribution of the three different patterns of vowel harmony (only with /ɔ́/, only with /ɛ́/ or with both [−ATR] vowels) is extremely irregular (cf. Jiménez 2001: 225-227; Saborit 2010: 252).

(*Map source*: J. Saborit's blog, "La /-a/ final i les harmonies vocàliques", http://reocities.com/SoHo/cafe/9308/alvhv.jpg)

Background

- In some towns belonging to the northern dialect (among which Borriana and Les Alqueries) round vowel harmony has been reported as well.

Background

- This study will be devoted to three Northern Valencian varieties:
  - The ***pre-harmonic*** variety of **Nules**
  - The ***harmonic*** variety displayed by old speakers in Borriana and Les Alqueries (from now on, shortened as **'Borriana$_{Old}$ variety'**)
  - The ***post-hamonic*** variety typical of Borriana young speakers (**'Borriana$_{Young}$ variety'**)

Goals

a) To investigate how formant frequency values of both the stressed and the final vowels vary in Borriana$_{Old\&Young}$ and Nules varieties as a function of different combinations of a mid-open vowel and a low vowel.

b) To demonstrate that Borriana$_{Old}$ variety displays round vowel harmony from stressed /ɔ́/ to a post-tonic final /a/ (*pistola* [pistólɔ]), whereas Nules & Borriana$_{Young}$varieties only exhibit high coarticulation levels in the same environment.

Goals

c) To show that we can draw a chronological path in the assimilation processes affecting unstressed /a/, with different stages (cf. Bermúdez-Otero 2007, Hualde 2011):

1. **No changes in F2**: context *sala (*all varieties)
2. **Sporadic changes in F2**: context *tela (*all varieties)
3. **Conventionalization**: partial assimilation of /a/ after a stressed /ɔ́/ (Nules variety, every context)
4. **Phonologization**: total assimilation of /a/ after a stressed /ɔ́/ (Borriana$_{Old}$ variety, word-level)
5. **Lexicalization**: La Canyada de Biar variety

Outline of the presentation

I. Acoustic study: Methodology

II. Leveling of F1: Typological consequences

III. Leveling of F2: From nothing to total assimilation

IV. Concluding remarks

I. Acoustic study: Methodology

1. Participants

- 8 male subjects from each variety
- **Nules & Borriana$_{Old}$** varieties:
  - Ranging from 43 to 65-years old
  - ***With no*** studies in Valencian Catalan
    - For Borriana$_{Old}$ variety, 2 non-harmonic speakers were discarded to prevent interference.
- **Borriana$_{Young}$** variety:
  - Ranging from 16 to 18-years old
  - ***With*** studies in Valencian Catalan

I. Acoustic study: Methodology

2. Task

- The participants were provided with the sentences in Spanish and were asked to translate them into Valencian Catalan.
  - *Spanish*: Tiene una pistola, pero pequeña.
  - *Valencian*: Té una pistola, però xicoteta.
    - *Gloss*: 'S/he has a gun, but small.'

I. Acoustic study: Methodology

3. Sequences analyzed

- Final unstressed /a/
- In a neutral context (/á/+/a/):
  - *sala* /sál+a/ 'room'
  - *Sara* /sár+a/ '*proper name*'

[In these data, + occurs at the site of attachment for an affix and # for a clitic; a major word-boundary is indicated by ##.]

I. Acoustic study: Methodology

3. Sequences analyzed

- After the stressed vowels [ɔ́] and [ɛ́], appearing:
  - In a prototypically harmonic environment:
    - Contiguous syllables within the word:

Context /ɔ/+/a/:
- *pistola* /pistól+a/ 'gun'
- *cassola* /kasól+a/ 'pot'

Context /ɛ́/+/a/:
- *tela* /tɛ́l+a/ 'cloth'
- *serra* /sɛ́r+a/ 'saw'

I. Acoustic study: Methodology

3. Sequences analyzed

- In two non-prototypically harmonic contexts:
  - Adjacent syllables, but separated by a minor morphological boundary, a clitic limit (#):

Context /ɔ/#/a/:
- *dissol-la* /disól#la/ 'dissolve it (FEM)'
- *correspon-la* /korespón#la/ 'respond to her'

Context /ɛ́/#/a/:
- *perd-la* /pɛ́rd#la/ 'lose it (FEM)'

I. Acoustic study: Methodology

3. Sequences analyzed

- In two non-prototypically harmonic contexts:
  - Adjacent syllables, but separated by a major morphological boundary, a word-boundary (##):

Context /ɔ/##/a/
- *dissol la farina* /disól##la…/
  's/he dissolves the (FEM) flour'
- *li correspon la faena* /korespón##la…/
  'it's his/her task'

Context /ɛ́/##/a/ (/pɛ́rd##la…/):
- *perd la clau* 's/he loses the (FEM) key'
- *perd la jaqueta* 's/he loses the (FEM) jacket'

I. Acoustic study: Methodology

3. Sequences analyzed

- For the sake of comparison, the vowels [ɔ́] and [ɛ́], were also registered in a neutral context: a final oxytone:

  Oxytone words with /ɔ́/:
  - *sol* /sɔ́l/ ‘sun’
  - *sort* /sɔ́rt/ ‘luck’

  Oxytone words with /ɛ́/:
  - *cel* /sɛ́l/ ‘sky’
  - *cert* /sɛ́rt/ ‘certain’

I. Acoustic study: Methodology

3. Sequences analyzed

- Whenever possible, the vowels were placed in the same consonantal environment: the stressed vowel was preceded by an unvoiced coronal obstruent and followed by a coronal liquid consonant, as in *pistola* or *tela*.
- The syllables preceding the stressed syllable and following the final low vowel were generally unstressed.

I. Acoustic study: Methodology

3. Sequences analyzed

- The sequences were situated at the end of a phonological phrase…
  - …inside the sentence:
    - *Ex.*: Té una **pistola**, però xicoteta.
      - *Gloss*: ‘S/he has a gun, but small’
  - …at the end of the sentence:
    - *Ex.*: Això és una **pistola**.
      - *Gloss*: ‘That’s a gun’

(In general, this parameter proved to be irrelevant to the assimilation. Therefore, we will leave aside the analysis of occurrences located at the end of the sentence.)

I. Acoustic study: Methodology

4. Recordings

- Two different tokens of each context (if possible) were registered.
- The sentences were registered in a quiet room.
  - Digital recorder Zoom H4.
  - AKG C520L Head-worn Cardioid Condenser Microphone.
  - 44,1 kHz sampling and 24 bits resolution.

I. Acoustic study: Methodology

5. Data labeling and analysis

- The mid-point of the vowels was identified using Praat.
- A Praat automatic routine was designed to extract the acoustic features: duration of the vowel, and intensity and formant values at the mid-point of the vowel.

I. Acoustic study: Methodology

5. Data labeling and analysis

- Formant values were normalized using Watt & Fabricius S-centroid procedure (Watt & Fabricius 2002).
- SPSS software package (SPSS 19) was used to perform statistical tests (one-way ANOVA; post-hoc Tukey).

II. Leveling of F1: Typological consequences

1. General pattern

- Generally, the two mid-open vowels, /ɛ ɔ/, and the low vowel /a/ contrast among them in height:

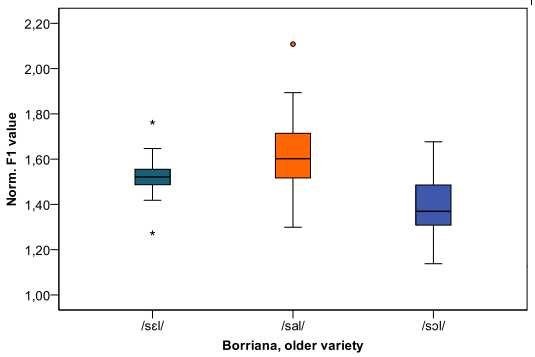
/ɛ/	/a/	/ɔ/
[−ATR]	[−ATR]	[−ATR]
[−low]	[+low]	[−low]

II. Leveling of F1: Typological consequences

1. General pattern

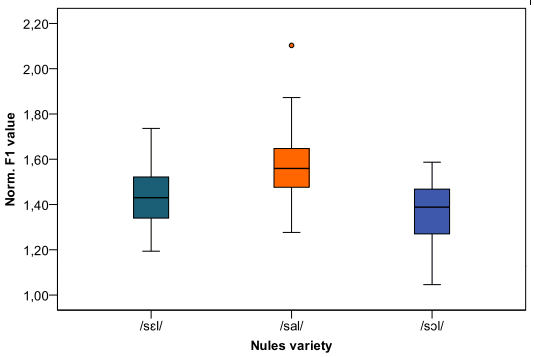
- The realization of /ɛ a ɔ/ in oxytones in Nules and Borriana$_{Old}$ reflects this contrast: the vowel [á] has the highest degree of aperture &, minor details aside, the F1 value of the mid-open vowels [ɔ́] and [ɛ́] is lower and roughly equivalent.

II. Leveling of F1: Typological consequences



[F1 (2, 45) = 9,300, p < 0,001]

II. Leveling of F1: Typological consequences



[F (2, 45) = 8,125, p = 0,001]

II. Leveling of F1: Typological consequences

2. Leveling of Height

- When /a/ follows a stressed mid-open vowel, the F1 value of /a/ tends to level with the value of the preceding vowel:

/ɔ/+/a/: pistola /ɛ́/+/a/: tela

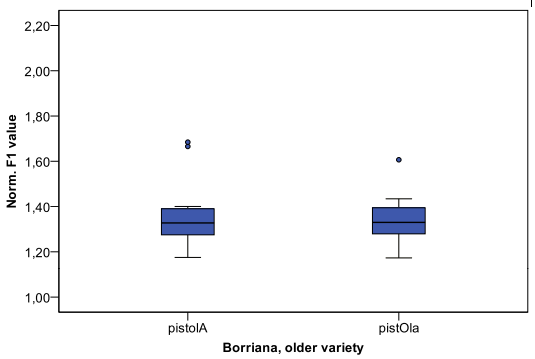
F1 value F1 value

II. Leveling of F1: Typological consequences

2. Leveling of Height

- That is what we expect in a harmonic scenario, where there is total assimilation between the two vowels.
- In Borriana$_{Old}$ variety, for example, in the context *pistola*, we expect the leveling of height, as the data reveal:

II. Leveling of F1: Typological consequences

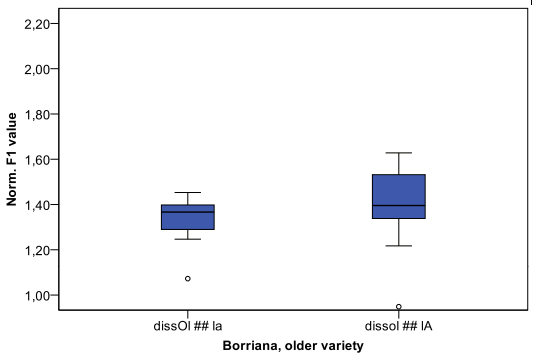


II. Leveling of F1: Typological consequences

2. Leveling of Height

- However, a matching in height between the stressed and the unstressed vowel is found in $\text{Borriana}_{\text{Old}}$ variety:
  - in the absence of total color assimilation: cf. context *dissol la farina*:

II. Leveling of F1: Typological consequences

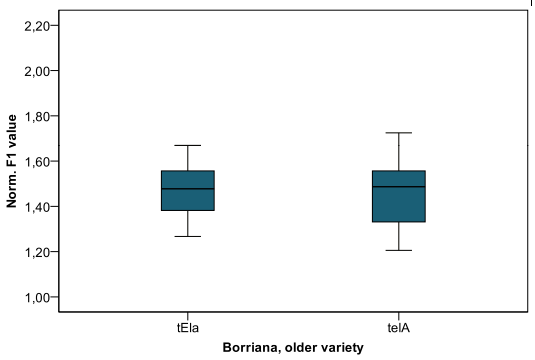


II. Leveling of F1: Typological consequences

2. Leveling of Height

- However, a matching in height between the stressed and the unstressed vowel is found in $\text{Borriana}_{\text{Old}}$ variety:
  - in the absence of total color assimilation: cf. context *dissol la farina*;
  - or even partial color assimilation: cf. context *tela*:

II. Leveling of F1: Typological consequences

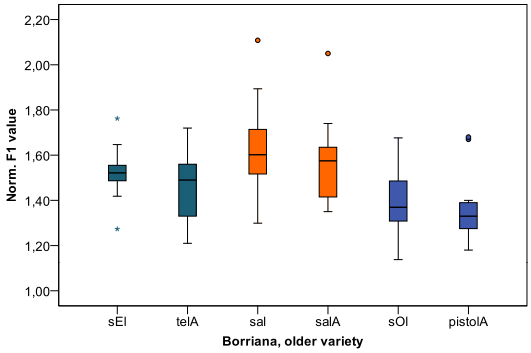


II. Leveling of F1: Typological consequences

2. Leveling of Height

- The leveling of height between /a/ and the stressed vowels is so generalized that the F1 values of /a/ in the contexts *tela*, *sala* & *pistola* almost completely match the F1 values of the stressed vowels /ɛ a ɔ/ in final oxytones: *cel*, *sal* & *sol*, respectively.

II. Leveling of F1: Typological consequences



II. Leveling of F1: Typological consequences

3. Typological consequences

- Hence, we can assume that the leveling of F1 is independent from color harmony and probably prior to it.
- That is, the matching of height would not be a parasitic effect of color harmony (against Jiménez 1998).

II. Leveling of F1: Typological consequences

3. Typological consequences

- The order in the changes is noteworthy because it means that, typologically, Valencian vowel harmony does not differ from other Iberian languages in so radical a way:
  - As in most Iberian harmonic processes, there are first changes in height, which is supposed to be a more peripheral feature.
  - Valencian vowel harmony additionally targets color features, usually considered more central and more stable.

III. Leveling of F2: From nothing to total assimilation

Outline:

1. The starting point: No changes in neutral contexts
2. Sporadic changes
3. Conventionalization: Categorical postlexical rule
4. Phonologization: Word-level rule
5. Back to stage 3: Borriana young speakers
6. The last stage in sound change: Lexicalization

III.1. The starting point: No changes in neutral contexts

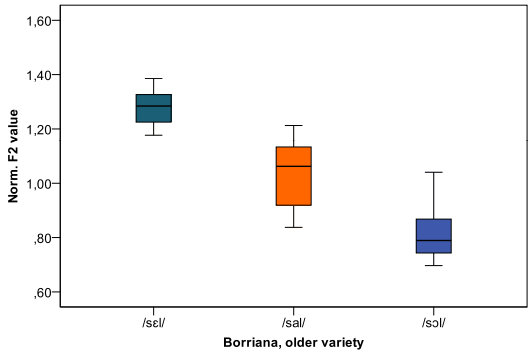
1. Basic contrast

- [−ATR] vowels also present a contrast depending on color (i.e. place of articulation).

/ɛ/	/a/	/ɔ/
[−back]	[+back]	[+back]
[−round]	[−round]	[+round]
[−ATR]	[−ATR]	[−ATR]
[−low]	[+low]	[−low]

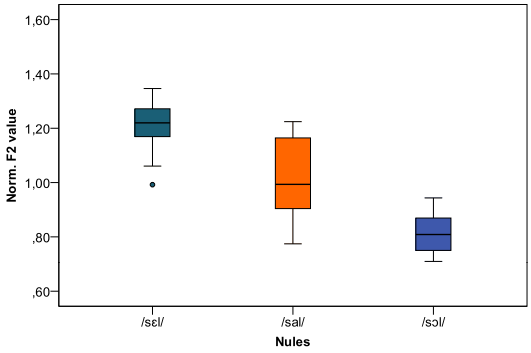
- In neutral contexts, without assimilation (*cel*, *sal* and *sol*), the distinction is undoubtedly robust enough in every variety:

III.1. The starting point: No changes in neutral contexts



[F (2, 45) = 96,078, p < 0,001]

III.1. The starting point: No changes in neutral contexts



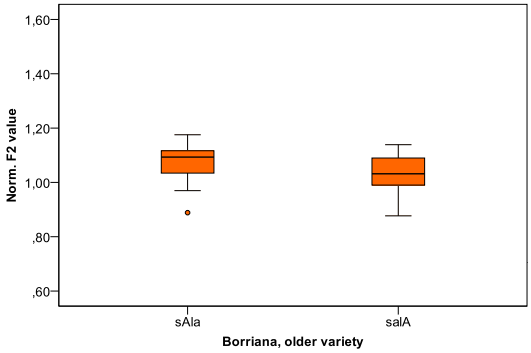
[F (2, 45) = 55,418, p < 0,001]

III.1. The starting point: No changes in neutral contexts

2. Lack of general neutralization

- In Nules and Borriana$_{Old}$ the F2 values of unstressed /a/ in post-tonic position are not different from stressed /á/ in the context exemplified by *sala,* /á/+/a/.
- Hence, there is no general neutralization of final /a/ as [ɔ] (or [ɛ]):
  - sala [sála] *[sálɔ], *[sálɛ]

III.1. The starting point: No changes in neutral contexts

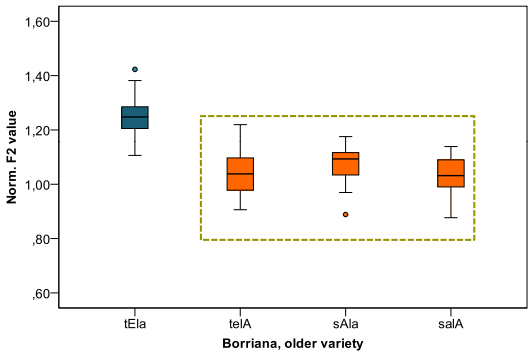


III.2. Sporadic changes

1. Lack of assimilation after front vowels

- There is not either assimilation triggered by the stressed front vowel [ɛ́] in the context illustrated by *tela*, /ɛ́/+/a/.
- That is, the color difference between the two vowels is usually maintained in the varieties under study:
  - tela [tɛ́la] *[tɛ́lɛ]

III.2. Sporadic changes



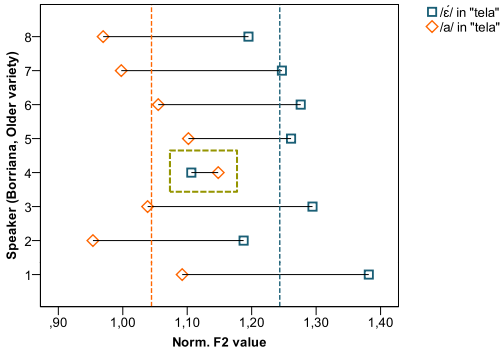
[F (3, 60) = 26,889, p < 0,001]

III.2. Sporadic changes

2. The harmonic seed

- Sporadically, though, some /a/ get attracted to the place of articulation of a stressed front vowel /ɛ́/, as in the pronunciation of *tela* by speaker number 4, from Borriana$_{Old}$ variety.

III.2. Sporadic changes



III.3. Conventionalization: Categorical postlexical rule

1. Conventionalization of the pattern

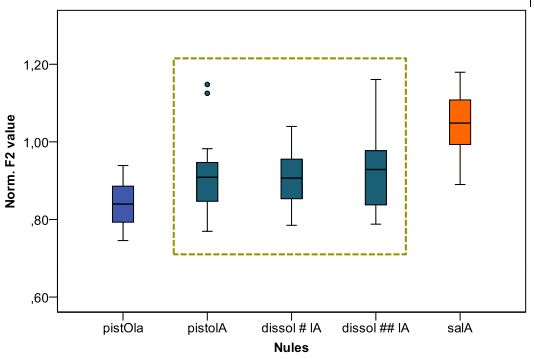
- Sporadic changes (stage 2) can become categorical in every environment where the two vowels are adjacent to each other.
- So, in Nules variety, due to coarticulation with the preceding round vowel /ɔ́/, low vowels tend to be realized at an intermediate point between neutral unstressed low vowels (context /á/+/a/ *sala*) and the stressed round vowel (context /ɔ́/+/a/ *pistola*).

III.3. Conventionalization: Categorical postlexical rule

1. Conventionalization of the pattern

- The process regularly applies:
  - at the **stem-level** (in *pistola*),
  - at the **word-level** (in *dissol-la*) &
  - **across word boundaries** (in *dissol la farina*)
- Hence, we can assume that the process applies at the postlexical level.

III.3. Conventionalization: Categorical postlexical rule



[F (4, 75) = 12,564, p < 0,001]

III.3. Conventionalization: Categorical postlexical rule

2. With gradient effects

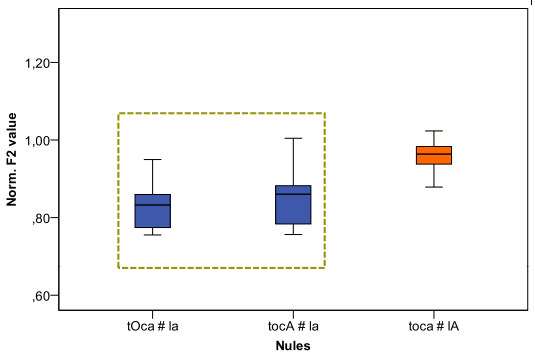
- Word-final /a/ is protected from total assimilation by its relative prominence (on the status of final vowels, see Barnes 2006, Walker 2011).
- By comparison, post-tonic internal syllables are regarded as prosodically weaker. What happens in that position, i.e. in a less prominent site, in sequences such as *toca-la* /tɔ́ka # la/ 'touch it FEM'?

III.3. Conventionalization: Categorical postlexical rule

2. With gradient effects

- Post-tonic internal /a/ undergoes total assimilation with the stressed vowel /ɔ́/ in the verbal form, thereby displaying the typical gradient effects expected in phonetic processes.

III.3. Conventionalization: Categorical postlexical rule



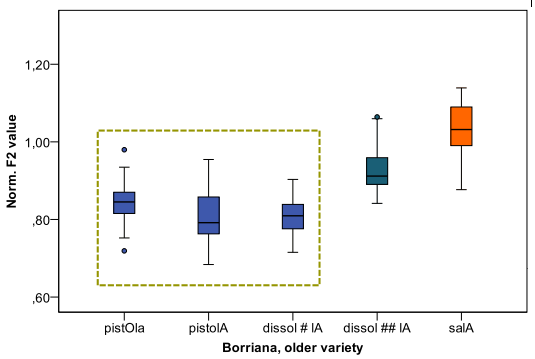
[F (2, 45) = 27,147, p < 0,001]

III.4. Phonologization: Word-level rule

1. Beyond coarticulation

- At some point, departing from realizations of /a/ close to those of the round vowel /ɔ́/, the coarticulation rule may split into two different processes, as in Borriana$_{Old}$ variety:
- At the **word-level** (across morphemes, in *pistola*, & across clitic boundaries, in *dissol-la*), low vowels totally assimilate to the preceding round stressed vowel.

III.4. Phonologization: Word-level rule



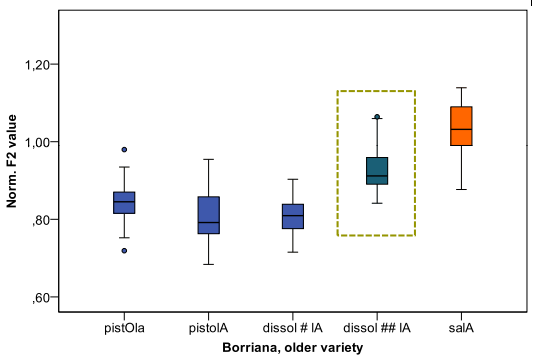
[F (4, 75) = 37,067, p < 0,001]

III.4. Phonologization: Word-level rule

1. Beyond coarticulation

- **Across words** (in *dissol la farina*), we still find high coarticulation effects, that is, partially assimilated vowels, as in Nules variety (stage 3).

III.4. Phonologization: Word-level rule



[F (4, 75) = 37,067, p < 0,001]

III.4. Phonologization: Word-level rule

2. Rule splitting & vowel perception

- Why two different processes?
- **Hypothesis**:
  - Although in Nules some allophones of /a/ are close to the realizations of the preceding round vowel /ɔ́/, those partially assimilated segments may still be interpreted as instances of the low vowel /a/.
  - By contrary, totally assimilated vowels in Borriana −indistinguishable from the allophones of /ɔ́/− are probably interpreted as variants of /ɔ/

III.4. Phonologization: Word-level rule

2. Rule splitting & vowel perception

- **Experiment**:
  - **Subjects**: 19 UV undergraduate students, with advanced skills in Catalan.
  - **Task**: The subjects listened to different stimuli & had to categorize them as /a/ or as /ɔ/, using Perceval (André et al. 2003).
  - **Stimuli**: 48 vowels from the corpus; 50 ms long

III.4. Phonologization: Word-level rule

2. Rule splitting & vowel perception

- **Experiment**:
  - **Compared vowels**:
    - Stressed /ɔ́/ in *pistola* (Nules) /ɔ́/
    - Harmonized unstr. /a/ in *pistola* (Borriana$_{Old}$) ?
    - Coarticulated unstr. /a/ in *pistola* (Nules) ?
    - Unstressed /a/ in *sala* (Nules) /a/
  - **Selection of the stimuli**: Form each set, we chose the vowels whose normalized values were just below (2 tokens) or above (2 tokens) the median.

III.4. Phonologization: Word-level rule

2. Rule splitting & vowel perception

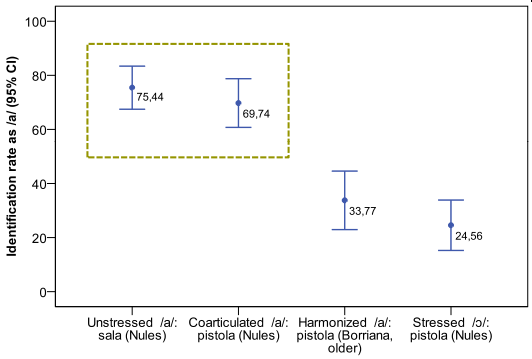
- **Experiment hypothesis**: The interpretation of the harmonized unstressed /a/ in *pistola* (Borriana$_{Old}$) & the coarticulated unstressed /a/ in *pistola* (Nules) should at least be **different** from each other.
- **Statistical test**: one-way repeated measures ANOVA, using SPSS.

III.4. Phonologization: Word-level rule

2. Rule splitting & vowel perception

- The **results** confirm the hypothesis, since the assimilated low vowels in Borriana$_{Old}$ *pistola* are regularly interpreted as variants of /ɔ/, while the coarticulated vowels in Nules *pistola* are mostly interpreted as instances of the low vowel /a/.

III.4. Phonologization: Word-level rule



III.4. Phonologization: Word-level rule

2. Rule splitting & vowel perception

- The different categorization of the harmonic output would play a critical role in narrowing the domain of application of the harmonic rule: low vowels belonging to an independent word (articles, for instance) would be more prone to display faithfulness effects, whereas low vowels inside the word would tend to totally assimilate.

III.5. Back to stage 3: Borriana young speakers

1. A postharmonic pattern

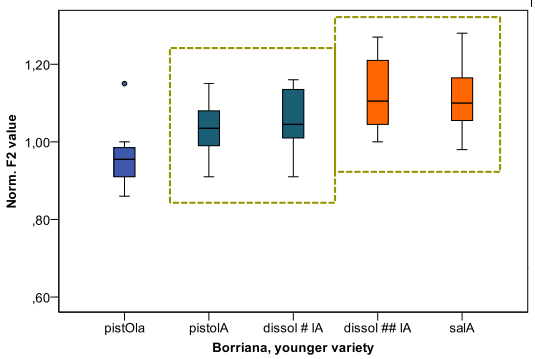
- Young Borriana speakers display a pattern that can be considered a regression to stage 3.
  - Two speakers, though, still show vowel harmony, in every word-level context, as in Borriana$_{Old}$ variety.

III.5. Back to stage 3: Borriana young speakers

1. A postharmonic pattern

- In Borriana$_{Young}$, high coarticulation effects are attested at the **word-level** (as in Nules, stage 3), both across morpheme boundaries (in *pistola*) & across clitic-boundaries (in *dissol-la*).
- **Across words** (in *dissol la farina*), instead, even the coarticulation rule fails to apply.

III.5. Back to stage 3: Borriana young speakers



[F (4, 75) = 12,153, p < 0,001]

III.5. Back to stage 3: Borriana young speakers

2. Factors favoring regression

- Presence, in every age group, of non-harmonic speakers & non-totally harmonized items (Saborit 1998, Herrero & Jiménez 2013).
- More familiarization with Catalan spelling (via schooling).
- The morphological nature of *a* (either a feminine marker or a verbal affix), pronounced as [a] in many other words, can also exert analogical pressure.

6. The last stage in sound change: Lexicalization

1. Fossilized vowel harmony

- The theoretically last stage in the life cycle of phonological processes (**lexicalization**, Bermúdez-Otero 2007), is exemplified by La Canyada de Biar variety (Southern Valencian; Colomina 1985, Hualde 1996, Jiménez 1998).

6. The last stage in sound change: lexicalization

1. Neutralization

- In this variety, the round mid-open vowel /ɔ/ becomes close, thus merging with the mid-close vowel /o/:
  - Original contrast:

[ósos]	[ɔ́sos]
óssos 'bears'	*ossos* 'bones'
↓	↓
[ósos]	[ósos]

  - Vowel merging:

6. The last stage in sound change: lexicalization

2. Fossilized vowel harmony

- The process affects likewise underlying stressed vowels, as in *dona* 'woman' and *mòlta* 'ground FEM', and the harmonized unstressed final vowels in these words:
  - Underlying representations:

/dɔ́na/	/mɔ́lta/
↓	↓
[dɔ́nɔ]	[mɔ́ltɔ]
↓	↓
[dóno]	[mólto]

  - Vowel harmony:
  - Vowel merging:

6. The last stage in sound change: lexicalization

2. Fossilized vowel harmony

- Some ancient contrasts based on aperture & vowel harmony now totally rely on fossilized vowel harmony:
  - Original contrast:

[dóna]	[dɔ́nɔ]
dóna 's/he gives'	*dona* 'woman'
↓	↓
[dóna]	[dóno]

  - Actual contrast:

6. The last stage in sound change: lexicalization

2. Fossilized vowel harmony

- Since the assimilation rule is no longer productive (there are no mid-open vowels to trigger the process), previously harmonized forms become **opaque**, closing, in this way, the life cycle of vowel harmony.

IV. Concluding remarks

1. Changes in F2: summary

1. **No changes**: all varieties
2. **Sporadic changes**: all varieties
3. **Conventionalization**: Nules ← $\text{Borriana}_{\text{Young}}$
4. **Phonologization (word-level)**: $\text{Borriana}_{\text{Old}}$
5. **Phonologization (stem-level)**: some $\text{Borriana}_{\text{Old}}$ speakers
6. **Lexicalization**: la Canyada de Biar

IV. Concluding remarks

2. Final remarks

- Generally speaking, differences in height among [−ATR] vowels do not seem to restrict their capability to trigger or experiment assimilation.
- As for F2, the behavior of the varieties under study let us draw a path that goes from contexts in which changes do not appear (stage 1) or only appear sporadically (stage 2) to contexts displaying total assimilation at the word-level, in $\text{Borriana}_{\text{Old}}$ variety (stage 4).

IV. Concluding remarks

2. Final remarks

- Nules (stage 3) displays a typically phonetic pattern:
- The coarticulation with the round vowel is insensitive to morphological domains, i.e. every low vowel in a potentially harmonic context is partially assimilated.
- The assimilation is stronger when the prominence of the trigger and the target is especially unbalanced.

IV. Concluding remarks

2. Final remarks

- $\text{Borriana}_{\text{Old}}$ variety (stage 4) displays total assimilation, but only at the word-level, that is, the process is sensitive to morphological domains: it only affects low vowels located inside the stem or in a clitic pronoun.
- Across words, we find high coarticulation levels, as in Nules (stage 3).

IV. Concluding remarks

2. Final remarks

- The narrowing of the domain from the coarticulatory stage in Nules variety (stage 3) to the harmonic stage in $\text{Borriana}_{\text{Old}}$ variety (stage 4) is probably due to a different interpretation of the resulting assimilated vowels:

still a low vowel in Nules

vs.

already a round vowel in $\text{Borriana}_{\text{Old}}$

IV. Concluding remarks

2. Final remarks

- Occasionally, some $\text{Borriana}_{\text{Old}}$ speakers constrain vowel harmony to the stem-level (see Herrero & Jiménez 2011), but, on the whole, the process is not sensitive to clitic boundaries.
- However, varieties in which only vowels belonging to the stem undergo vowel harmony (stage 5) are very likely to occur.

IV. Concluding remarks

2. Final remarks

- $\text{Borriana}_{\text{Young}}$ variety, on the other hand, shows a regression to the phonetic stage of Nules (stage 3), chiefly based on analogical and sociolinguistic factors.
- The last stage in the life cycle of vowel harmony, lexicalization (stage 6), is attested in a variety belonging to the Southern dialect, la Canyada de Biar, where the fossilized harmonic forms have become totally opaque.

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Thank you for your attention

Presentation soon available at:
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