Exploring Spanish Consonantal Dialectal Variation with the Cross-language Articulatory Database (CLAD)

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University of Toronto

Accessing the Database

Username:	**clad**
Password:	**CLad15**

https://clad.linguistics.utoronto.ca/

Outline of our Presentation

1) <u>The Cross-language Articulatory Database (CLAD)</u>
   - Background: Electropalatography
   - Languages/speakers and tasks (datasets)
   - Conducting queries

2) <u>Using CLAD for Research: Consonantal Variation</u>
   - Oral palatal consonants: deaffrication of /t͡ʃ/; multiple outputs of yeísmo [ʎ ɟ̞ ɟ ʒ ʃ])
   - Variable realization of the palatal nasal
   - Production of anterior coronal consonants /s θ/

Outline of our Presentation

3) <u>Using CLAD for Teaching</u>
   - Phonetics class: Production of word-final /n/
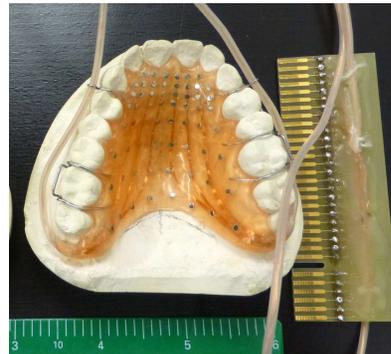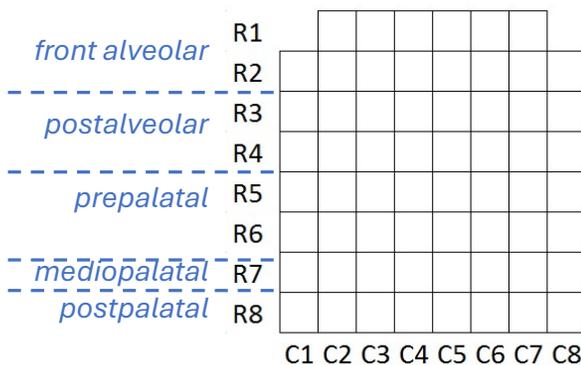   - L2 Pronunciation: POA of /t d/

4) <u>Conclusion</u>
   - CLAD: Present & Future

The Database

Background: Electropalatography (EPG)

- Uses a custom-made artificial palate with built-in electrodes (N=62)

- Tracks the contact between the tongue and the roof of the mouth
  - captures most coronal and (fronted) velar articulations

- Good temporal resolution (every 10 ms)

CLAD: Languages & Speakers

Spanish

- Argentine (n=5), Peninsular (n=1), Cuban (n=1)

French

- France (n=2), Quebec (n=2)

English

- L1 (n=3), L2 (n=11)

Japanese (n=5)

Serbian (n=4)

CLAD: Tasks (Romance Language Survey)

<u>Reading</u>

- Word list

1) Words in isolation

2) Words in a carrier sentence

- Passage

3) The North Wind and the Sun

<u>Narratives</u>

4) Little Red Riding Hood (not yet uploaded)

CLAD: Conducting Queries

- Can be carried out for a target phoneme/grapheme or passage
- For both types of searches, can specify
  - variety
  - speaker sex
- For phoneme/grapheme, can also specify
  - preceding & following phoneme/grapheme

CLAD

Cross-Language Articulatory Database
University of Toronto

Welcome

The Cross-Language Articulatory Database (CLAD) is an on-line research and teaching tool containing tagged video samples of electropalatography (EPG) data from a variety of languages. The data includes read isolated words, sentences, and passages designed to illustrate various segmental aspects of the phonetics and phonology of the following languages or varieties: L1 English, French, Japanese, Serbian, and Spanish; L2: English. The database was developed by Professors Laura Colantoni (Spanish and Portuguese, UofT St. George), Alexei Kochetov (Linguistics, UofT St. George), and Jeffrey Steele (Language Studies, UofT Mississauga). Please see the links below for more information.

Begin Query

To begin querying the database, click on one of the links below.

- Query words: Simple query | Advanced query
- Query passages

1)   Click on 'Simple query'; you will be prompted to log in.

If you are a first time user, you may wish first to read about the corpora or the basics of undertaking queries.

Corpora descriptions

- Romance Language Survey: French and Spanish
- English (L1 and L2)
- Japanese
- Serbian

Undertaking queries

- Coding of files
- Search basics
- SAMPA-IPA equivalences

Database overview

- History, administration, and policies on use
- Method, recordings, and file format
- Funding and thank you's
- Related publications

Instructions

CLAD Cross-Language Articulatory Database
University of Toronto

Query Words / Simple Query

In order to query the database, select values for the following variables; not all variables need to be specified. When finished, click on 'Query Database'.
(Tip: If you don't specify any variable and hit 'Query Database' all the analyses will be retrieved from the database!).

Language

Variety Language

English
English - Canada
French - France
French - Quebec
Japanese
Serbian
Spanish - Argentina
Spanish - Cuba
Spanish - Spain

2) Select all 3 varieties of 'Spanish' in the Language menu.
3) Select the target phoneme or grapheme of interest (e.g., <ñ> for the palatal nasal /ɲ/)
4) Leave everything else as is; click on 'Query Database' at the bottom of the page.

Linguistic Variables

Target Phoneme
Highlight: None

Target Grapheme
Highlight: None

#
@
{
1
2

lh
ll
m
n
ñ

- NB: The database currently contains EPG data from:
  - 5 speakers of *Argentine Spanish* (Buenos Aires, 4f)
  - 1 speaker of *Cuban Spanish* (Havana, 1f)
  - 1 speaker of *Peninsular Spanish* (Madrid, 1f)

Query Database   Reset

CLAD — Cross-Language Articulatory Database
University of Toronto

Query Results

Browse results (total: 170)

No.	TP	TG	PP	FP	PG	FG	Word file	Language	Study	
1.	J	ñ	a	a	a	a	cana_c1-1_epSPAf01_x1.zip (play)	Spanish - Argentina	Romance Language Survey	SPAf01
2.	J	ñ	a	a	a	a	cana_c1-1_epSPAf02_x1.zip (play)	Spanish - Argentina	Romance Language Survey	SPAf02
3.	J	ñ	a	a	a	a	cana_c1-1_epSPAf03_x1.zip (play)	Spanish - Argentina	Romance Language Survey	SPAf03
4.	J	ñ	a	a	a	a	cana_c1-1_epSPAm01_x1.zip (play)	Spanish - Argentina	Romance Language Survey	SPAm01
5.	J	ñ	a	a	a	a	cana_c1-1_epSPCf01_x1.zip (play)	Spanish - C		
6.	J	ñ	a	a	a	a	cana_c1-1_epSPCf01_x1.zip (play)	Spanish - C		
7.	J	ñ	a	a	a	a	cana_c1-2_epSPAf01_x1.zip (play)	Spanish - A		
8.	J	ñ	a	a	a	a	cana_c1-2_epSPAf02_x1.zip (play)	Spanish - A		
9.	J	ñ	a	a	a	a	cana_c1-2_epSPAf03_x1.zip (play)	Spanish - A		
10.	J	ñ	a	a	a	a	cana_c1-2_epSPAm01_x1.zip (play)	Spanish - A		
11.	J	ñ	a	a	a	a	cana_c1-2_epSPCf01_x1.zip (play)	Spanish - C		
12	J	ñ	a	a	a	a	cana_c1-3_epSPAf01_x1.zip (play)	Spanish - A		

Results for <ñ> (graphemic search)
- Organized by:
  - Target phoneme and grapheme (TP, TG)
  - Preceding and following phoneme (PP, FP)
  - Preceding and following grapheme (PG, FG)
  - Word
  - Language - variety
  - Study (dataset)
  - Speaker (where A/C/P = variety, f/m = gender)

![CLAD Cross-Language Articulatory Database University of Toronto]

Query Results

Browse results (total: 170)

No.	TP	TG	PP	FP	PG	FG	Word file	Language	Study	
							Word file	**Language**	**Study**	
1.	J	ñ	a	a	a	a	cana_c1-1_epSPAf01_x1.zip (play)	Spanish - Argentina	Romance Language Survey	SPAf01
2.	J	ñ	a	a	a	a	cana_c1-1_epSPAf02_x1.zip (play)			
3.	J	ñ	a	a	a	a	cana_c1-1_epSPAf03_x1.zip (play)			
4.	J	ñ	a	a	a	a	cana_c1-1_epSPAm01_x1.zip (play)			
5.	J	ñ	a	a	a	a	cana_c1-1_epSPCf01_x1.zip (play)			
6.	J	ñ	a	a	a	a	cana_c1-1_epSPCf01_x1.zip (play)			
7.	J	ñ	a	a	a	a	cana_c1-2_epSPAf01_x1.zip (play)			
8.	J	ñ	a	a	a	a	cana_c1-2_epSPAf02_x1.zip (play)			
9.	J	ñ	a	a	a	a	cana_c1-2_epSPAf03_x1.zip (play)			
10.	J	ñ	a	a	a	a	cana_c1-2_epSPAm01_x1.zip (play)			
11.	J	ñ	a	a	a	a	cana_c1-2_epSPCf01_x1.zip (play)	Spanish - Cuba	Romance Language Survey	SPCf01
12.	J	ñ	a	a	a	a	cana_c1-3_epSPAf01_x1.zip (play)	Spanish - Argentina	Romance Language Survey	SPAf01

(Analyze columns: TP, TG, PP, FP, PG, FG)

Results for <ñ> (graphemic search)
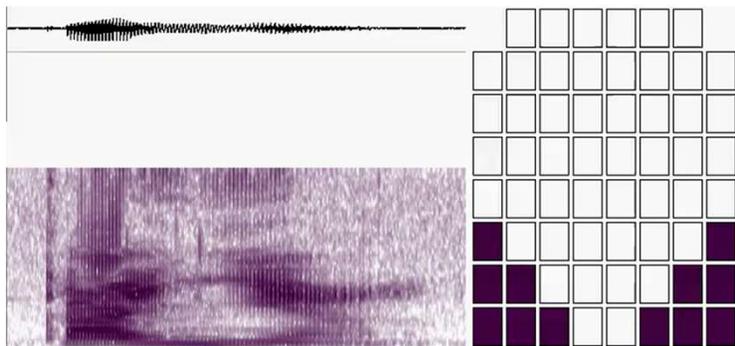
- Word files are organized in an alphabetical order, with file names including the
  - the target word (e.g., *caña*)
  - production context & repetition, for example,
    - **c1-2**: second repetition in the first round in carrier phrase (there were 3 rounds, with each having 3 repetitions = 9 repetitions in total)
    - **s1**: second repetition as a single word (there were 2 repetitions)

To work with individual words, scroll down to where these appear for the target word in question

Let's click on the first token of single (s1) *caña* produced by SPAf01 (Argentine Spanish female 1)

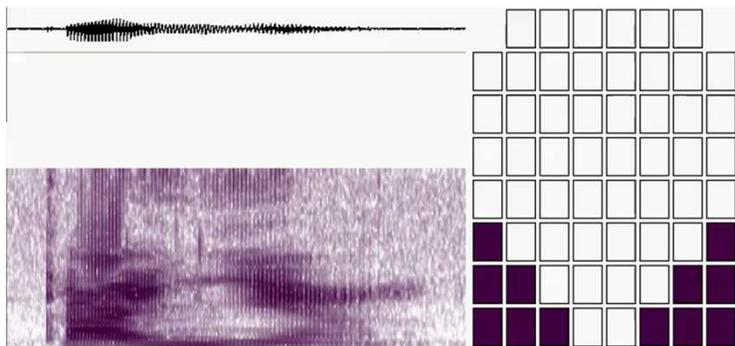| 37. | J | ñ | a | a | a | a | cana_c4-3_epSPPf01_x1.zip (play) | Spanish - Spain | Romance Language Survey | SPPf01 |
| 38. | J | ñ | a | a | a | a | cana_s1_epSPAf01_x1.zip (play) | Spanish - Argentina | Romance Language Survey | SPAf01 |
| 39. | J | ñ | a | a | a | a | cana_s1_epSPAf02_x1.zip (play) | Spanish - Argentina | Romance Language Survey | SPAf02 |

caña
(normal speed)

- This brings up a pop-up window containing:
  o an EPG + spectrogram video at **normal speed**
  o the same video slowed-down and containing a larger number of frames
  o an audio-only file
- Play both videos, then manually move the cursor to select specific frames, with reference to the spectrogram
  o the image on the left shows the EPG frame towards the midpoint of /ɲ/
- As the slow-motion videos have better temporal resolution, use these for the analysis

To work with individual words, scroll down to where these appear for the target word in question

Let's click on the first token of single (s1) *caña* produced by SPAf01 (Argentine Spanish female 1)

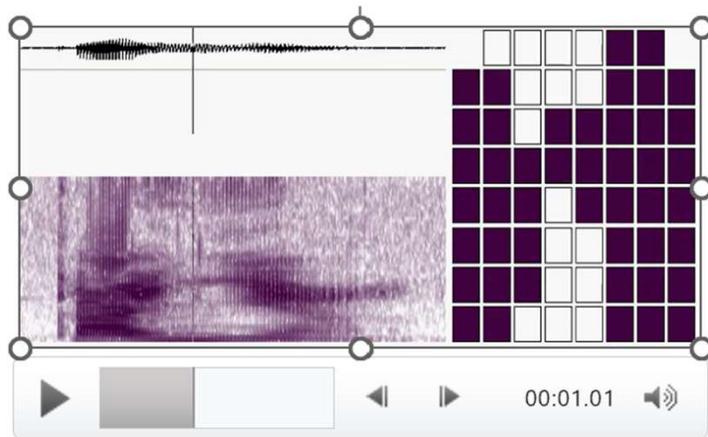| 37. | J | ñ | a | a | a | a | cana_c4-3_epSPPf01_x1.zip (play) | Spanish - Spain | Romance Language Survey | SPPf01 |
| 38. | J | ñ | a | a | a | a | cana_s1_epSPAf01_x1.zip (play) | Spanish - Argentina | Romance Language Survey | SPAf01 |
| 39. | J | ñ | a | a | a | a | cana_s1_epSPAf02_x1.zip (play) | Spanish - Argentina | Romance Language Survey | SPAf02 |

caña

(slow speed, x4)

- This brings up a pop-up window containing:
  - an EPG + spectrogram video at normal speed
  - the same video **slowed-down** and containing a larger number of frames
  - an audio-only file
- Play both videos, then manually move the cursor to select specific frames, with reference to the spectrogram
  - the image on the left shows the EPG frame towards the midpoint of /ɲ/
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Let's click on the first token of single (s1) *caña* produced by SPAf01 (Argentine Spanish female 1)

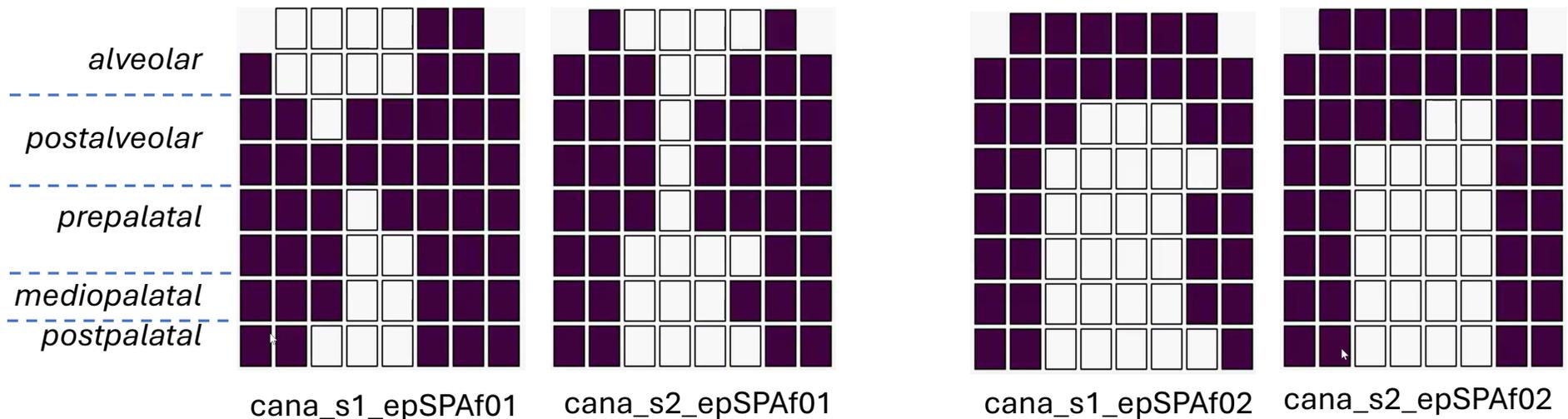| 37. | J | ñ | a | a | a | a | cana_c4-3_epSPPf01_x1.zip (play) | Spanish - Spain | Romance Language Survey | SPPf01 |
| 38. | J | ñ | a | a | a | a | cana_s1_epSPAf01_x1.zip (play) | Spanish - Argentina | Romance Language Survey | SPAf01 |
| 39. | J | ñ | a | a | a | a | cana_s1_epSPAf02_x1.zip (play) | Spanish - Argentina | Romance Language Survey | SPAf02 |

caña

(slow speed, x4)

- This brings up a pop-up window containing:
  - an EPG + spectrogram video at normal speed
  - the same video **slowed-down** and containing a larger number of frames
  - an audio-only file
- Play both videos, then manually move the cursor to select specific frames, with reference to the spectrogram
  - the image on the left shows the EPG frame towards the midpoint of /ɲ/
- As the slow-motion videos have better temporal resolution, use these for the analysis

Once a frame of interest is selected, we can create a screenshot for comparison to 1) other tokens of the word; 2) consonants produced by the same or 3) other speakers.

- The two frames on the left below are from two repetitions of /ɲ/ in *caña* produced by Argentine speakers SPAf01 (left) and SPAf02 (right)
  - The first produces the sound with a fairly posterior, postalveolar/prepalatal constriction, with the closure optionally incomplete (having a central opening) – **[ɲ]**
  - The second speaker produces the sound with a very front, alveolar closure and, overall, less contact with the tongue sides; this is relatively consistent across repetitions – **[nʲ]**
- The two patterns are representative of the variable fronting/depalatalization of /ɲ/ in Argentine Spanish.
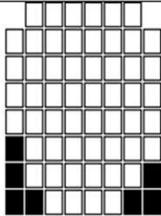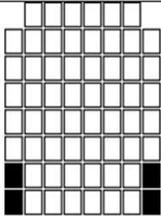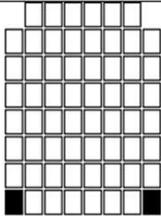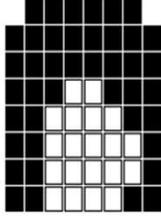

alveolar
postalveolar
prepalatal
mediopalatal
postpalatal

cana_s1_epSPAf01   cana_s2_epSPAf01   cana_s1_epSPAf02   cana_s2_epSPAf02

Using CLAD for Research: Consonantal Variation

Three Examples

A Case-study: Cross-dialectal Variation

- To illustrate cross-dialectal similarities and differences, we will present selected productions by **3 female speakers**: SPPf01 (Spain), SPCf01 (Cuba), SPAf02 (Argentina)

- The data come from the **2nd repetition** of single words with the following graphemes:
  1) <p>, <t>, <c> (/k/): no expected major differences
  2) <ll>, <y>, <ch> (palatal obstruents/glides): dialectal variation expected
  3) <ñ>, <n> (coronal nasals): dialectal variation expected in the palatal nasal; for alveolar depending on position
  4) <z>, <s> (anterior coronal fricatives): certain dialectal variation expected in the presence/absence of contrast and positional variation

Stable Consonants

	Peninsular (SPPf01)	Cuban (SPCf01)	Argentine (SPAf02)
<p> in *pato*			
<t> in *taza*			
<c> (/k/) in *cara*			
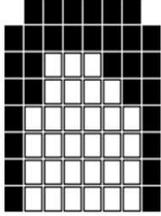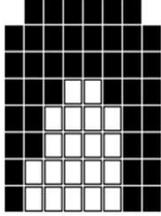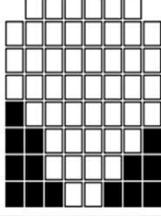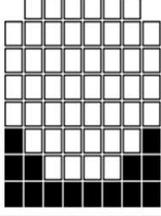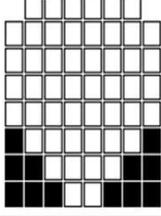
<p>:
- Little linguopalatal contact
- Tongue not involved in production

<t>:
- Alveolar closure extending into the postalveolar regions (laminal) for SPPf01 and SPAf02

<c>:
- Contact at the back of the palate with full closure beyond the artificial palate for /k/ (SPPf01 and SPAf02)

Example 1: Palatal Obstruents

	Peninsular (SPPf01)	Cuban (SPCf01)	Argentine (SPAf02)
<ll> in *llave*			
<ll> in *callar*			
<y> in *kayak*			
<ch> in *chacra*			
<ch> in *hachar*			

<ll,y>

- <u>SPPf01</u>: extensive alveolar to prepalatal closure word-initially; reduced (fricative-like) word-medially, [ʥ] and [ʑ]
- <u>SPCf01</u>: retracted front closure word-initially and a weak glide-like constriction word-medially, [ʥ] and [j]
- <u>SPAf02</u>: retracted relatively narrow central opening, i.e. fricative, [ʃ] (vls. acoustically)

<ch>

- <u>SPPf01</u>: similar to initial <ll>, somewhat reduced medially, [tɕ]
- <u>SPCf01</u>: a retracted fricative-like constriction, [ɕ]
- <u>SPAf02</u>: similar to SPPf01, [tɕ]

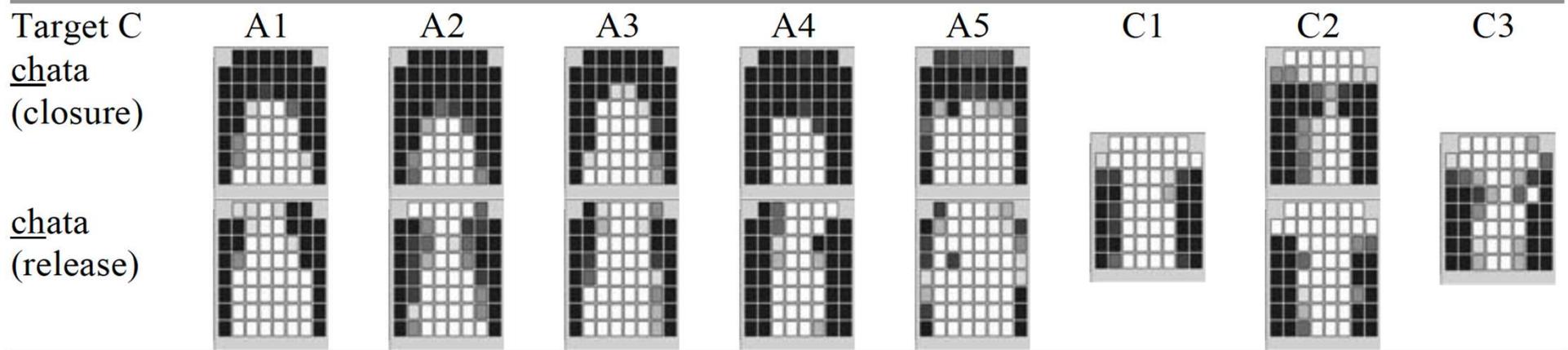# Realization of <ch> in Argentine & Cuban Spanish

Figure 3: Individual linguo-palatal contact profiles for /tʃ/, averaged over six repetitions of each word. The different shades of grey represent different degrees of contact (black=100%; white=0%)

From Colantoni & Kochetov (2011: 88)

Palatal Obstruents: Main Findings

- **Realization of <ll, y>**
  - <u>Peninsular Spanish</u>: prepalatal affricate in word-initial position; weakly fricated palatal in word-medial position
  - <u>Cuban Spanish</u>: retracted alveolar closure (affricate) in word-initial position; glide-like realization word-medially
  - <u>Argentine Spanish</u>: fricative with narrow central constriction in all positions
- **Realization of <ch>**
  - <u>Peninsular and Argentine Spanish</u>: similar realizations
  - <u>Cuban Spanish</u>: deaffrication with fricative realization resembling but not identical to Argentine Spanish <ll, y>

References: (1) Kochetov, A., & Colantoni, L. (2011). Coronal place contrasts in Argentine and Cuban Spanish: An electropalatographic study. Journal of the International Phonetic Association, 41, 313-342. (2) Colantoni, L., & Kochetov, A. (2011). An articulatory study of sibilant fricatives in two Spanish varieties. In S. Alvord (ed.), Selected Proceedings of the Conference on Laboratory Approaches to Romance Phonology (pp. pp 84-97). Cascadilla Press.

Example 2: Alveolar & Palatal Nasals

	Peninsular (SPPf01)	Cuban (SPCf01)	Argentine (SPAf02)
<ñ> in *ñoqui*			
<ñ> in *engaño*			
<n> in *afgano*			
<n> in *cenit*			
<n> in *ión*			

<ñ>

- SPPf01: extensive closure across the palate word-initially, somewhat more front closure medially, [ɲ]
- SPCf01: retracted closure, [ɲ]
- SPAf02: alveolar closure with some palatal side contact, [nʲ] (similar to /n/ in *cenit*)

/n/

- Prevocallically: all speakers show an alveolar/postalveolar closure, with more side contact before /i/ due to coarticulation
- Word-finally: the same kind of alveolar closure for SPPf01 and SPAf02, [n]; a velar constriction for SPCf01, [ŋ]

Spanish Quasi-Minimal Pairs: *ɲa-nja*
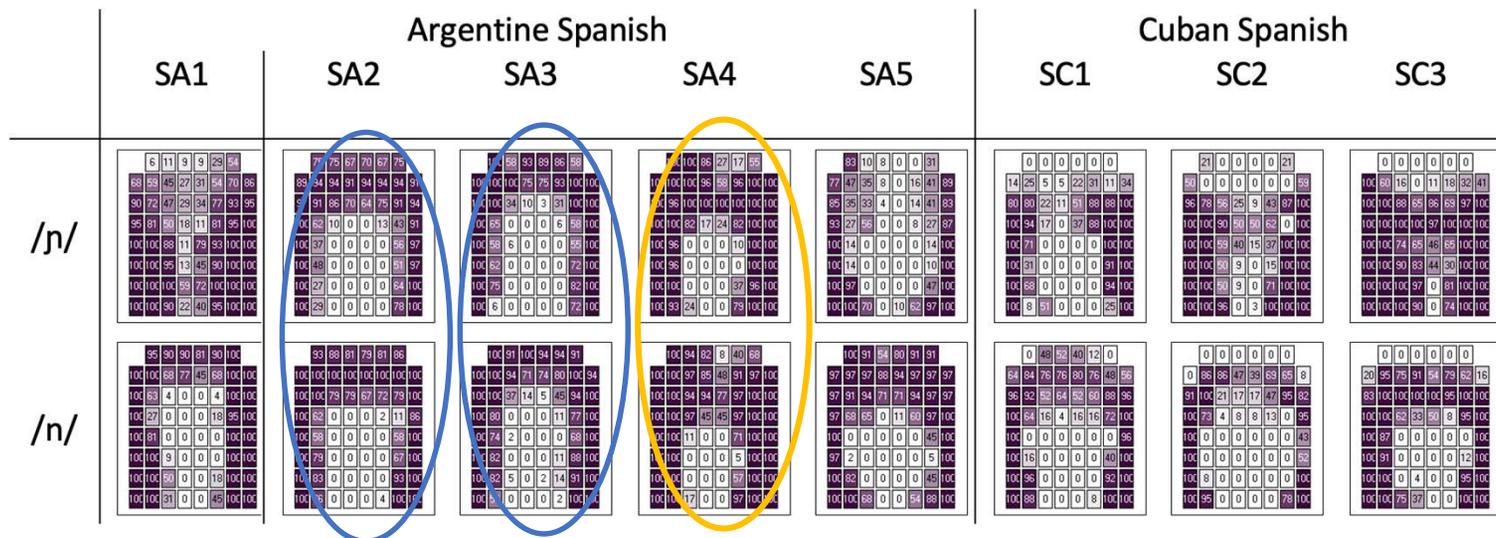
Mean linguopalatal contact for all speakers in *pestaña* and *Alemania*, based on 6 tokens

Alveolar and Palatal Nasals: Summary

- Peninsular and Cuban Spanish: Stable realization of palatal nasals
- Argentine Spanish: decoupling of the nasal and glide gestures
  - The relative differences in alignment between the nasal and the palatal gesture would result in depalatalization of the palatal nasal or palatalization of the alveolar nasal

References: (1) Colantoni, L., & Kochetov, A. (2010). Palatal nasal or nasal palatalization? Paper presented at the 40th Linguistic Symposium on Romance Languages, Washington University, March 26-28. (2) Kochetov, A., & Colantoni, L. (2011). Coronal place contrasts in Argentine and Cuban Spanish: An electropalatographic study. Journal of the International Phonetic Association, 41, 313-342. (3) Colantoni, L., Kochetov, A., & Steele, J. (2023). Phonological processes targeting palatal nasals in Romance: Articulatory evidence from Spanish and French. Paper presented at the International Conference on Experimental Phonetics, University of Vigo, June 21-23.

Example 3: Anterior Coronal Fricatives

	Peninsular 1	Cuban 1	Argentine 1
<z> in *brazo*			
<s> in *vaso*			
<s> in *mismo*			
<s> in *gusto*			
<s> in *pesca*			

<z> vs. <s>:

- SPPf01: distinct patterns – interdental [θ] (with the constriction made beyond the artificial palate) and alveolar/apical [s]
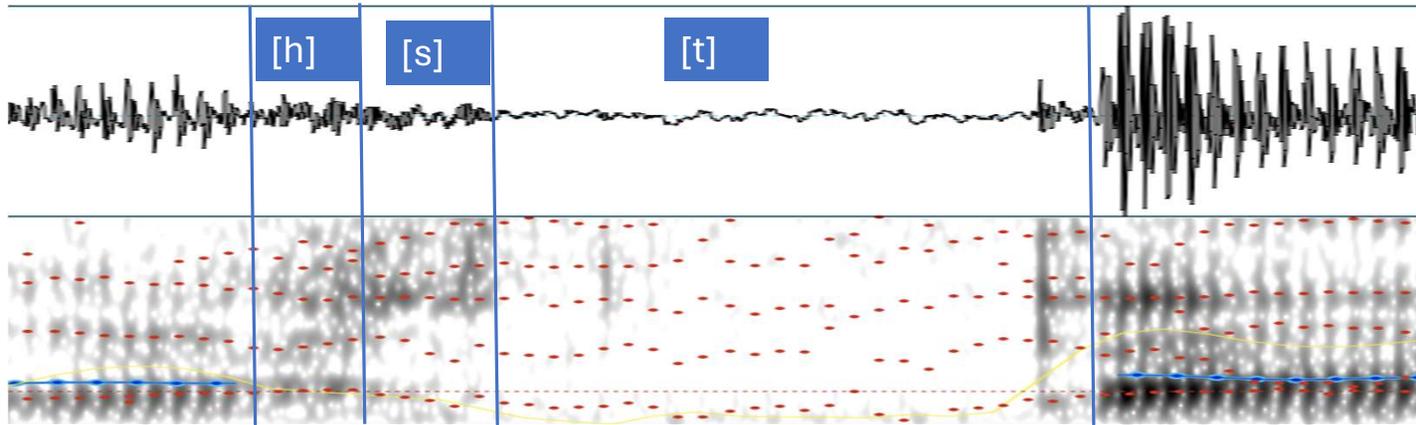- SPCf01 and SPAf02: alveolar fricative, [s]

/s/ prevocalically:

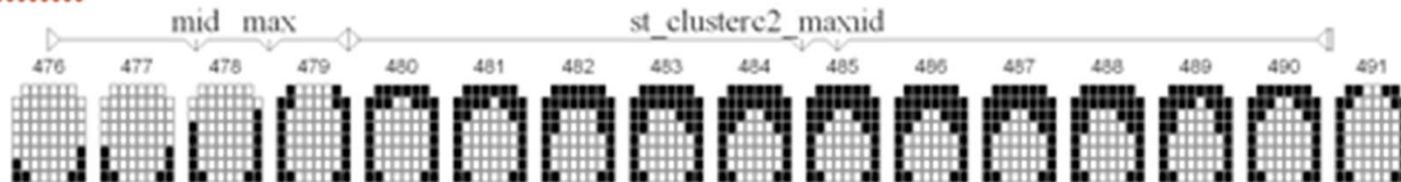- Similar pattens across speakers, [s]

/s/ preconsonantally:

- SPPf01 and SPCf01: alveolar fricatives
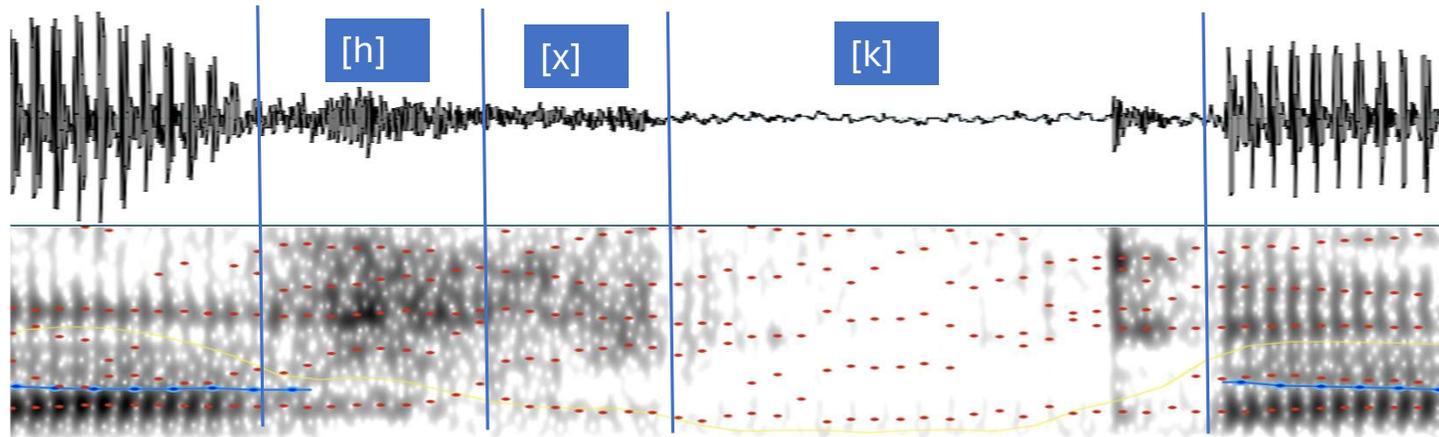- SPAf02: lack of alveolar contact for; lenition to [h] or [x] (before /k/)
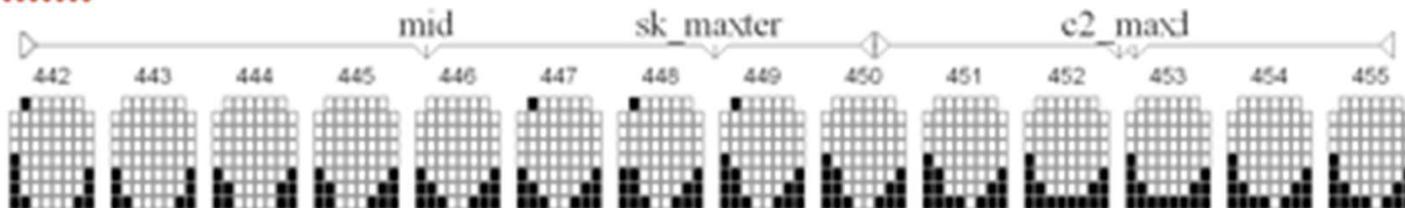
Temporal Profiles: [st] in Argentine Spanish

Temporal Profiles: [sk] in Argentine Spanish

Anterior Coronal Fricatives: Summary

- Onset
  - Distinction between /s/ and /θ/ in Madrid Spanish
  - No distinction and alveolar realization in both Argentine and Cuban Spanish; less contact in Cuban than in Argentine Spanish

- Coda
  - Maintenance of /s/ in Madrid and Cuban Spanish (as concerns the speaker reported here)
  - Argentine Spanish: anticipatory coarticulation before lingual stops, resulting in homorganic excrescent fricatives ([hst, hxk])

References: (1) Colantoni, L., & Kochetov, A. (2016). Estudio electropalatográfico del debilitamiento de /s/ y /n/ en coda en dos dialectos del español. In Ana Ma. Fernández Planas (Ed.), 53 reflexiones sobre aspectos de la fonética y otros temas de lingüística (, pp. 29-37). Laboratori de Fonètica de la Universitat de Barcelona; (2) Kochetov, A., & Colantoni, L. (2011). Gestural assimilation in Spanish /s/ weakening: An electropalatographic study. Paper presented at ISSP, Montreal. June 21-22, 2011; (3) Colantoni, L., & Kochetov, A. (2011). Weakening and assimilation: An electropalatographic study of coda /s/ in Buenos Aires Spanish. Paper presented at the 42th Linguistic Symposium on Romance languages. University of Ottawa, May 5-7.

Cross-dialectal Variation: Summary

	Peninsular	Cuban	Argentine
<ll, y> /#_	dʑ	dʑ	ʃ
<ll, y> /V_V	ʑ	j	ʃ
<ch>	tɕ	ɕ	tɕ
<ñ>	ɲ	ɲ	nʲ
<n> /_V	n	n*	n
<n> /_#	n	ŋ	n
<z> (/_V)	θ	s	s
<s> /_V	s	s	s
<s> /_C	s **	s	h ~ x

* But see SPAf01's [ɲ] shown earlier (i.e. [nʲ] ~ [ɲ] for Argentine Spanish)
**SPCf01 doesn't show the otherwise expected s-aspiration

Using CLAD for Teaching

Two Examples

Using CLAD for Teaching

- The EPG database lends itself well to illustrating the production of all consonants (except labials and post-velars) including **intra- and inter-speaker variation** as conditioned by phonetic environment and task

- In phonetics classes, this can include helping learners to learn inductively **patterns of dialectal variation**

- In pronunciation classes, this can involve using data for both heightening awareness of **L1-L2 articulatory differences** and providing visual **illustration of the target realization**

Phonetics Course: Production of Word-final /n/

<u>Objectives</u>: This lab will allow you

- to investigate differences in the production of **Spanish word-final /n/** as conditioned by a speaker's variety

- to learn how to use articulatory data, particularly from electropalatography (EPG), to assess place of articulation

<u>Phenomenon</u>

- The production of word-final /n/ in **Argentine vs. Cuban Spanish**

Phonetics Course: Production of Word-final /n/

<u>Hypothesis Formulation</u>: Based on what we have already discussed in this course re cross-dialectal variation as well as any experience you may have with Argentine and/or Cuban Spanish speakers' pronunciation of words such as *ión* and *plan*, formulate both a general and a specific hypothesis in response to the following questions:

- Will the two speakers produce word-final /n/ in the same way?

- If not, what difference(s) might we expect?
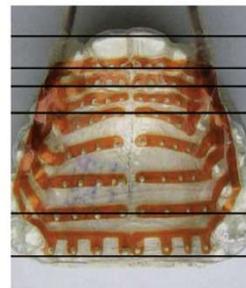
Phonetics Course: Production of Word-final /n/

Background on Electropalatography (EPG)

- uses a custom-made artificial palate that fits snuggly against a speaker's hard palate. The palate has built-in electrodes that register the contact between the palate and the tongue.

- is an effective method for recording the timing and location of tongue contact with the hard palate during continuous speech.

- may involve one of multiple EPG systems and palate designs. The data that we will be analyzing were collected using a 62-electrode Reading-style palate (1b below) and a WinEPG system (1c below) by *Articulate Instruments* (Wrench et al., 2002). Articulatory data is sampled at 100 Hz, acoustic data at 22,050 Hz.

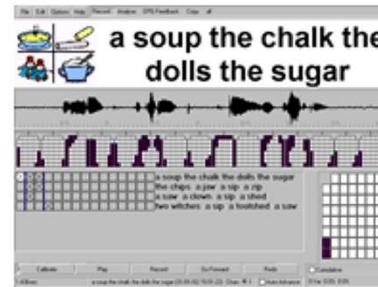# Phonetics Course: Production of Word-final /n/

Figure 1. (a) A palate cast used to create an artificial palate; (b) a Reading-style 62-electrode palate; (c) the WinEPG system; (d) an Articulate Assistant software display showing tongue-palate contact. (Images from http://www.articulateinstruments.com/)

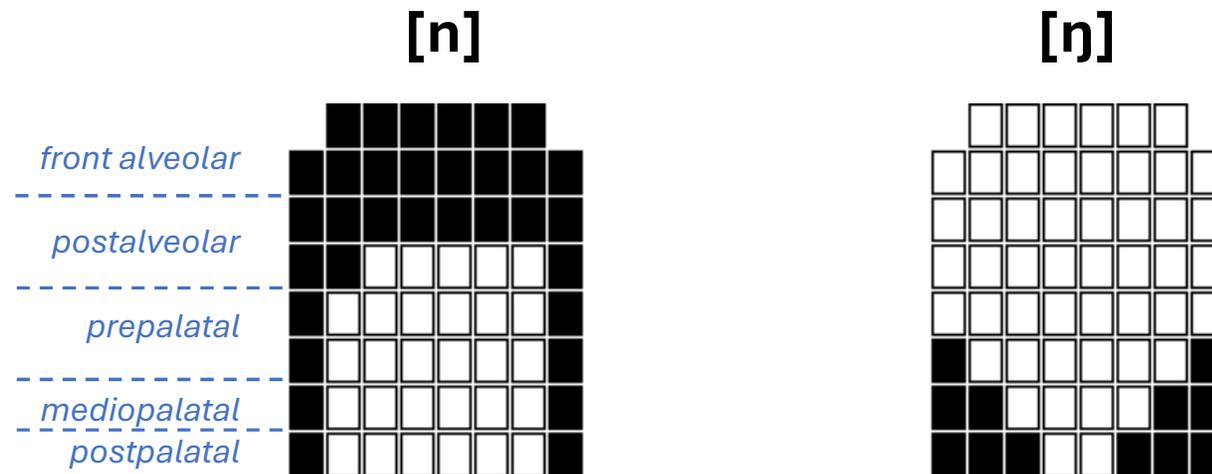# Phonetics Course: Production of Word-final /n/

Figure 2. Production of word-final /n/ in *ión* /iˈon/ (produced in isolation) as realized by an Argentine (SPAf02 SPCf01; left) and Cuban (SPCf01; right)

Phonetics Course: Production of Word-final /n/

<u>Hypothesis Evaluation</u>

- Based on the data in Figure 2, to what extent are your general and specific hypotheses supported?

Pronunciation Course: POA of /t d/

Objectives:

- to investigate the place of articulation (POA) of **Spanish stops /t d/**
- to determine to what extent the POA is the same/differs from your **L1 English**

Pronunciation Course: POA of /t d/

Background on Electropalatography (EPG)

- uses a custom-made acrylic palate that fits snuggly against the roof of the mouth

- the palate has built-in electrodes that register the contact between the tongue and the roof of the mouth

- allows to measure the articulation of consonants including their place of articulation (POA)

Pronunciation Course: POA of /t d/

Palatograms

- illustrate the location of tongue contact
- involve 8 rows (Figure 3) corresponding to different POAs:

  Rows 1-2:   (Front) Alveolar

  Rows 3-4:   Postalveolar

  Rows 5-6:   Prepalatal

  Row 7:   Mediopalatal

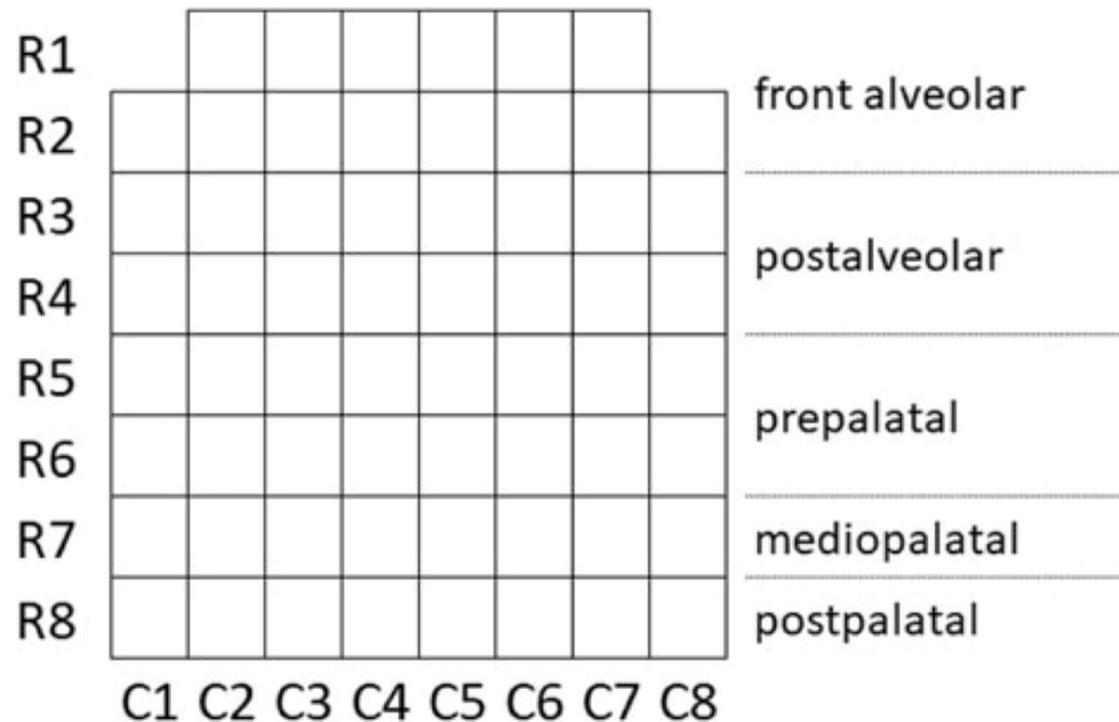 Row 8:   Postpalatal

Pronunciation Course: POA of /t d/

Figure 3. Places of articulation (POA) as illustrated with a palatogram
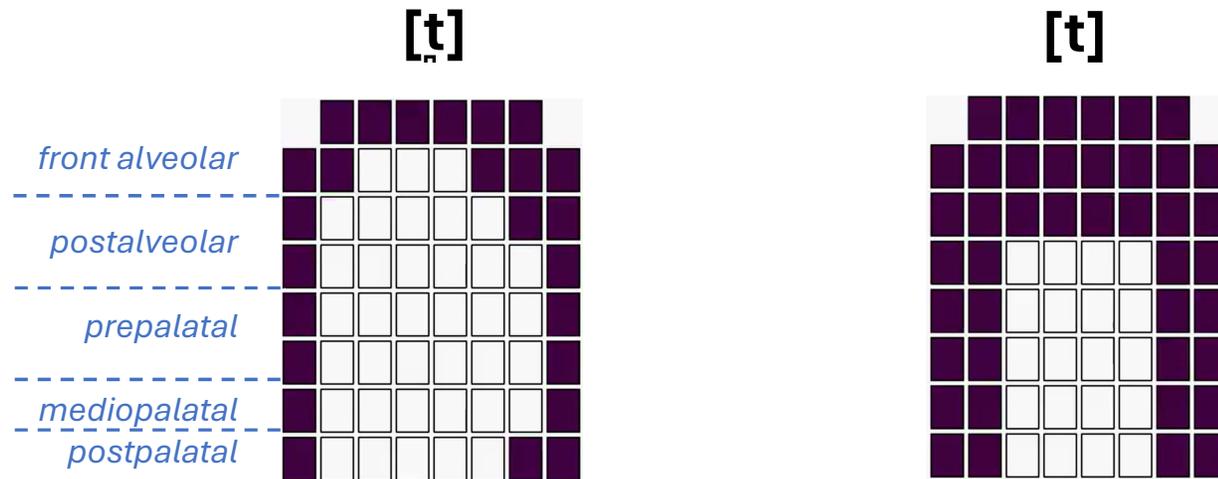
Pronunciation Course: POA of /t d/

Figure 4. Production of word-initial **/t/** in Spanish **taza** /ˈtasa/ (SPCf01, left) and English **tidy** /ˈtaɪɾi/ (ENm01, right), produced in isolation
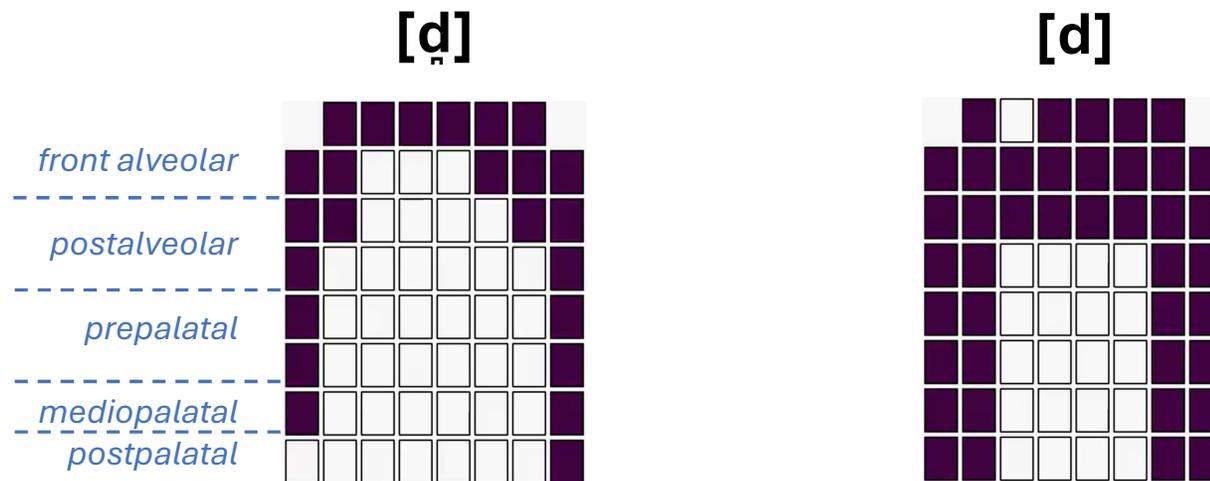
Pronunciation Course: POA of /t d/

Figure 4. Production of word-initial **/t/** in Spanish **dama** /ˈd̪ama/ (SPCf01, left) and English **die** /ˈdaɪ/ (ENm01, right), produced in isolation

Pronunciation Course: POA of /t d/

Comparing Spanish & English /t d/

- What similarities/differences do you notice between the production of /t d/ in the two languages?

- To what extent do you think that your own Spanish /t d/ production is target-like?

Conclusion

CLAD: Present & Future

- <u>Present</u>
  - o Speech style: limited to read speech
  - o Languages: Spanish, French, English (L1 & L2), Japanese & Serbian

- <u>Future</u>
  - o Speech style: adding semi-spontaneous speech
  - o Languages
    - o L1 Spanish: 2 additional Cuban speakers
    - o L1 Korean, Punjabi - new; L1 French, Serbian, Spanish - additional data
    - o L2 English (L1 Spanish, French, Japanese, Korean) - additional data
  - o Type of data
    - o Including raw linguopalatal contact data to enable quantitative data analysis

Questions

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