LINGUISTIC PHONETICS:

A LOOK INTO THE FUTURE

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INTRODUCTION

We have at present a good deal of knowledge about **consonant inventory types** (Maddieson, 1984) while being in need of more experimental data on

- **consonant production characteristics/mechanisms**, &

- **consonant allophonic patterns**

along the lines of work carried out by Ladefoged and colleagues (Ladefoged & Maddieson, 1996, Dart, 1991, Nartey, 1982).

This paper is a contribution to the knowledge of these aspects through the study of the

- **typology of places of articulation for (alveolo)palatal consonants**,

- **allophonic patterns for clear and dark /l/**.

PLACE OF ARTICULATION TYPOLOGY

(ALVEOLO)PALATAL CONSONANTS

Goal

Study on closure and constriction location for (alveolo)palatal consonants based on linguopalatal contact and tongue configuration data (static palatography, EPG, X-ray, MRI).

Consonants

fricatives /ɕ, ʑ/,
lateral /ʎ/,
oral stops /c, ɟ/,
nasal stop /ɲ/

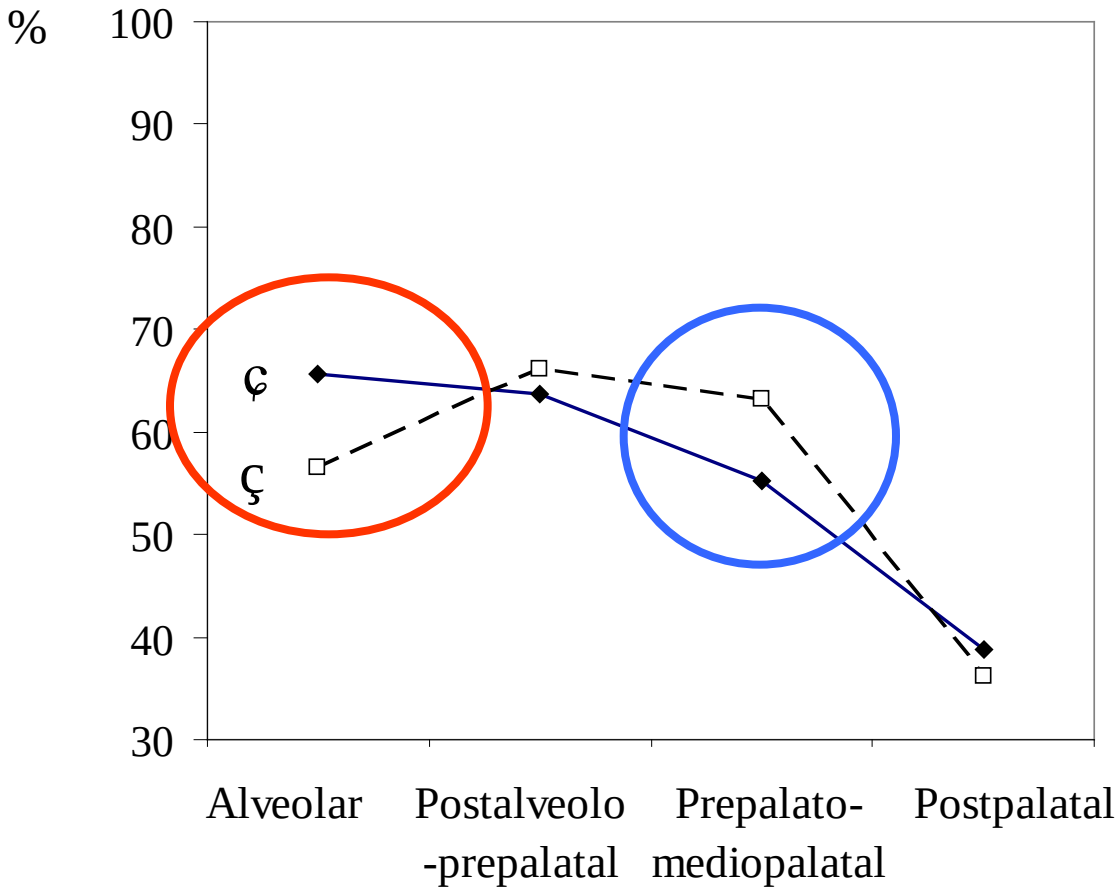
Languages/dialects

[1]	**Romance**	(Catalan; French; Italian; Occitan; Portuguese; Romansh; Spanish);
[2]	**Germanic**	(German; Icelandic; Swedish), **Irish Gaelic**
[3]	**Slavic**	(Czech; Polish; Slovak), **Hungarian**
[4]	**African**	(Ibibio; Malagasy; Ngwo; Suto; Zulu)
[5]	**Australian**	(Arrernte)
[6]	**Eastern Asian**	(Chinese; Japanese)
[7]	**Other**	(Greek; Basque; Abkhaz).

Number of items subjected to analysis

		ɕ	ç	ʎ	c, ɟ	ɲ	
Romance	tongue contact	0	0	42	14	66	***136***
	X-ray, MRI	0	0	5	1	8	
Germanic, Irish	tongue contact	1	5	2	4	2	***23***
	X-ray, MRI	0	8	0	1	0	
Slavic	tongue contact	2	0	3	13	11	***47***
	X-ray, MRI	5	0	1	5	7	
African	tongue contact	0	0	0	2	4	***7***
	X-ray, MRI	0	0	0	1	0	
Australian	tongue contact	0	0	2	2	2	***6***
	X-ray, MRI	0	0	0	0	0	
Eastern Asian	tongue contact	9	0	0	1	3	***17***
	X-ray, MRI	4	0	0	0	0	
Other	tongue contact	0	0	4	0	0	***5***
	X-ray, MRI	1	0	0	0	0	
		22	***13***	***59***	***44***	***103***	***241***

Cross-language linguopalatal contact percentages (fricatives)



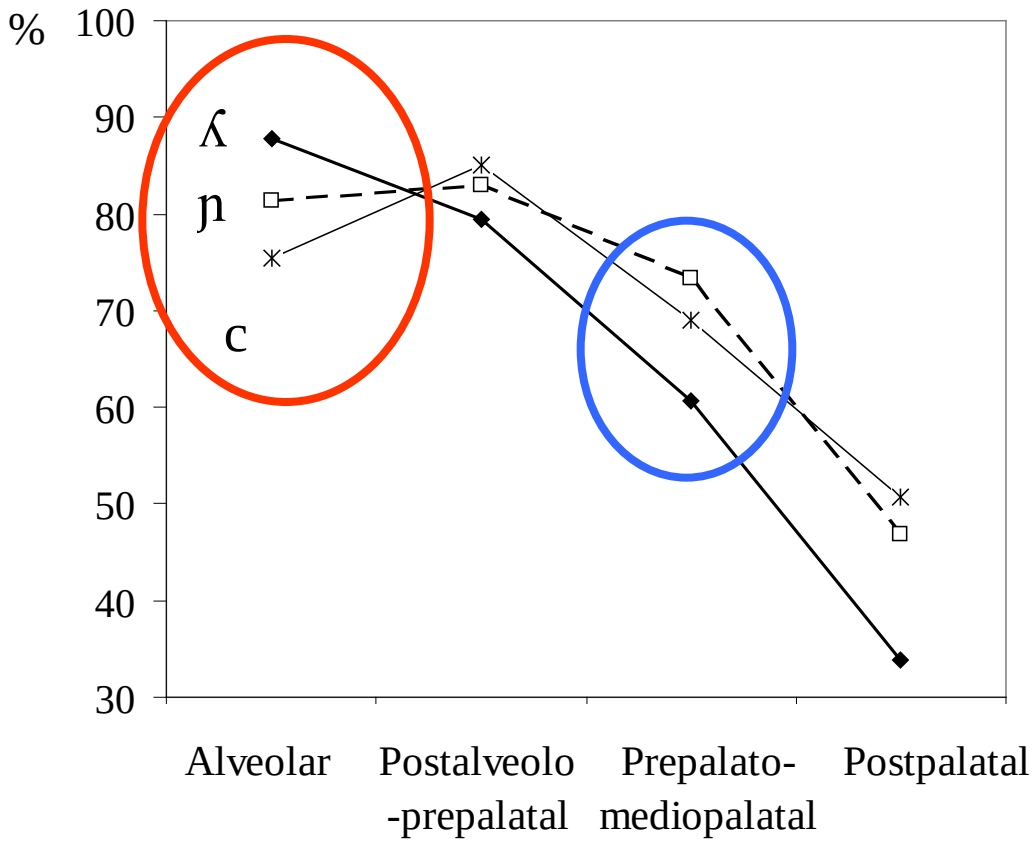
Fronting at place of articulation

/ɕ/ > /ç/

Dorsopalatal contact size

/ç/ > /ɕ/

Cross-language linguopalatal contact percentages (stops, laterals)



Fronting at place of articulation

/ʎ/ > /ɲ/ > /c/

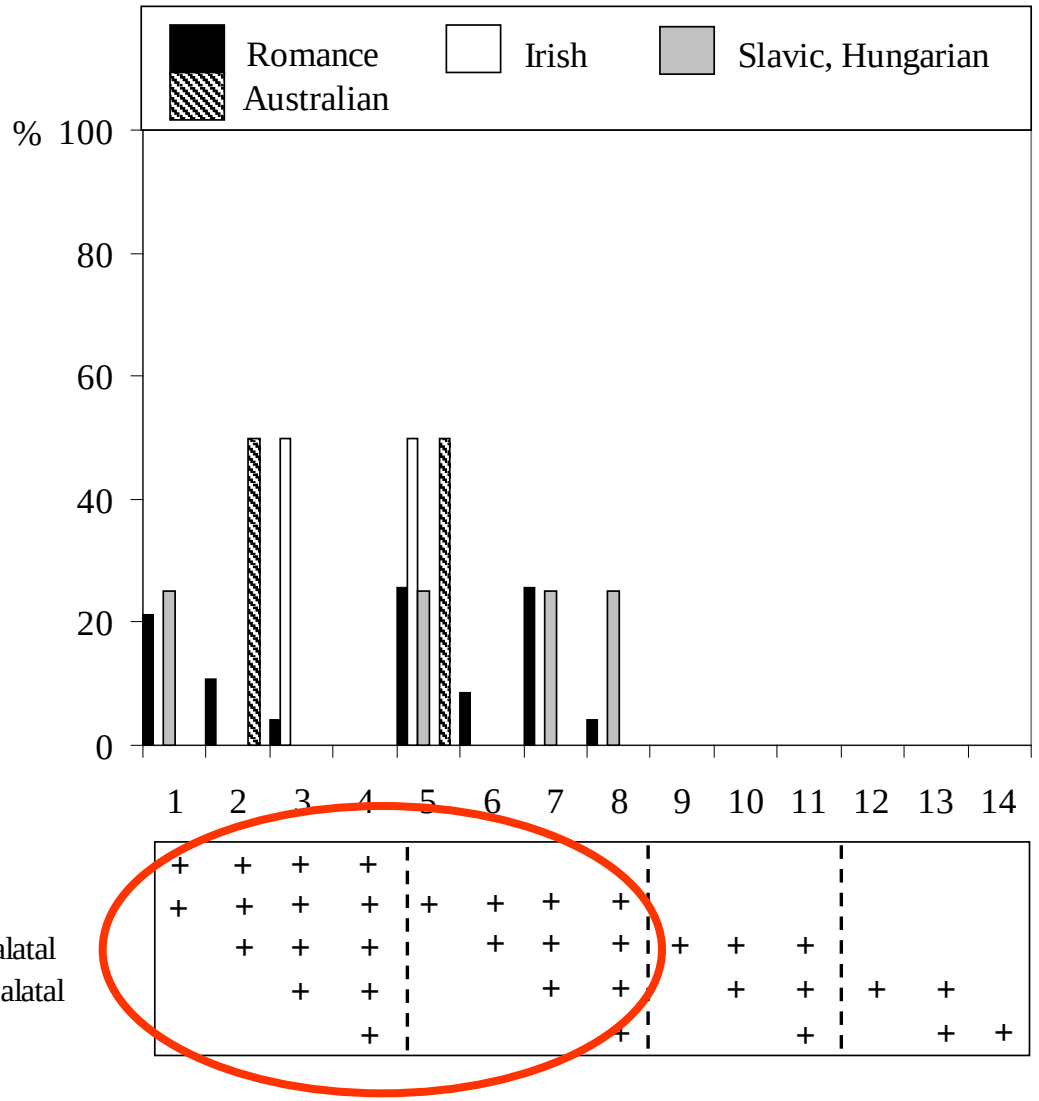
Dorsopalatal contact size

/c, ɲ/ > /ʎ/

Language/dialect differences in place of articulation (lateral /ʎ/)

Dentoalveolar, Alveolar, Alveolopalatal

All languages/dialects



Language/dialect differences in place of articulation (stops /c, ɟ /)

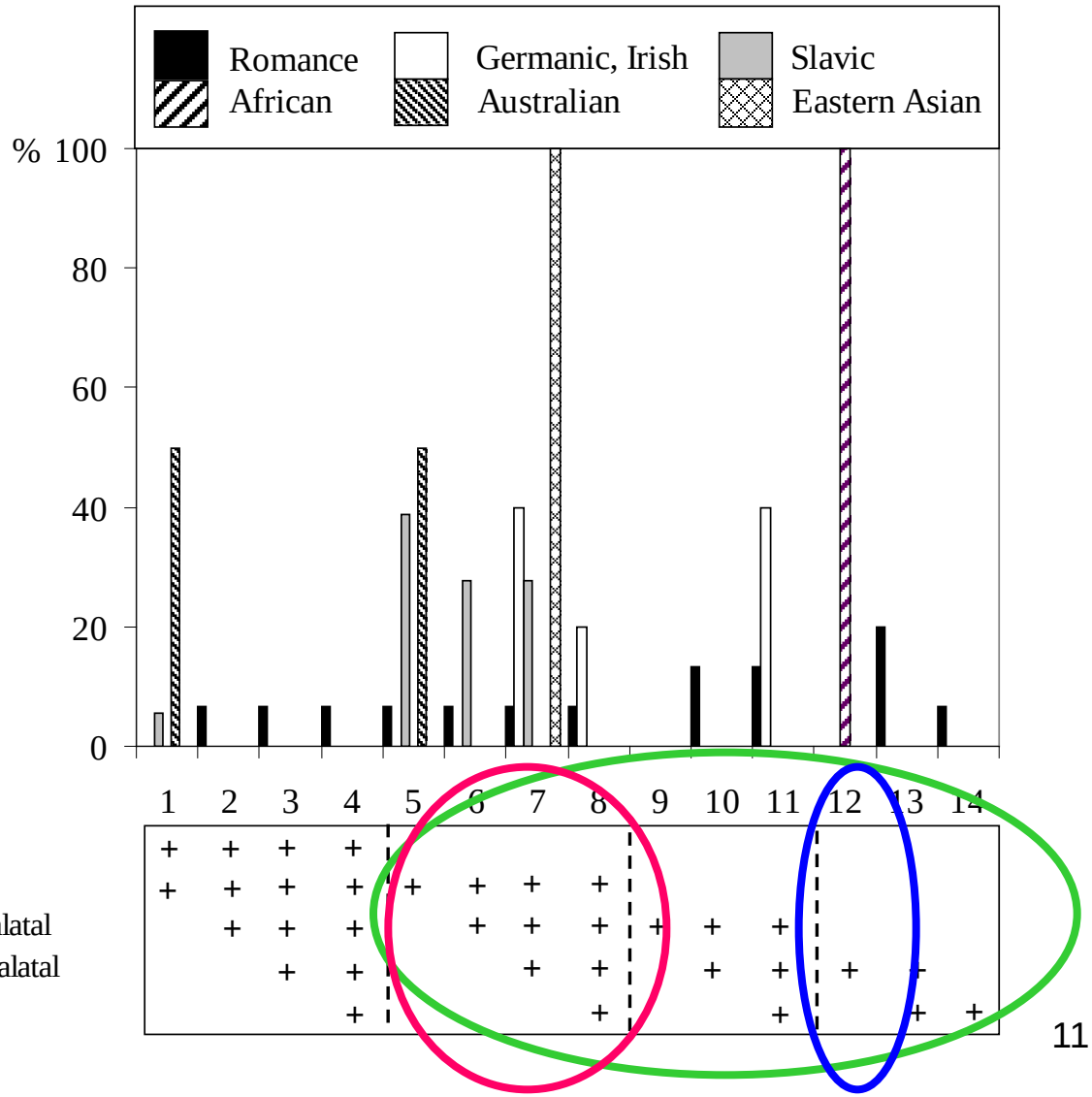
Alveolar, Alveolopalatal
Most Romance dialects
Icelandic
Slavic, Hungarian
Australian
Chinese

Alveolar, Alveolopalatal, Palatal

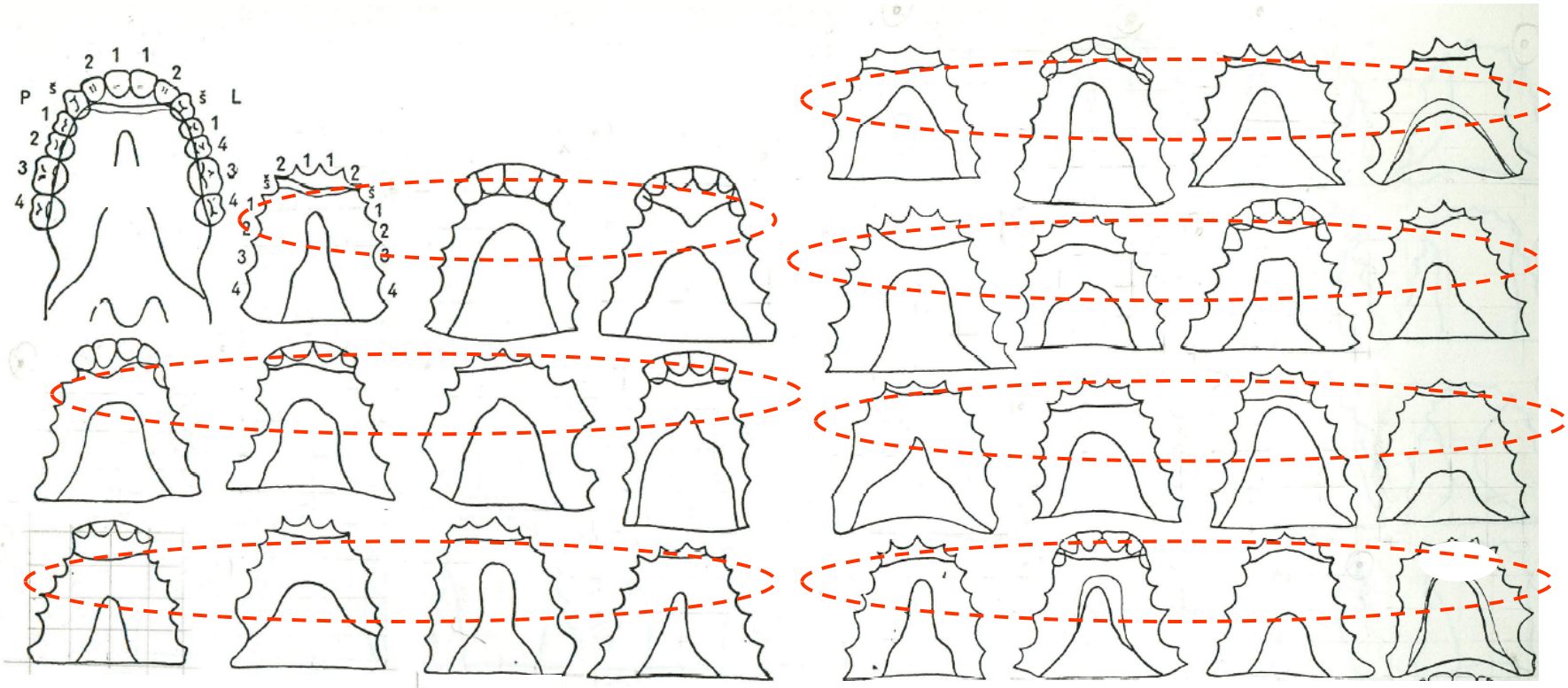
Romance (Parisian, Majorcan)
Irish

Palatal

African (Ngwo, Ibibio)

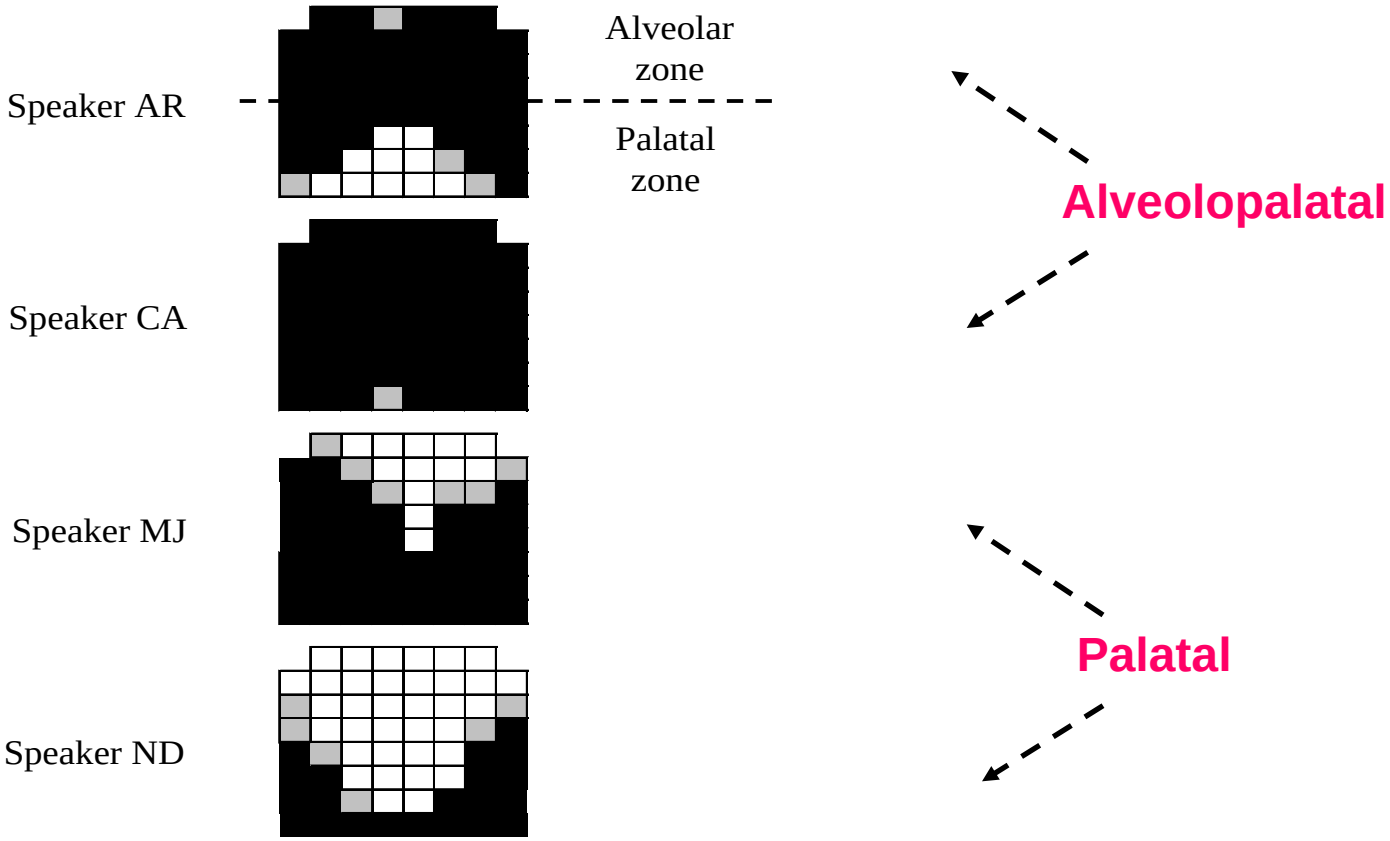


Alveolopalatal */c/ in Czech (Hála, 1962, 27 speakers)



Alveolopalatal and palatal [c] (allophone of /k/) in Majorcan Catalan

(Recasens & Espinosa, 2006)



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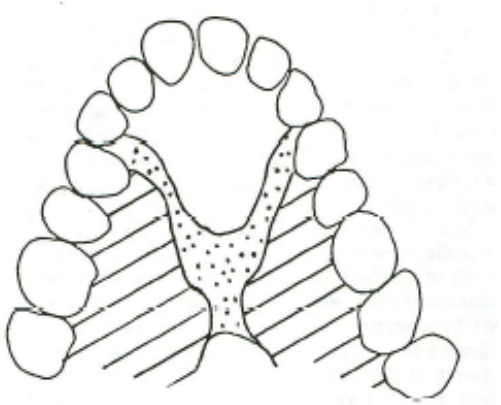
Palatal [c] (allophone of /k/) in Ibibio (Connell, 1991)



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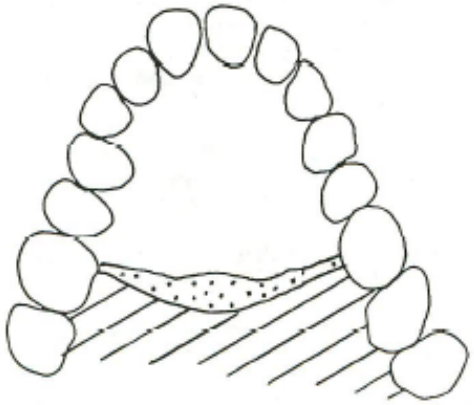

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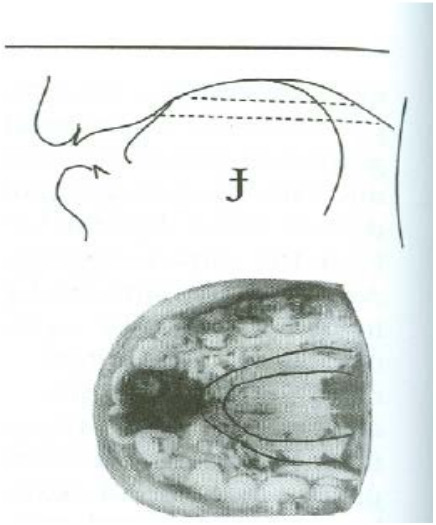
Palatal /ɟ/ in Ngwo (Ladefoged & Maddieson, 1996)

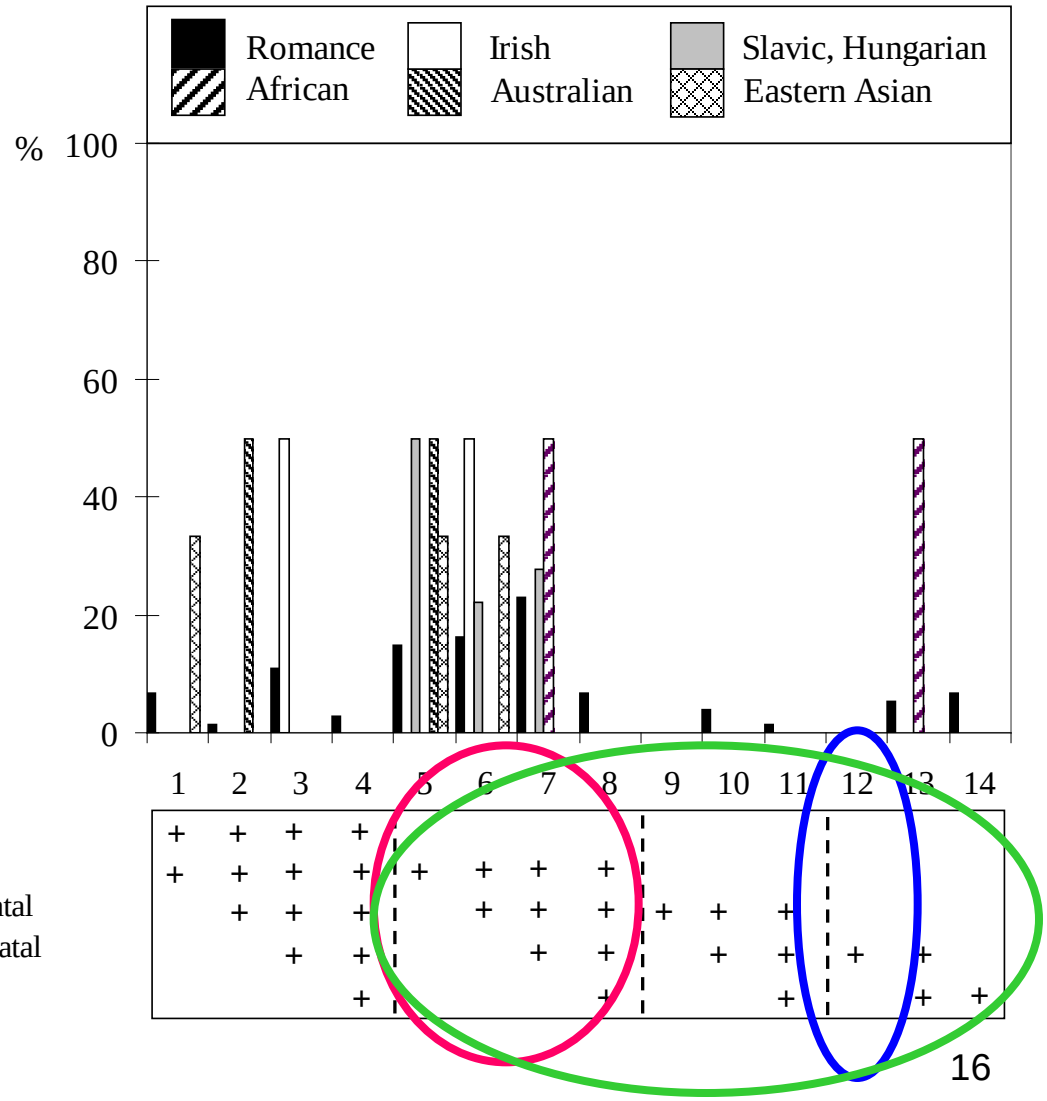


Language/dialect differences in place of articulation (nasal /ɲ/)

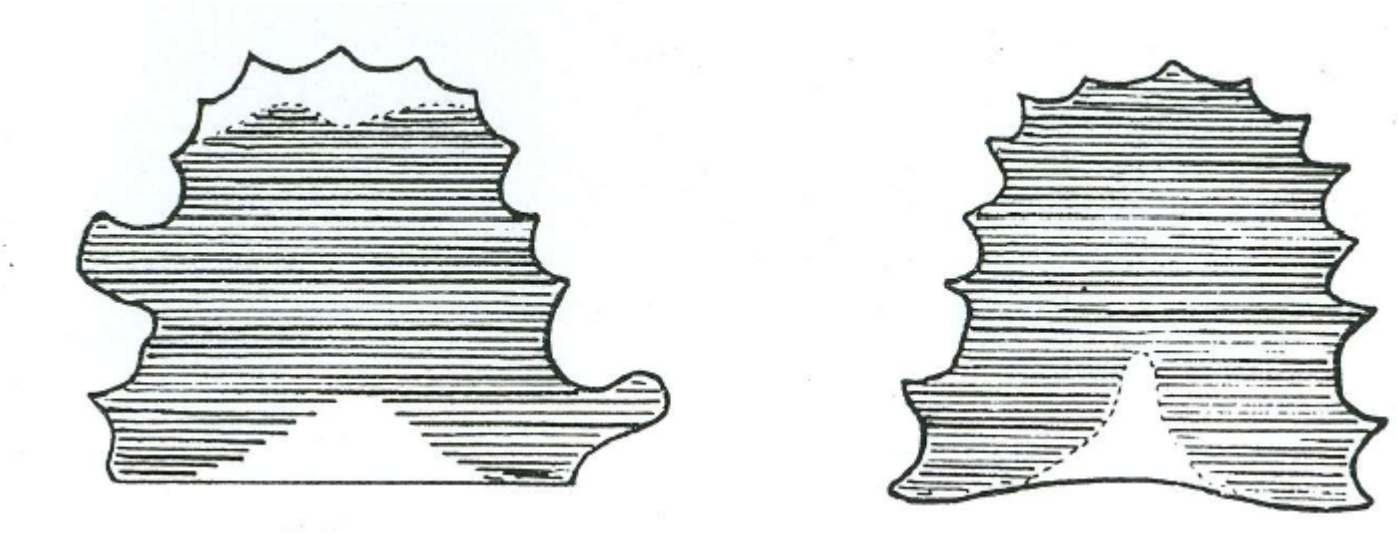
Alveolar, Alveolopalatal
Most Romance dialects
Irish
Slavic, Hungarian
African (Zulu, Suto)
Australian
Chinese, Japanese

Alveolar, Alveolopalatal, Palatal
Romance dialects (Parisian, Majorcan Catalan)
African (Ibibio)

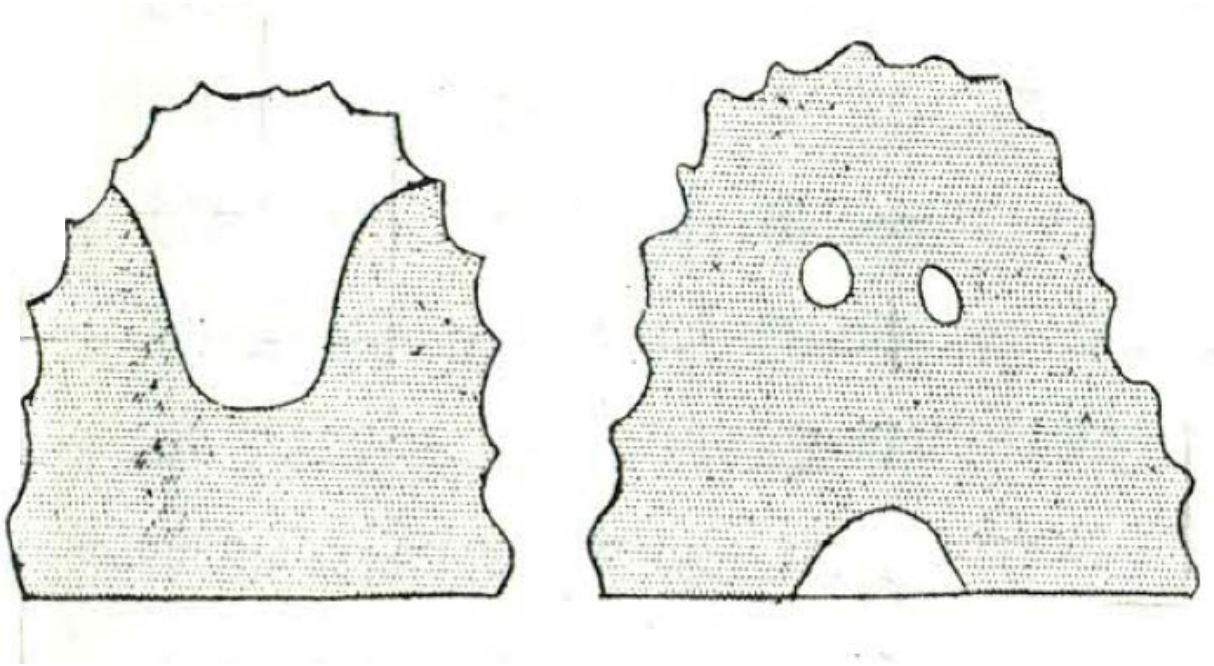
Palatal
African (Austronesian Malagasy)



Alveolopalatal /ɲ/ in Zulu and Suto (Doke,1926)

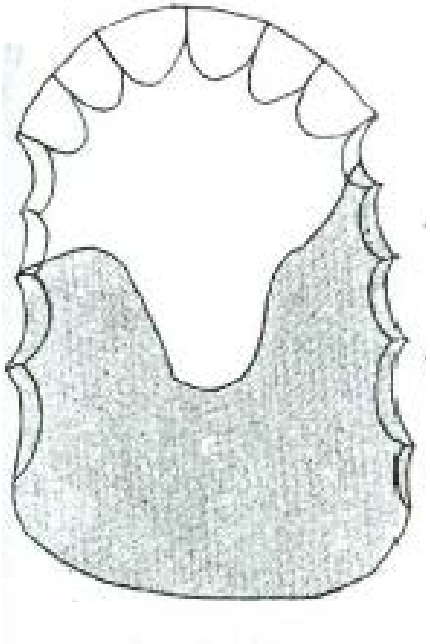


Alveolopalatal and palatal /ɲ/ in Parisian French (Rousselot, 1924-1925)



Palatal **Alveolopalatal**

Palatal /ɲ/ in the Malagasy (Rousselot, 1924-1925)



Symmetry relationship between /c/ and /ɲ/ in the same language/dialect

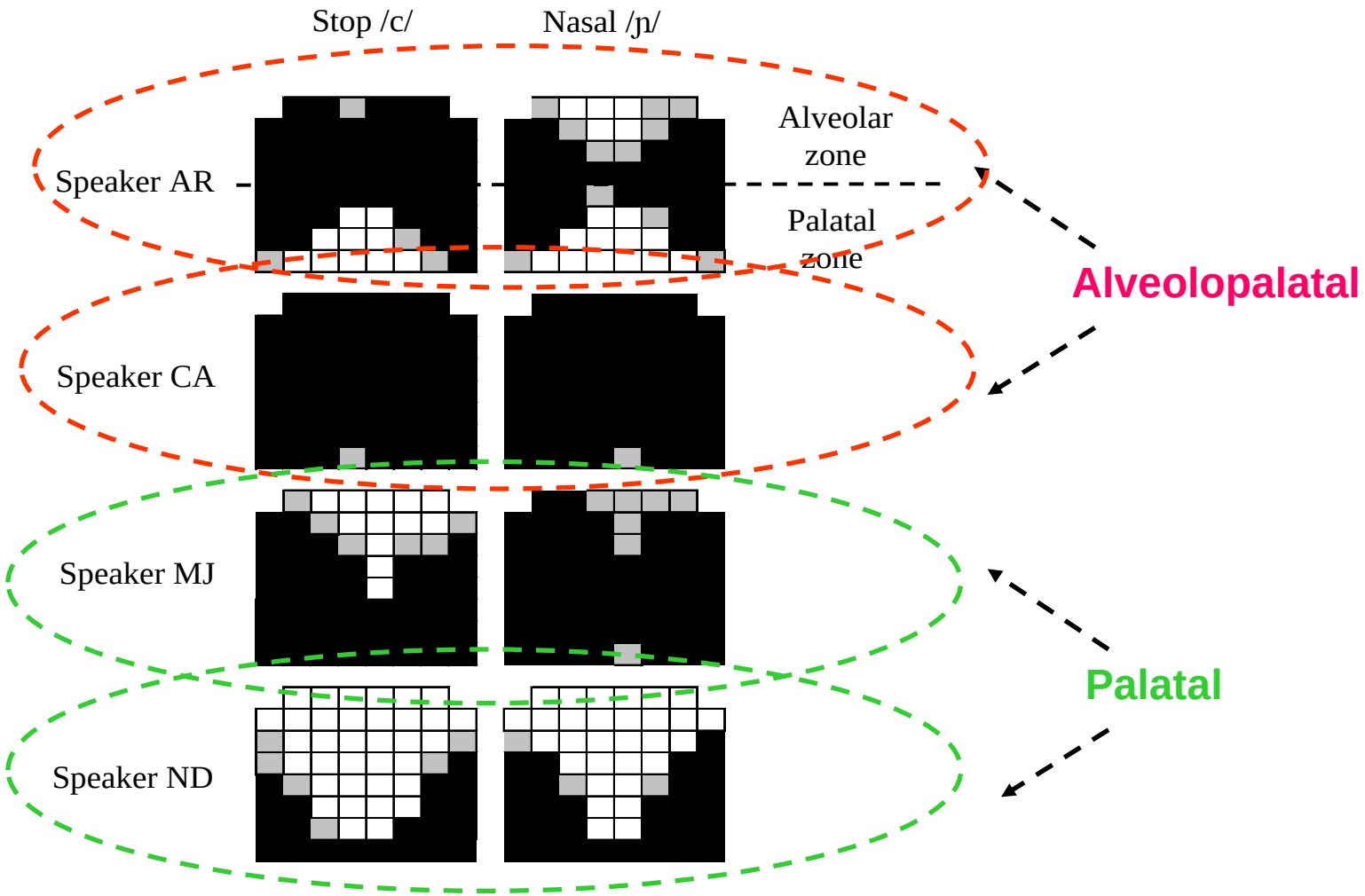
Alveolar, alveolopalatal /c/ → **Alveolar, alveolopalatal /ɲ/**

in several language families (Romance, Slavic, Hungarian, Arrernte, Hakka Chinese).

Palatal /c/ → **Palatal /ɲ/**

in several Romance dialects (Parisian French, Majorcan Catalan) and in African languages (Ibibio, Ngwo).

Majorcan Catalan (Recasens & Espinosa, 2006)



Ibibio (Connell, 1991)

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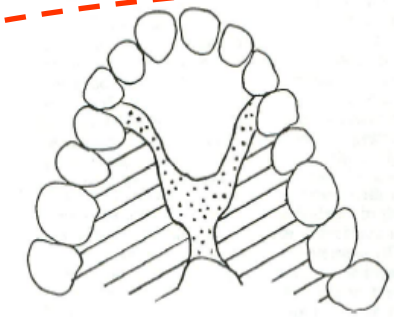
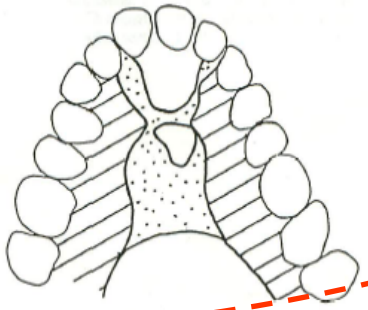


/ɲi/



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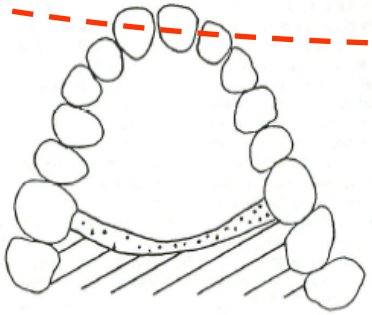
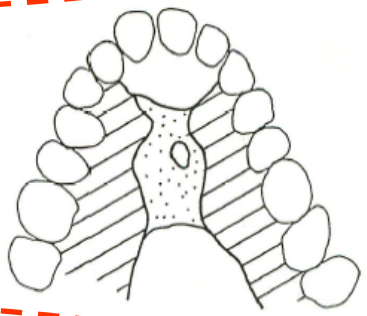


/ɲu/



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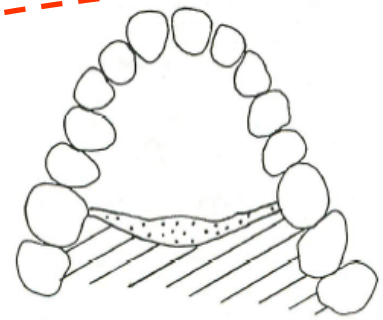


/ɲa/

Possible generalizations

Closure location for (alveolo)palatal consonants may differ as a function of manner of articulation, i.e., the lateral [ʎ] cannot be purely palatal.

Clear preference to assign an alveolopalatal over a palatal place of articulation to consonants such as [c] and [ɲ] (also [j], not shown in this presentation) across languages/dialects.

Closure location for (alveolo)palatal consonants may differ as a function of language group.

- Languages/dialects may allow for one or two places of articulation.

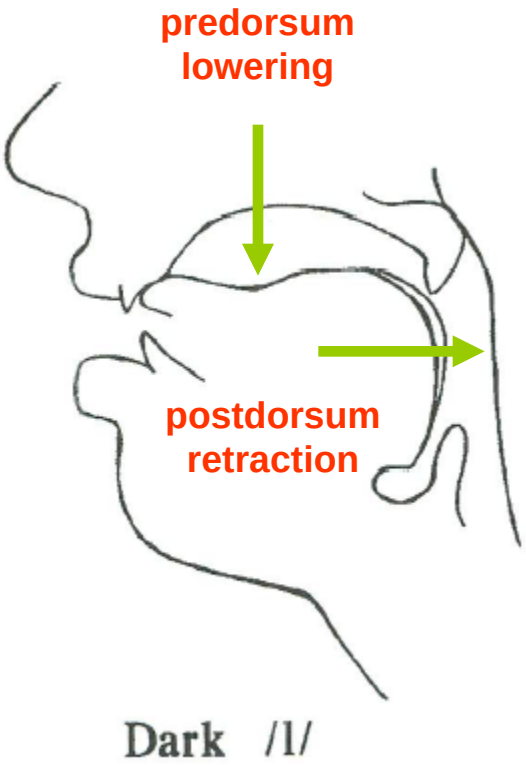
- Is there a preference for African languages to favor truly palatal realizations? (more data are needed).

Symmetrical relationship between closure location for (alveolo)palatal oral stops and nasals.

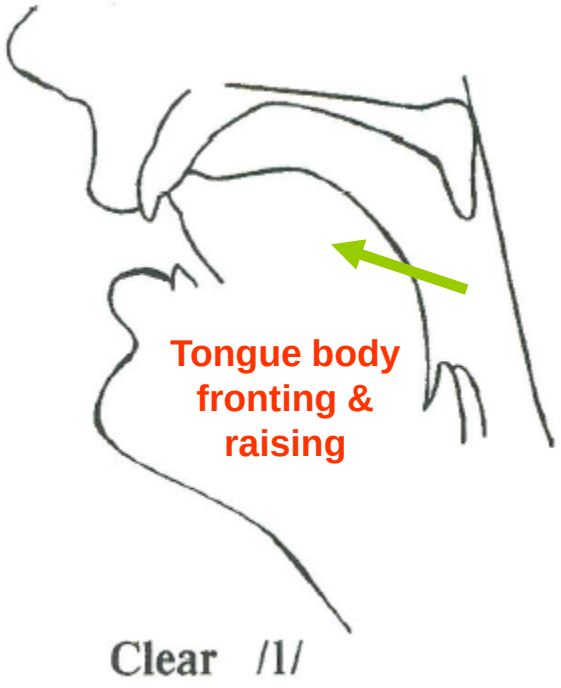
TYPOLOGY OF ALLOPHONIC PATTERNS

DARKNESS DEGREE IN /l/

Two different varieties of apicoalveolar /l/ have been identified traditionally, i.e., **dark** and **clear**.



([ɫ])

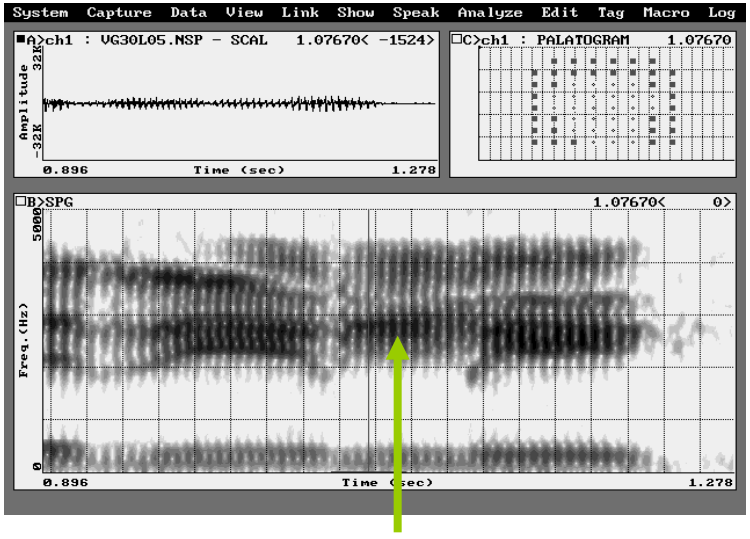


([l])

Production differences between the two /l/ types yield different spectral configurations.

ili

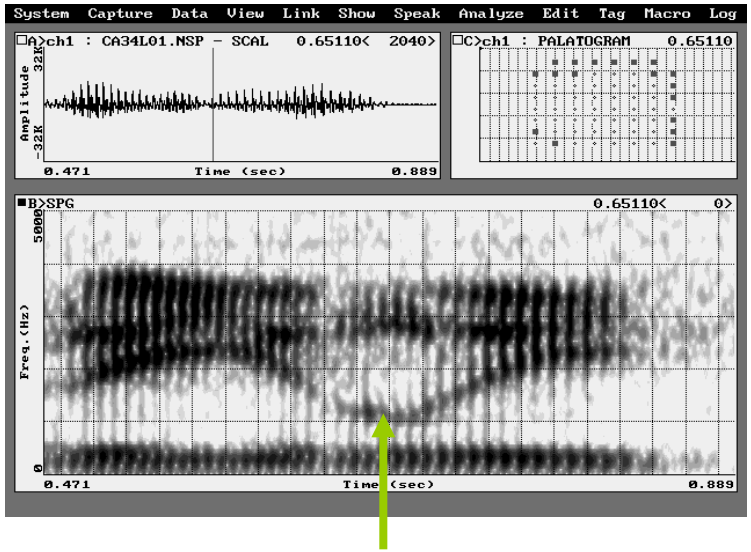
(Valencian Catalan)



High F2 (1500-2000 Hz)

iɬi

(Majorcan Catalan)



Low F2 (800-1300 Hz)

Research issues

‘Intrinsic’ allophones of /l/

/l/ should be ‘clearer’ initially than finally

in line with a trend for front lingual consonants to be articulated with a somewhat higher and more anterior tongue position initially than finally (Recasens & Pallarès, 2004).

The initial and final allophones of /l/ should exhibit a larger F2 frequency distance if the consonant is clear than if it is dark

in line with differences in articulatory constraint, i.e., the tongue body is actively involved in the production of dark /l/ vs clear /l/.

‘Extrinsic’ allophones of /l/

Initial and final /l/ may exhibit different target articulatory configurations such that the consonant may be characterized as clear initially and as dark finally (Ladefoged, 1971).

Spectral differences between the intrinsic and extrinsic allophones of /l/.

May extrinsic allophones differ in degree depending on language/dialect?.

Methodology

Experimental conditions

- Acoustic recordings
- Postpausal /li, la/, intervocalic /i(#)li, a(#)la/, prepausal /il, al/ (short meaningful sentences)
- 3 to 8 male speakers.

Languages/dialects (23)

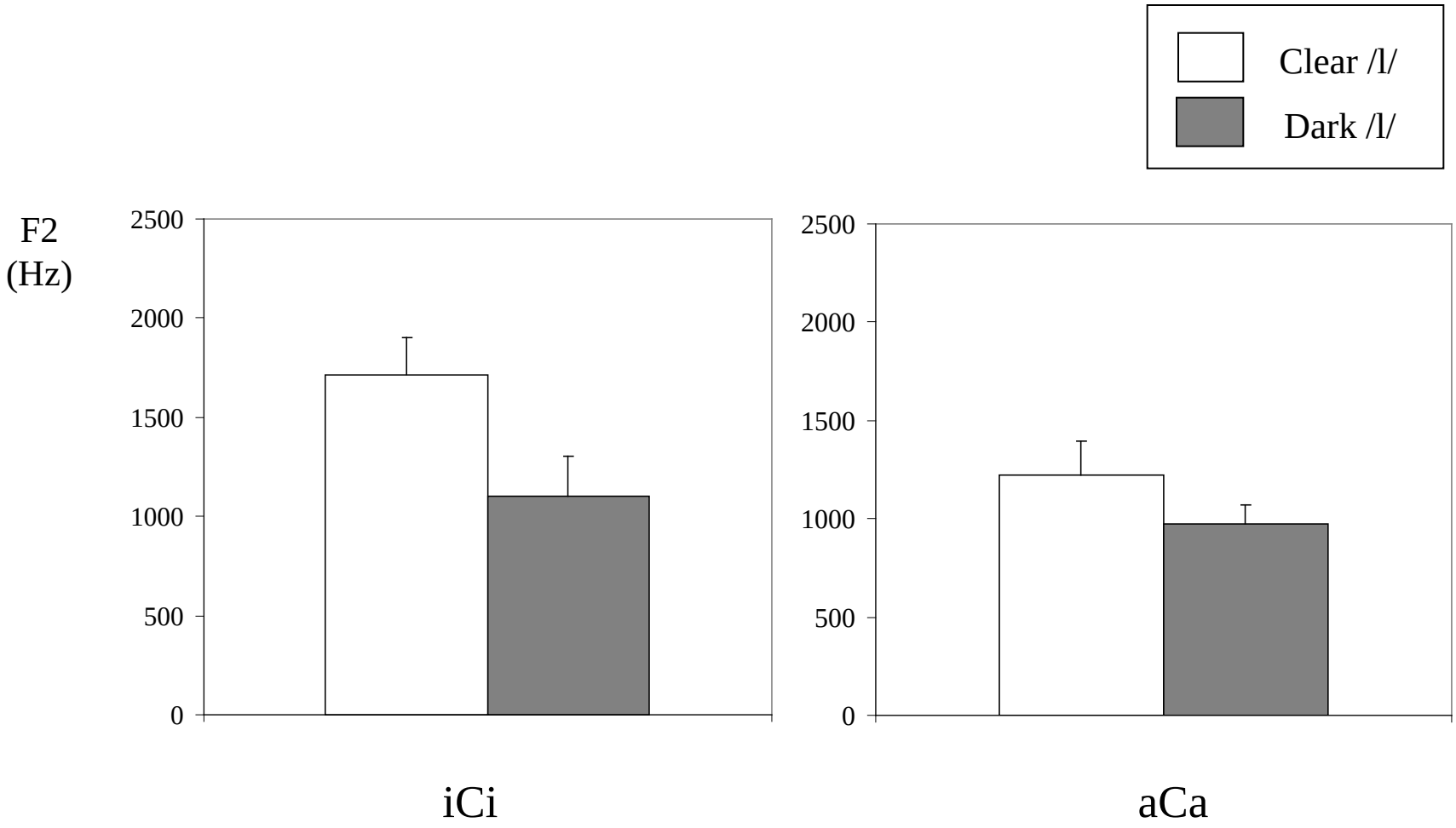
Clear /l/

Alguerese & Valencian Catalan
Czech
Dutch **(extrinsic allophony)**
Danish
Finnish
French
Hungarian
German
Italian
Newcastle English **(extrinsic allophony)**
Norwegian
(Lengadocian) Occitan
Romanian
Spanish
Swedish

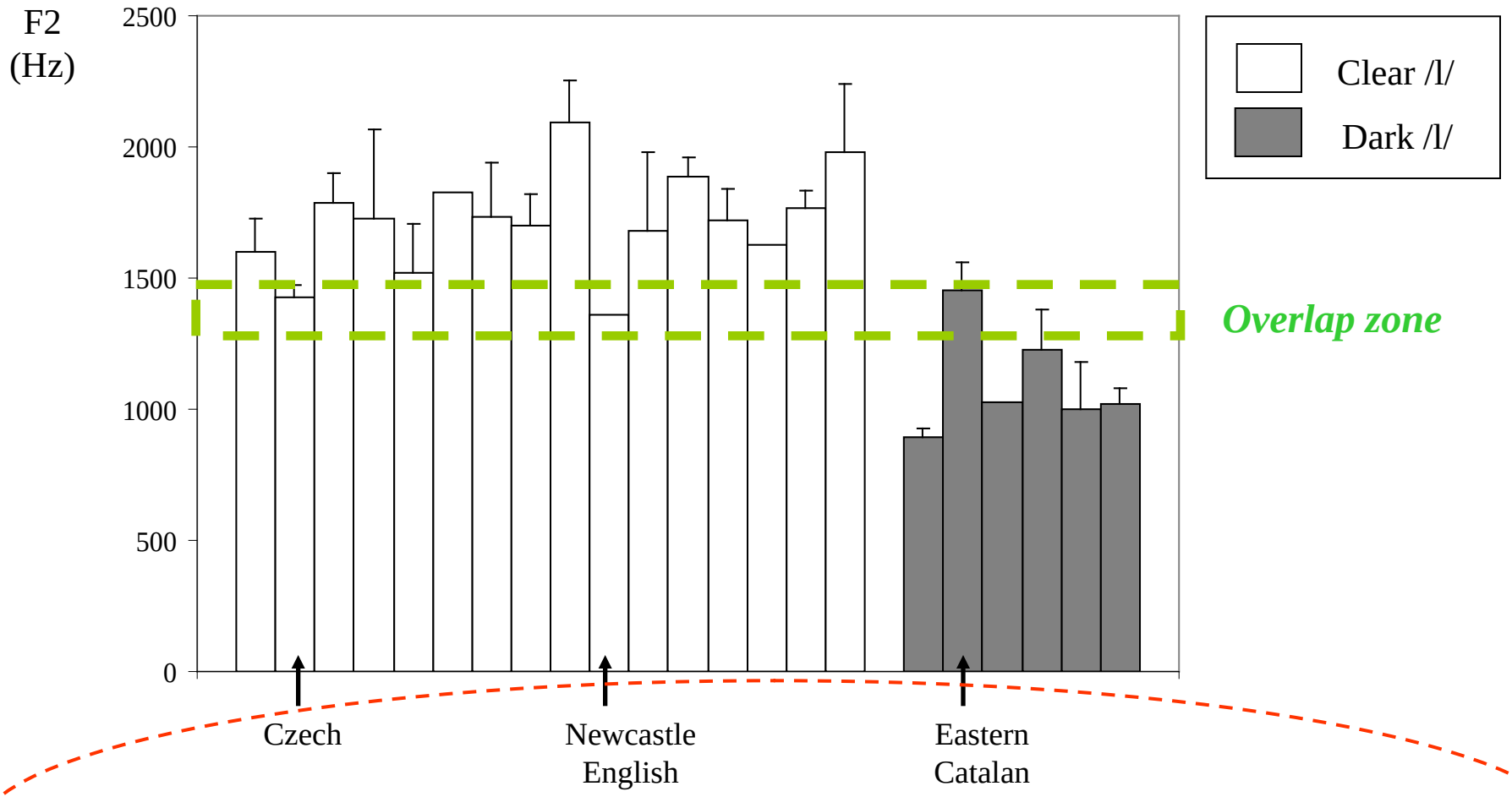
Dark /l/

(Midwestern) American English **(extrinsic allophony)**
British English RP **(extrinsic allophony)**
Eastern & Majorcan Catalan
Leeds English
Portuguese
Russian

Darkness degree (cross-language data)

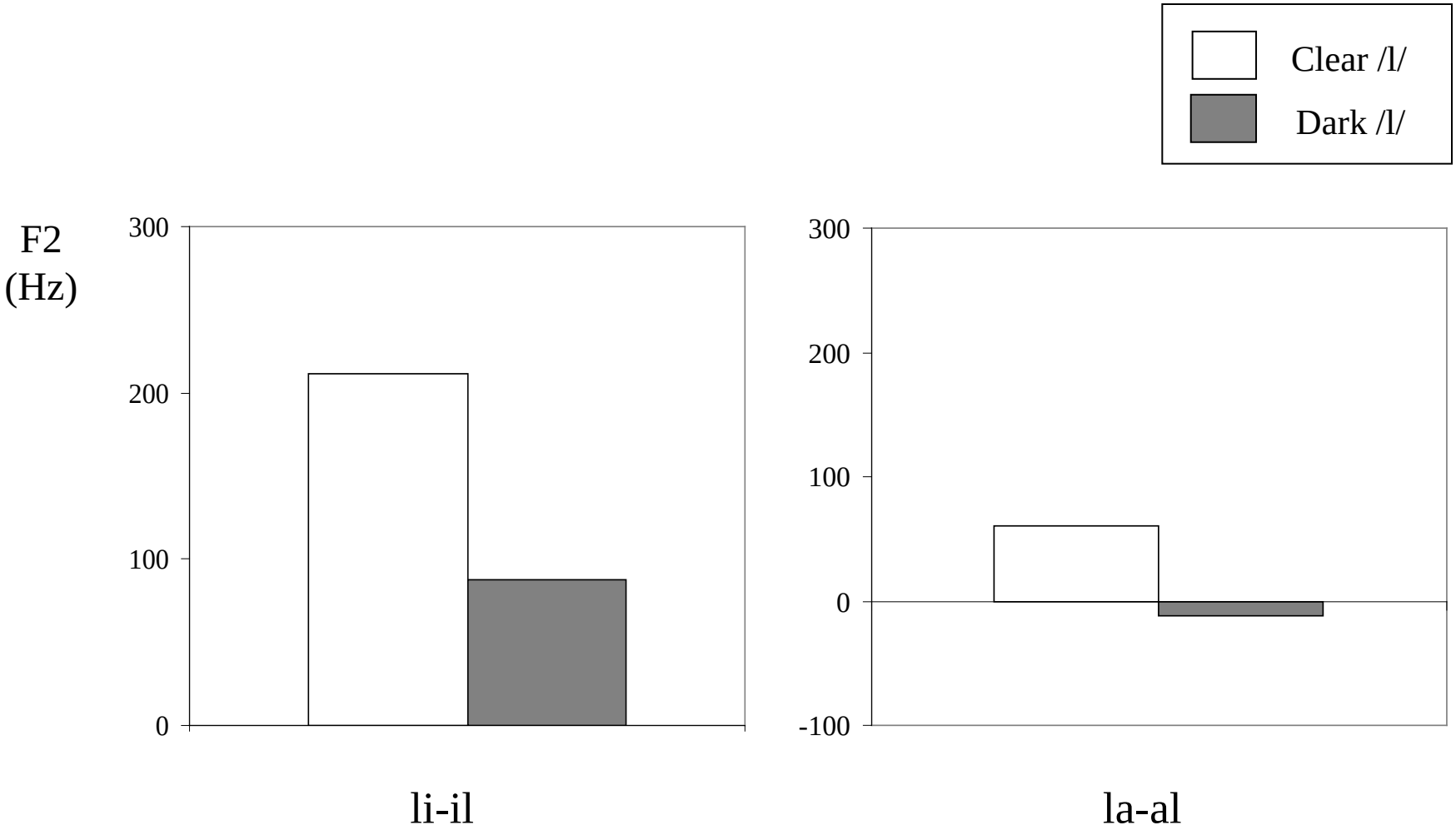


Darkness degree (data for individual languages/dialects)



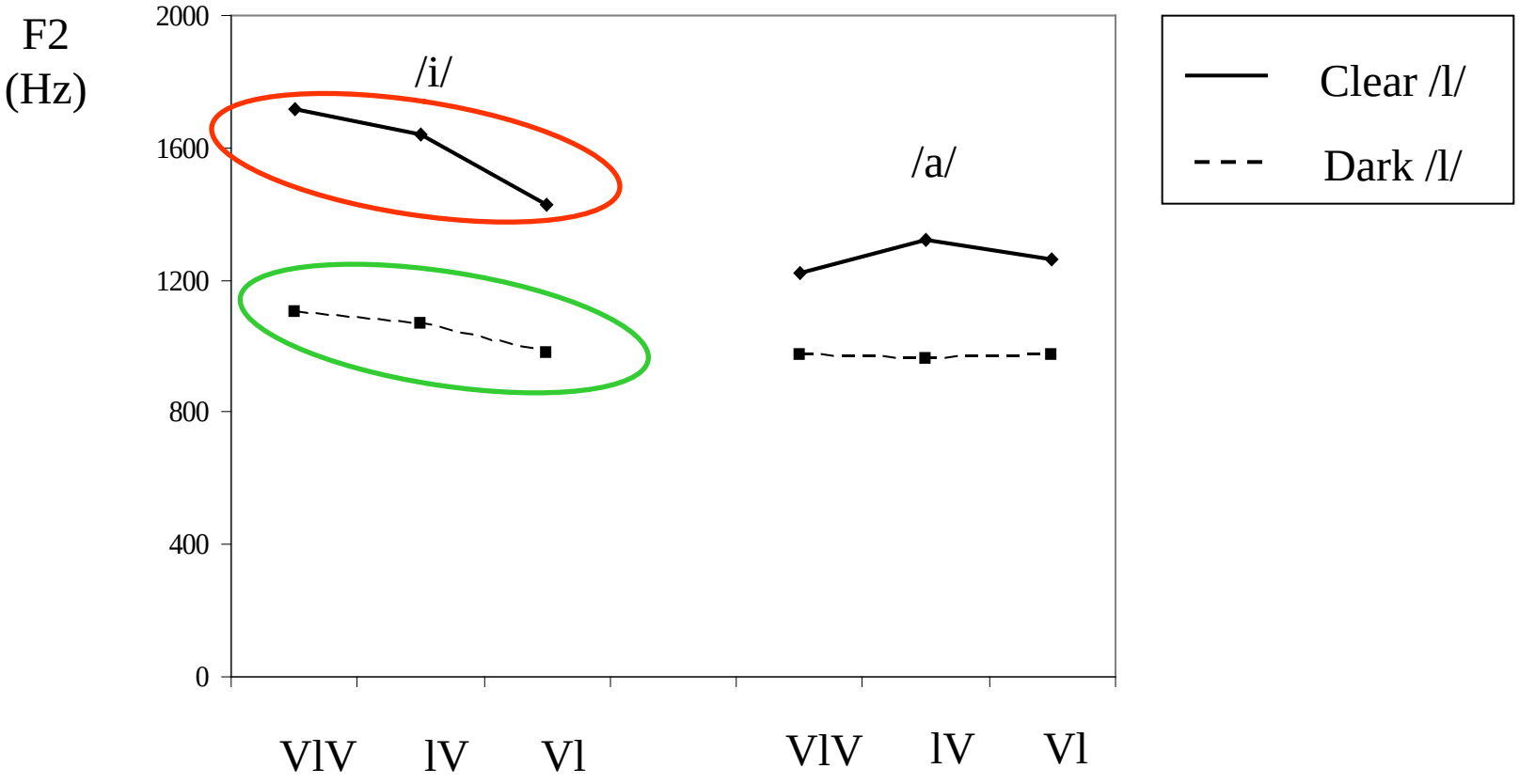
Languages/dialects showing an intermediate darkness degree

Initial and final allophones (cross-language data)



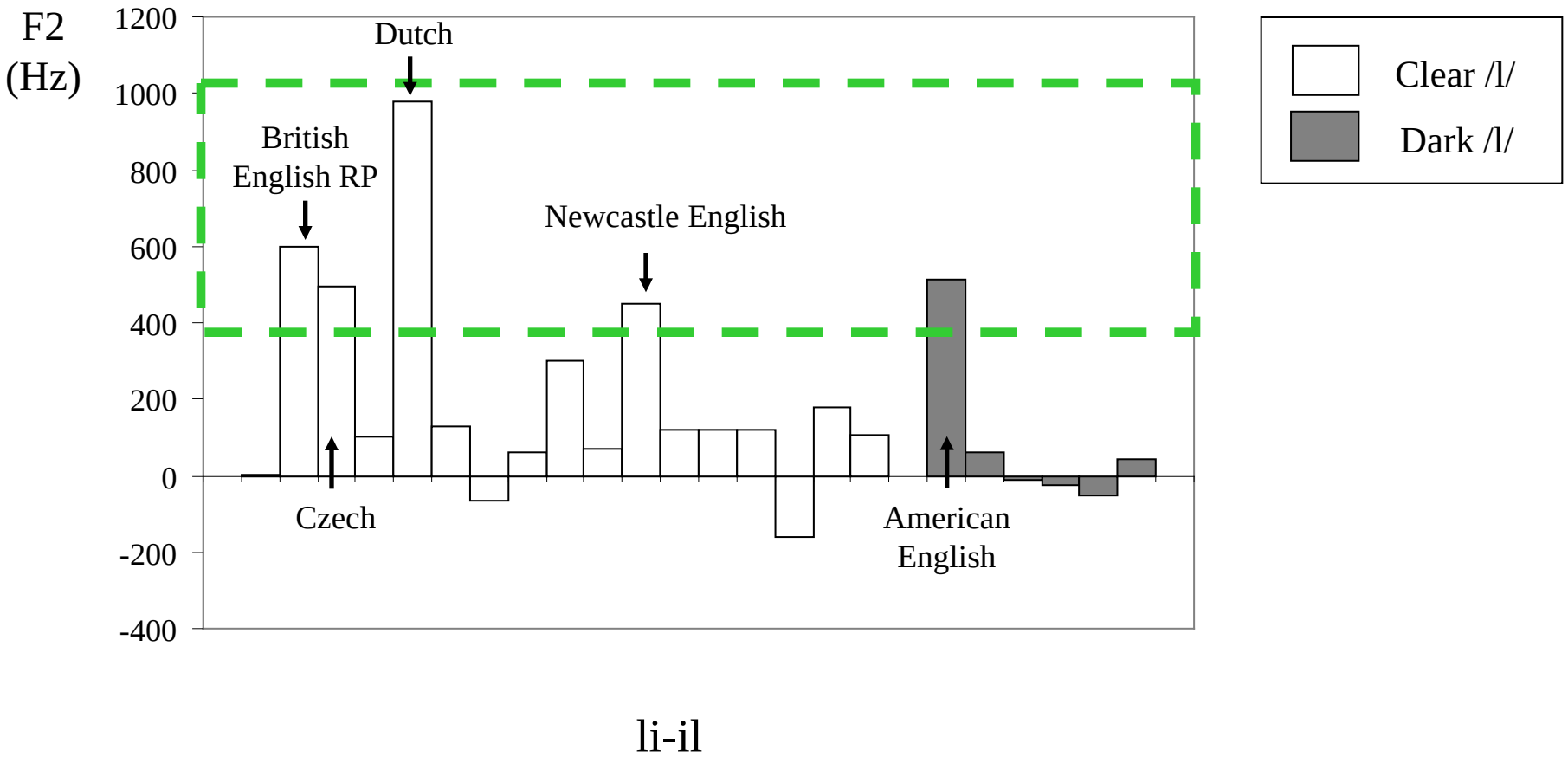
Differences in allophonic distance between the two /l/ varieties are related to differences in articulatory constraint

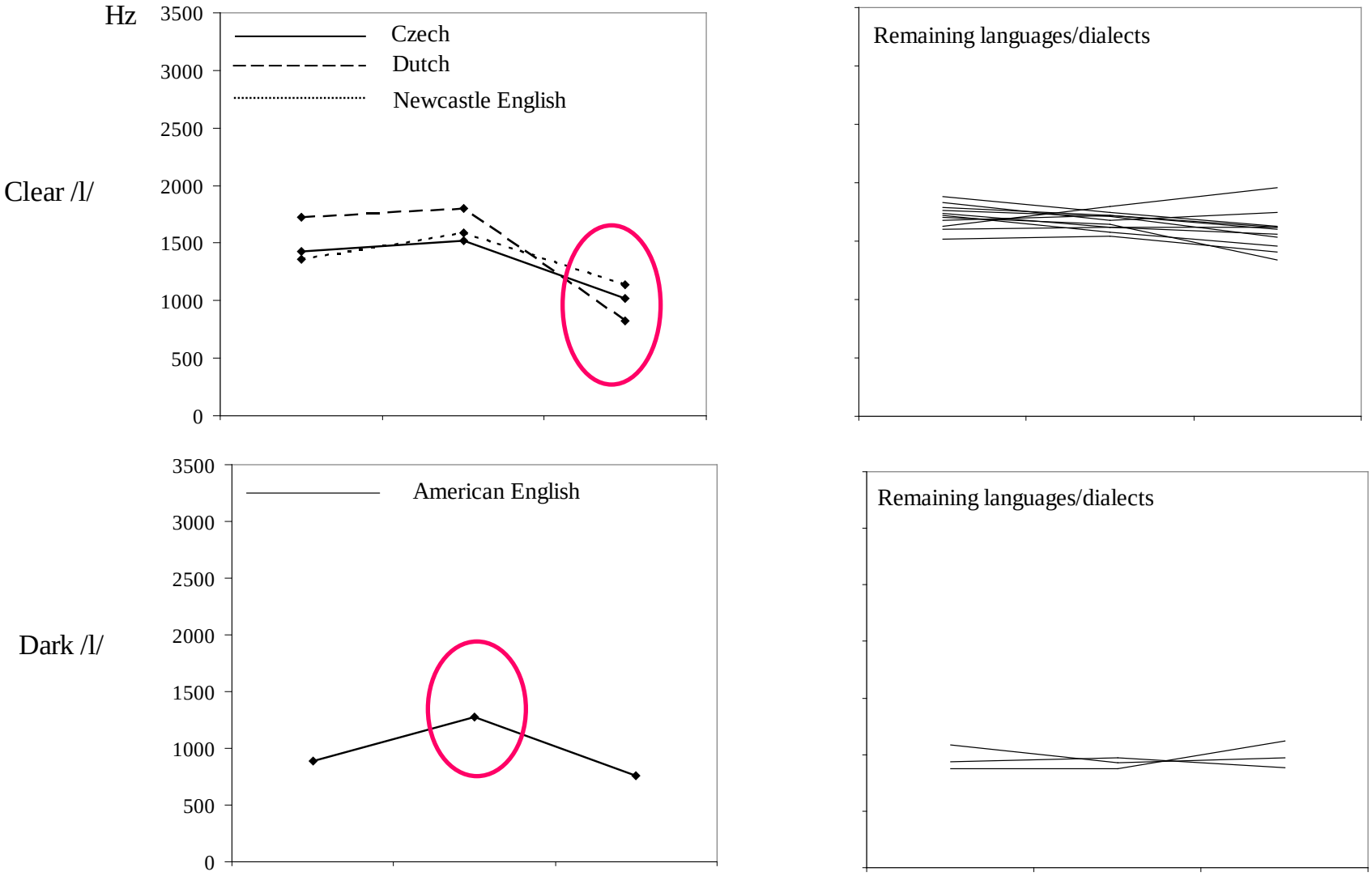
Position-dependent darkening degree (cross-language data)



More /l/ darkening as a function of position for clear /l/ than for dark /l/

Extrinsic allophones (data for individual languages/dialects)




Hz
3500
3000
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Czech
Dutch
Newcastle English
Remaining languages/dialects
Clear /l/
American English
Remaining languages/dialects
Dark /l/
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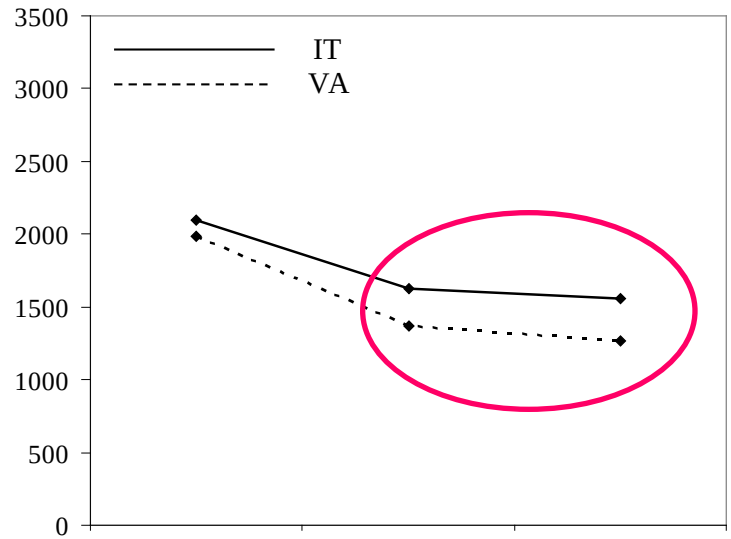
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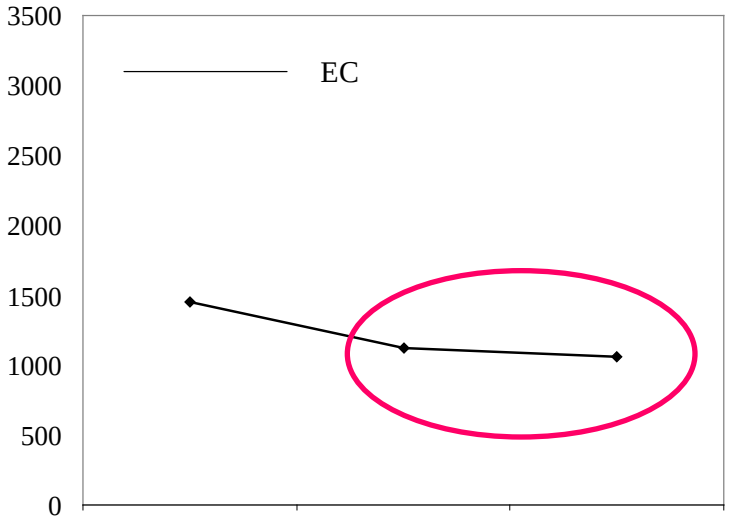
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EC

/ili/ /li/ /il/

Summary and discussion

F2 for clear /l/ and dark /l/ are set in contrast quite robustly, i.e., the splitting boundary occurs at 1300-1400 Hz in the /i/ context and at 1000 Hz in the /a/ context.

Several languages/dialects exhibit a moderately clear/dark variety of /l/ (Czech, Newcastle English, Eastern Catalan).

Larger allophonic differences for clear /l/ than for dark /l/ in line with differences in articulatory constraint between the two /l/ varieties. Differences are larger initially than finally due to differences in degree of darkness in the context of /i/.

The F2 difference between 'intrinsic' and 'extrinsic' allophones of /l/ is below and above 200-300 Hz, respectively.

'Extrinsic' allophones:	American English (initial clearing); British English RP, Czech, Dutch, Newcastle English (final darkening).
Special 'intrinsic' allophones:	Italian, Valencian Catalan (darker /l/ realization initially &/or finally than intervocalically).

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Thus, **no clear relationship** was found to hold between linguopalatal contact size and palate shape for a set of vowels and consonants produced by 20 speakers from 4 different languages, i.e., it was not the case that speakers exhibiting domeshaped palates always had more lateral tongue contact than speakers with more flat palates (Brunner et al., 2005).

In a study reporting linguopalatal contact data for 9 consonants produced by 15 speakers of 3 Catalan dialects, a positive correlation between linguopalatal contact size and fronting and palate shape was **only** found to hold for (alveolo)palatals in one dialect (Recasens, 2011).

This prediction is consistent with data showing smaller position-dependent articulatory differences for more highly constrained consonants (fricatives, trills) vs less highly constrained ones (stops, nasals) (see Recasens & Pallarès, 2004 for other constrainbed vs unconstrained consonants).

(c) If **languages/dialects may exhibit intermediate degrees of darkness**, they are expected to exhibit specific allophonic characteristics vis-à-vis languages/dialects with strongly clear and strongly dark varieties of /l/.

Dialect-dependent vs speaker-dependent characteristics

Doubts as to whether the articulatory and acoustic data reported in experimental studies are

- truly dialect-specific, or else
- determined by **speaker-dependent vocal tract characteristics** and/or speaker-dependent preferred production strategies.

Speech production studies deal often with data

- on a **small number of speakers**,
- not subjected to **speaker normalization procedures**.

A reason suggesting that experimental phonetic data may be truly dialect-dependent derives from studies (Brunner et al., 2005, Recasens, 2011) showing that

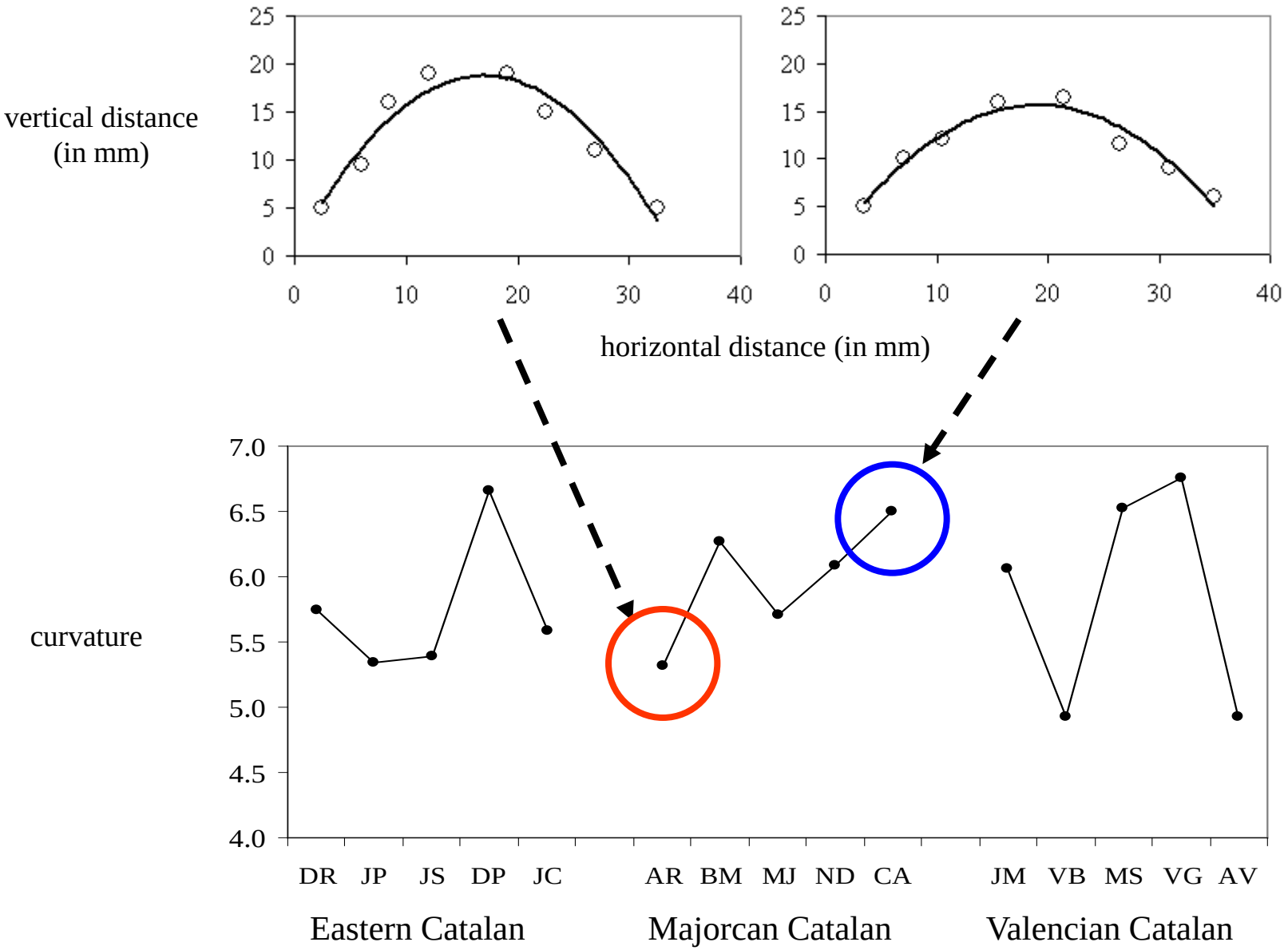
- **the articulatory and/or acoustic properties of speech sounds are <u>often</u> not linearly related to the speakers' vocal tract characteristics**.

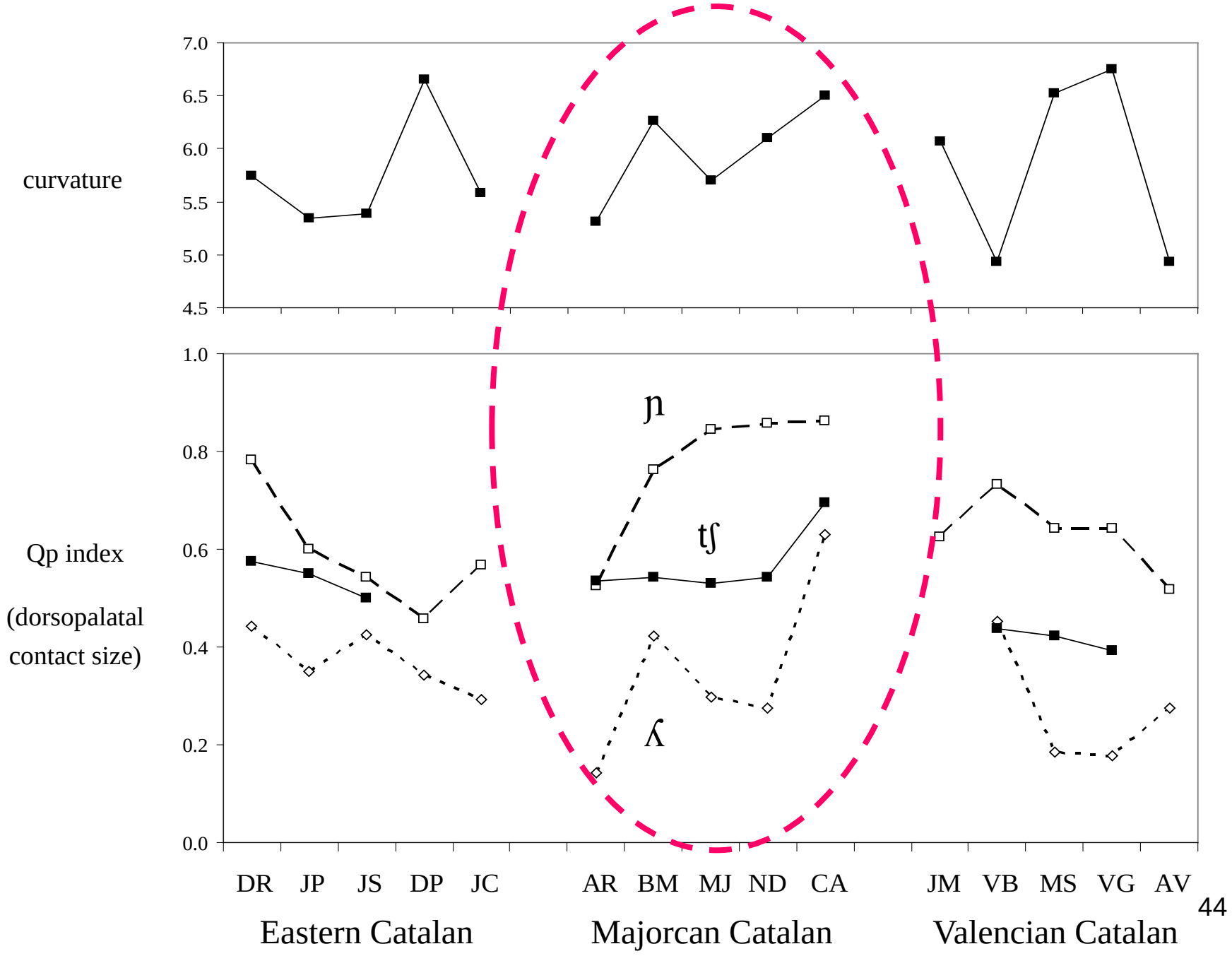
STEEP PALATE

(Majorcan Catalan speaker AR)

FLAT PALATE

(Majorcan Catalan speaker CA)




curvature
7.0
6.5
6.0
5.5
5.0
4.5
Qp index
(dorsopalatal
contact size)
1.0
0.8
0.6
0.4
0.2
0.0
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DR JP JS DP JC AR BM MJ ND CA JM VB MS VG AV
Eastern Catalan
Majorcan Catalan
Valencian Catalan