

Proposed gestural model of the syllable

- Each onset C coupled *in-phase* (*synchronous*) with V
- Onset Cs coupled *anti-phase* (*sequential*) with each other
- Coda C coupled *anti-phase* (*sequential*) with V
- In-phase coupling mode is the most stable

Predictions:

- onsets are more stable than codas
- onsets are more stable than heterosyllabic sequences

Today : examine these predictions for

jV vs. *iV*

in five varieties of Romance

Cross-Romance typology of /iV/ variability

(Chitoran & Hualde, 2007)

Goals

- Establishing a cross-Romance typology of phonetic variation in the production of vocalic sequences (*iV*) in: *Romanian, Spanish, French, European and Brazilian Portuguese*
 - variation in syllabification
 - but almost identical lexical items
- Experimental phonetic data reveal differences in details of variation.
- Comparative synchronic study of phonetic variation can shed light on the historical development of a system.

Latin *iV* sequences

Catalan, Portuguese

French

[m j<p]

[b jE]

[med j an] ‘median’

Spanish

[m i ope]

[b j e la]

[ital j a na]

Romanian

[m i o pu]

[bi e la]

[ital j / i a na]

‘short-sighted’

‘rod’

‘Italian’ fem.

diphthong

hiatus



Questions

- Are there *general factors* that favor a change $iV > jV$ over the alternative $jV > iV$, or stability of iV ?
- Are there *language-specific structural factors* that favor $iV > jV$?
- Are there *prosodic factors* that might inhibit $iV > jV$?

Hypothesis

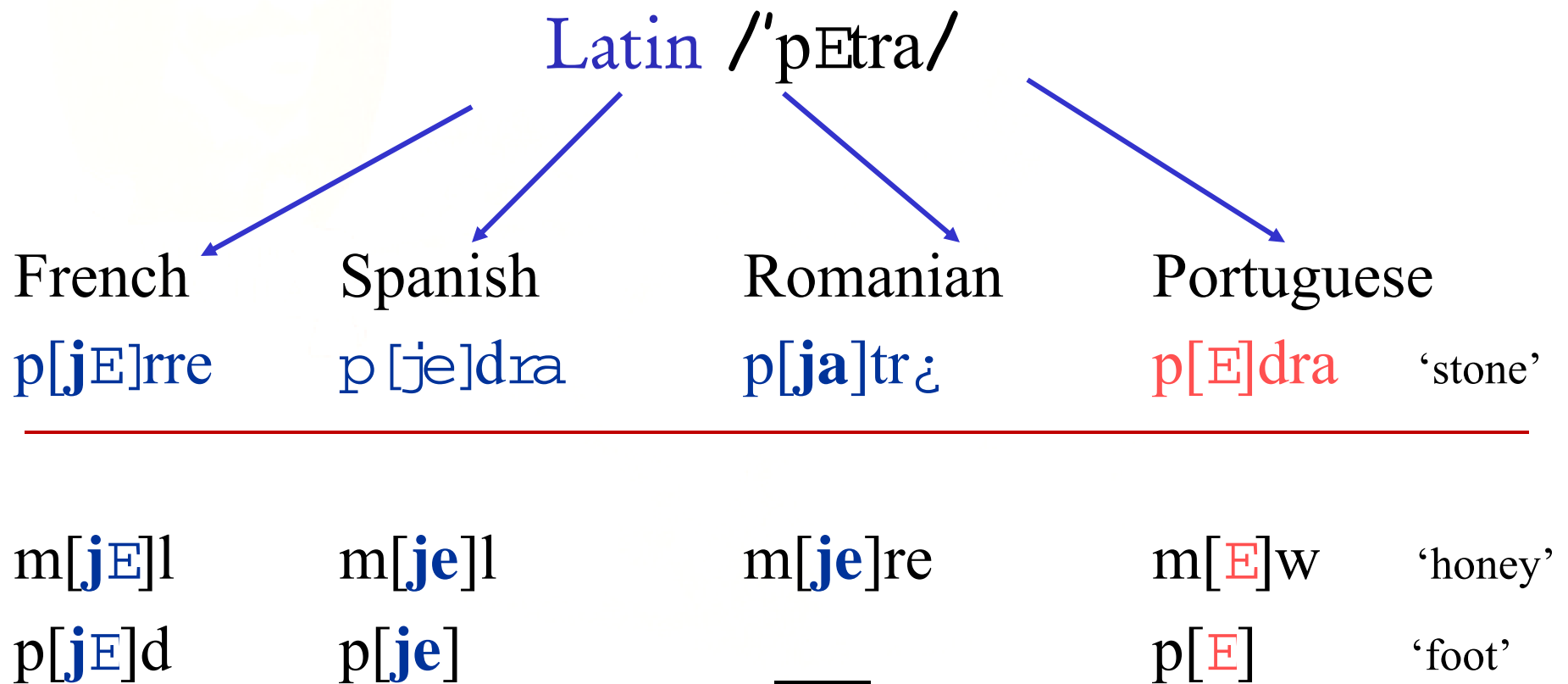
Observed difference in variability is related to:

- General tendency for unstressed [iV] to become [jV]
- ❖ The presence and distribution of [jV] diphthongs in one language from independent historical sources, acting as “attractors”
- ❖ The duration of *iV* sequences in different prosodic positions (e.g., resist diphthongization in positions favoring longer vowels)

- ❖ Relevant historical facts
- ❖ Acoustic study – prosodic factors
- Interpretation and conclusion

Historical sources of diphthongs

Diphthongization of stressed mid vowel



Differences in details

Romanian

Diphthongs in limited context – only after labials:

PETRA > piatrɨ ‘stone’

Palatalization of coronals and velars, glide absorption:

TERRA > tsarɨ ‘land’

SEPTEM > ʃapte ‘seven’

DECEM > zetsɛ ‘ten’

Other historical sources of prevocalic glides

Obstruent-liquid clusters

[kɫ]	<i>CLAMARE</i>	>	k[j]ema	‘to call’	Rom
			[ʃ]amar		Portg
			k[j]amare		Italian
[pɫ]	<i>PLUVIA</i>	>	p[l]oaie	‘rain’	Rom
			p[l]uie		French
			[ʃ]uva		Portg
			p[j]oggia		Italian
[fɫ]	<i>FLAMMA</i>	>	[ʃ]ama	‘flame’	Portg
			[fl]or	‘flower’	Spanish
			f[j]amma		Italian

Romanian

Lateral palatalization

LEPORE(M) > [jé]pure ‘hare’

- Slavic loans

Ukr. *jarmarok* > [ja]rmaroc ‘fairgrounds; market’

Sl. *ljubiti* > [ju]bi ‘to love’

- Adaptations of Turkish [y, ɔ] – *following velars*

karagöz > carag[jo]s ‘funny’

gülle > g[ju]lea ‘cannonball’

- A few French adaptations

liqueur > lik[jo]r

purée > p[ju]rew

Word-final glides?

singular

lup

ban

plural

lup^j

ban^j

‘wolf’

‘coin’

- short, devocalized, perceptually not salient
(*Spinu 2006*)

Summary

- 3 of the 5 Romance varieties have sources of [jV] diphthongs, as well as sources of [iV] hiatus sequences.
 - Predicts an etymologically-based lexical contrast between hiatus and diphthong
 - But it is found only in Romanian

How do the *iV* sequences pattern in each of the 5 languages?

iV sequences

Standard French:

- *iV* sequences contract to *jV*, merging with historical diphthongs

p[**ja**]no ‘piano’ méd[**ja**]teur ‘mediator’

p[**jE**]ce ‘coin/piece’ b[**j<**]logie ‘biology’

Exceptions:

- after complex onsets:

l[**j**]er ‘*to tie*’ vs. pl[**i**].er ‘*to fold*’

Castilian Spanish

- [iV] sequences contract to [jV], merging with diphthongs

Exceptions:

- across a morpheme boundary: **boqu[i-á]ncho**
(Navarro Tomás 1977; Hualde 1997)
- paradigmatic effects: **l[i.á]mos** ‘*we tie*’ cf. **l[í.a]s** ‘*you tie*’
- *sometimes* in word-initial position
(Aguilar 1999; Hualde & Prieto 2002; Chitoran & Hualde 2002)

- *iV* sequences in Romanian:
 - [iV] maintained, contrast with historical diphthongs [jV]
(Chitoran 2001; Chitoran & Hualde 2002)
- *iV* sequences in Portuguese:
 - no historical diphthongization of mid vowels
 - [iV] maintained
 - [jV] possible in casual/fast speech and post-tonic position

palác[ju] ‘palace’

(Mateus & d’Andrade 2000; Mateus et al.2003)

Same scenario for Catalan (Cabr  & Prieto 2004)

iV sequences

Variability in:

- Native speaker syllabification judgments:
 - tautosyllabic (**jV**) diphthong production vs. heterosyllabic (**i.V**) hiatus production
- Acoustic duration:
 - shorter vs. longer duration

(Hualde & Prieto 1999, Chitoran & Hualde 2002)

Romance *iV* sequences

Prosodic effects

May inhibit contraction to *jV*:

- Position in the word
 - Sequences tend to be longer word-initially than word-internally
- Position with respect to stress
 - Sequences tend to be longer the closer they are to the main stress syllable, preceding it

Hypothesis based on prosodic edge effects:

- Lengthening correlated with boundary strength (*Fougeron & Keating 1997, Turk & Shattuck-Hufnagel 2000, Fougeron 2001, Cho & Keating 2001*)
 - $iV > jV$ is often blocked word-initially (e.g., Spanish)
 - Possibly because iV sequences in this position tend to be longer

Experiment 1 – Word position effect

- Spanish – 4 speakers
 - Carrier phrase: Digo ____ porque sí ‘I say ____ just so’
- Romanian – 4 speakers
 - Spune ____ de trei ori ‘Say ____ three times’
- French – 5 speakers
 - Dis-nous ____ de nouveau ‘Tell us ____ again’
- E Portuguese – 4 speakers
- B Portuguese – 5 speakers
 - Digo ____ porque sim ‘I say ____ just so’

Word position effect – Romanian

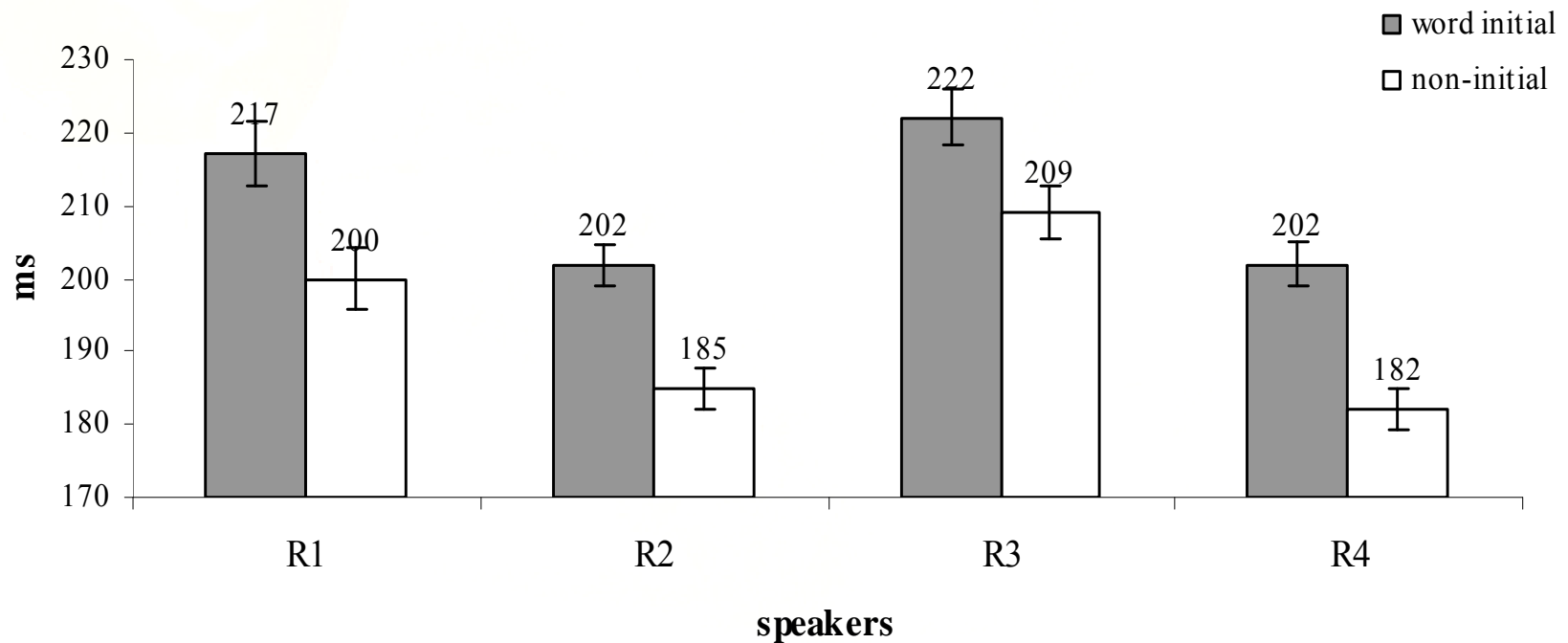
- 7 repetitions, total 560 words
- Control for stress, n° of syllables, segmental context
- Measured: acoustic duration of iV sequence
- Syllabification task following each recording session

<u>Examples:</u>	<u>word-initial</u>	<u>word-internal</u>
	ca-n p <u>i</u> on	camp <u>i</u> on
	ce p <u>i</u> os	cop <u>i</u> os
	ce v <u>i</u> abil	serv <u>i</u> abil
	din D <u>i</u> ana	med <u>i</u> ana
	vez ^j t <u>i</u> are	vest <u>i</u> are
	și ca l <u>i</u> ana	ital <u>i</u> ana
	ca la D <u>i</u> ana	canad <u>i</u> ana

Results – Romanian

iV sequences longer word-initially ($p < .0001$)

Romanian - *iV* sequence duration (means)



Word position effect – French

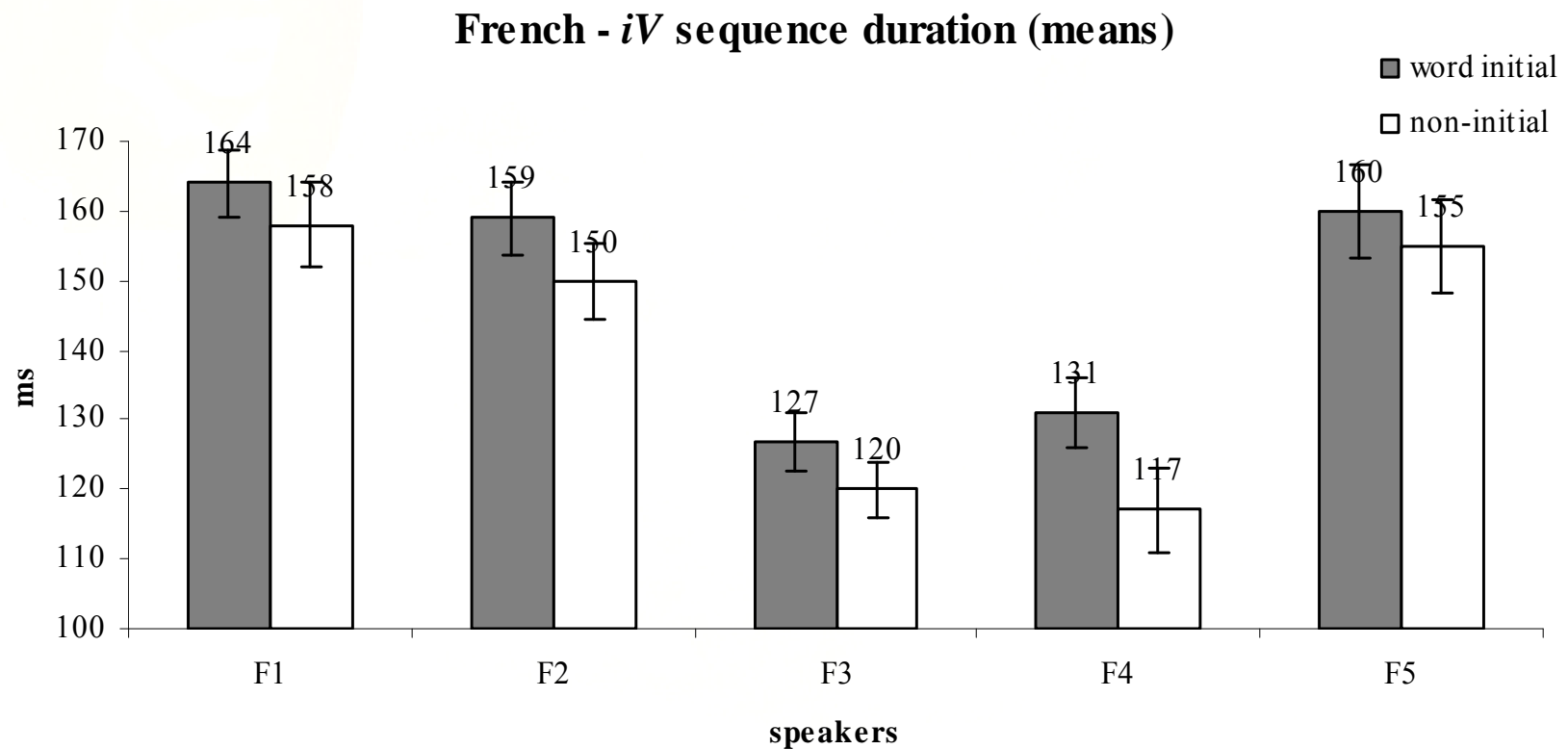
7 repetitions, total 630 words

<u>Examples:</u>	<u>word-initial</u>	<u>word-internal</u>
	une p <u>ion</u> ne	champ <u>ion</u> ne
	la v <u>io</u> le	rav <u>io</u> le
	le di <u>ol</u>	s'ét <u>io</u> le
	ta ni <u>elle</u>	Dani <u>elle</u>
	mes Di <u>ane</u> s	médi <u>ane</u>
	tes li <u>er</u> res	béli <u>ère</u>
	ta li <u>asse</u>	ali <u>as</u>
	sous Vi <u>enne</u>	souvi <u>enn</u> ent

All judged tautosyllabic

Results – French

iV sequences longer word-initially ($p < .05$)



Portuguese – No word position effect

European Portuguese (EP) Brazilian Portuguese (BP)

- 7 repetitions, 502 words

- 3 repetitions, 269 words

Examples: word-initial word-internal

a liana

aliada

que viavel

enviavel

da Diana

mediana

a miada

ameealha

com piolho

copiioso

com a Diana

canadiana

e a liana

italiana

p > .05

All sequences judged heterosyllabic

Word position and stress

Castilian Spanish

- 4 repetitions, total 528 words

Examples:

Initial-stressed

fiordo

‘fiord’

dieta

‘diet’

diana

‘Diana’

Non-initial-stressed

cordial

‘cordial’

italiana

‘Italian’ f.

mediana

‘mid’ f.

Initial-unstressed

piolet

‘axe’

diagonal

‘diagonal’

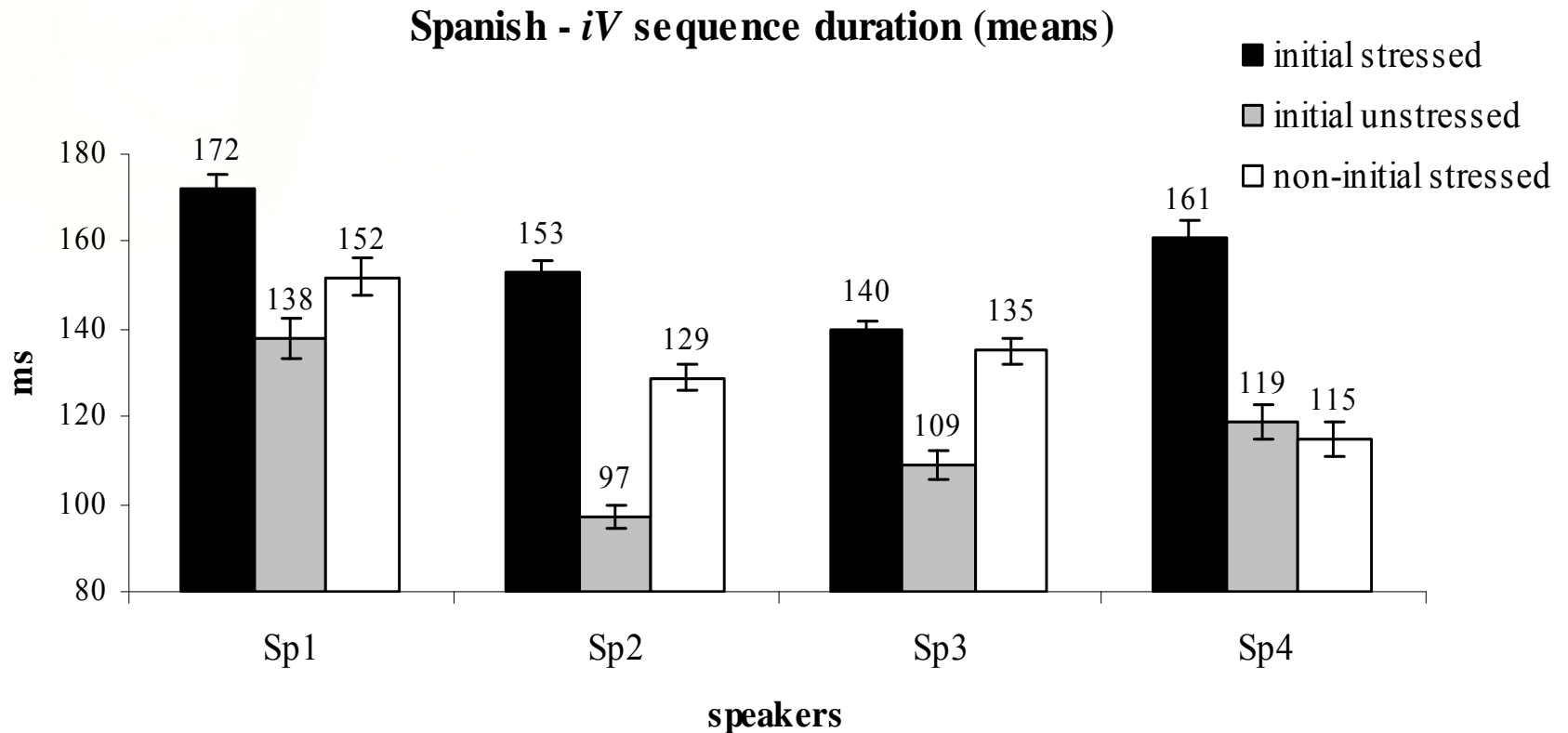
diabetes

‘diabetes’

Do variable syllabification judgments match duration trends?

Results – Spanish

initial-stressed > non-initial-stressed > initial-unstressed ($p < .001$)



Different cross-Romance patterns

diphthong / hiatus contrast

Romanian	<i>yes</i>	
Spanish	<i>partial</i>	
French	<i>no</i>	- <i>diphthongs only</i>
Portuguese	<i>no</i>	- <i>hiatus only</i>

Factors affecting the force of the merger:

- The presence of diphthongs from other historical sources (*enhance*)
- Effect of position on the duration of vocalic sequences (*inhibit*)

Proximity to stress effects

- Spanish, Romanian, E & B Portuguese

Immediately pretonic syllables tend to have greater duration than other unstressed syllables further to the left

(Hualde & Chitoran 2003)

stressed # ***V** σ σ #

pretonic # **V** * σ σ #

pre-pretonic # **V** σ * σ #

* indicates stress

Proximity to stress effects in *iV* sequences

- *Same speakers*
- *Same carrier phrase, randomized list*
- *Measured duration of word-initial *iV* sequence*

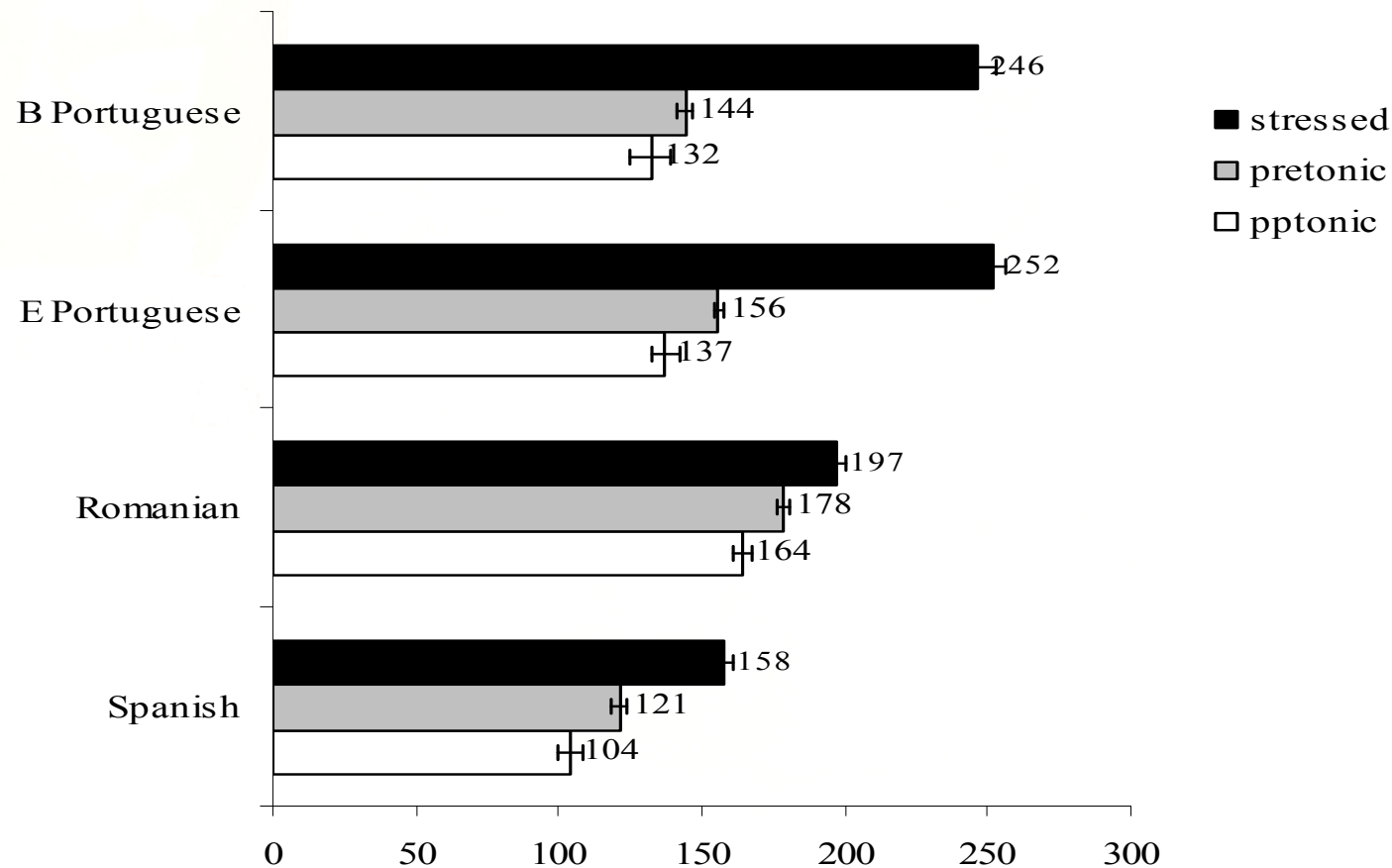
	stressed	pretonic	pre-pretonic
Spanish/	di <u>á</u> spora	di <u>a</u> mánte	di <u>a</u> pasón
Portuguese	di <u>a</u> cono	di <u>a</u> bétes	di <u>a</u> gonál
		di <u>a</u> tríba	di <u>a</u> metrál
Romanian	di <u>á</u> spora	di <u>a</u> mántu	di <u>a</u> pazón
	di <u>a</u> conu	di <u>a</u> bétur ^j	di <u>a</u> gonál
		di <u>a</u> tríba	di <u>a</u> metrál

Results

stressed > pretonic > pre-pretonic ($p < .05$)

diáspora > *diamántu* > *diapazón* (differences may be phonologized)

iV sequence duration - Proximity to stress (means)



Proximity to stress effects in vowels

- May be due to more general rhythmic pattern
- Same speakers
- Test words: 5 triplets (Sp), 6/7 (Rom), 7 pairs (EP), contrasting in location of stress
- Measure duration of vowel in word-initial syllable

	stressed	pretonic	pre-pretonic
Spanish	c <u>é</u> lebre	ce <u>l</u> ébre	ce <u>l</u> ebr <u>e</u>
	l <u>a</u> mina	la <u>m</u> ína	la <u>m</u> in <u>a</u>
Romanian	p <u>a</u> tima	pa <u>t</u> ína	pa <u>t</u> in <u>a</u>
	re <u>p</u> ede	re <u>p</u> éde	re <u>p</u> et <u>a</u>
EPortuguese	_____	ha <u>b</u> íto	ha <u>b</u> it <u>o</u> u
	_____	de <u>b</u> íto	de <u>b</u> it <u>o</u> u

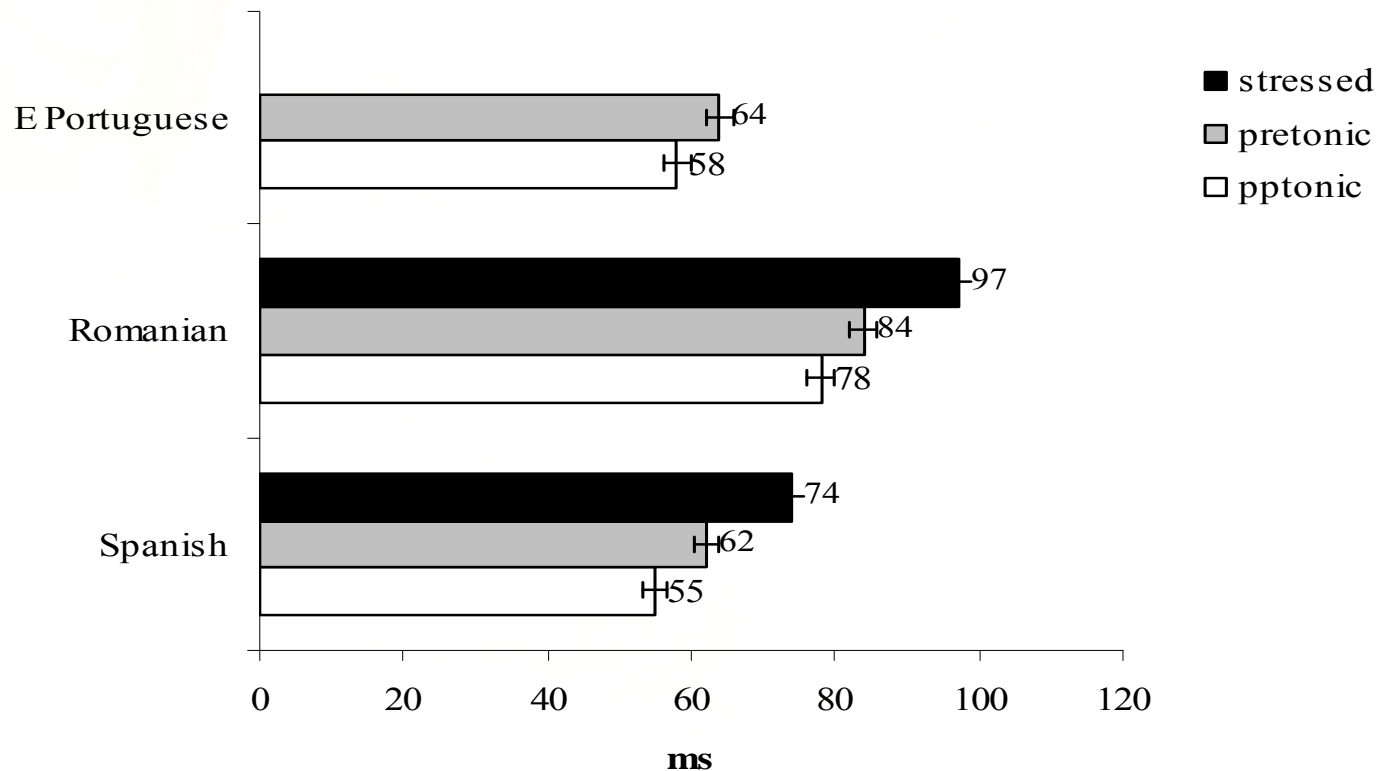
Results

stressed > pretonic > pre-pretonic

($p < .05$)

pátima > patína > patiná

Vowel duration - Proximity to stress (means)

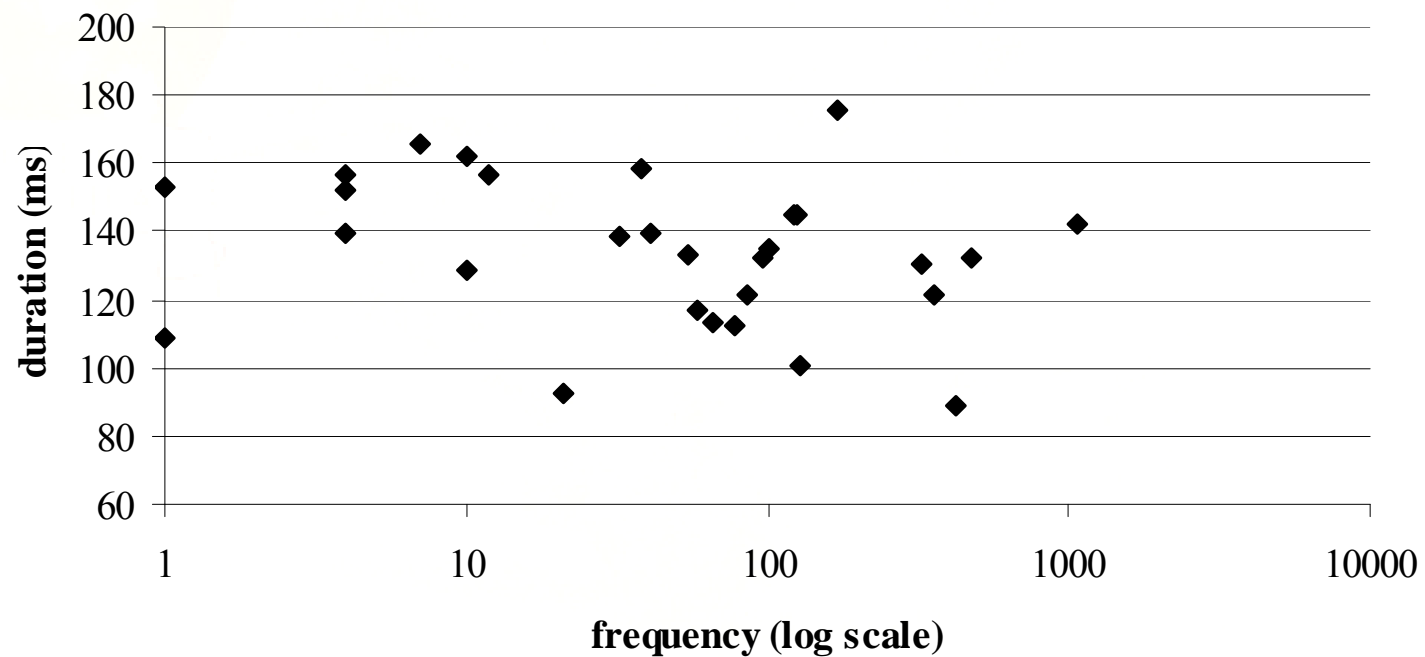


What about frequency?

- High frequency words undergo a given sound change earlier than lower frequency words (*Zipf 1929 ...Bybee 2001 ...Pierrehumbert 2001, 2003 ...*)
- But not always (*e.g., Phillips 1984*)
- Examine **Spanish** – the most relevant
 - variability in duration matches variability in syllabification intuitions
 - Frequency count based on Davies's *Corpus del español* (20 million words – www.corpusdelespanol.org)

Result – no correlation

Spanish: Duration-frequency correlation ($R^2 = 0.06$)



Discussion – The diphthong as attractor

General cross-linguistic tendency against hiatus: $i.V > jV$

- Gestural model of the syllable:
 - **Onset** C gestures are coordinated *synchronously* with next V
 - **Coda** C gestures are coordinated *sequentially* with preceding V
 - across syllable boundary? Possibly no coordination
- **Synchronous** coordination mode is more **stable** than sequential in speech (*Nam 2007*)
- Stable coordination modes are attractors

Diphthong is an attractor – tautosyllabic, more stable than sequential hiatus.

Stable diphthong vs. unstable hiatus

Hiatus (heterosyllabic) – unstable coordination mode:

- instability = increased variation
- gestures vary more in their relative timing
- potential source of ambiguity

Variation may result in shorter, overlapped /i/, possibly perceived as /j/

- [jV] favored by:
 - stable coordination mode as attractor
 - presence of diphthongs in the language, as lexical attractors
- [iV] favored by prosodic effects

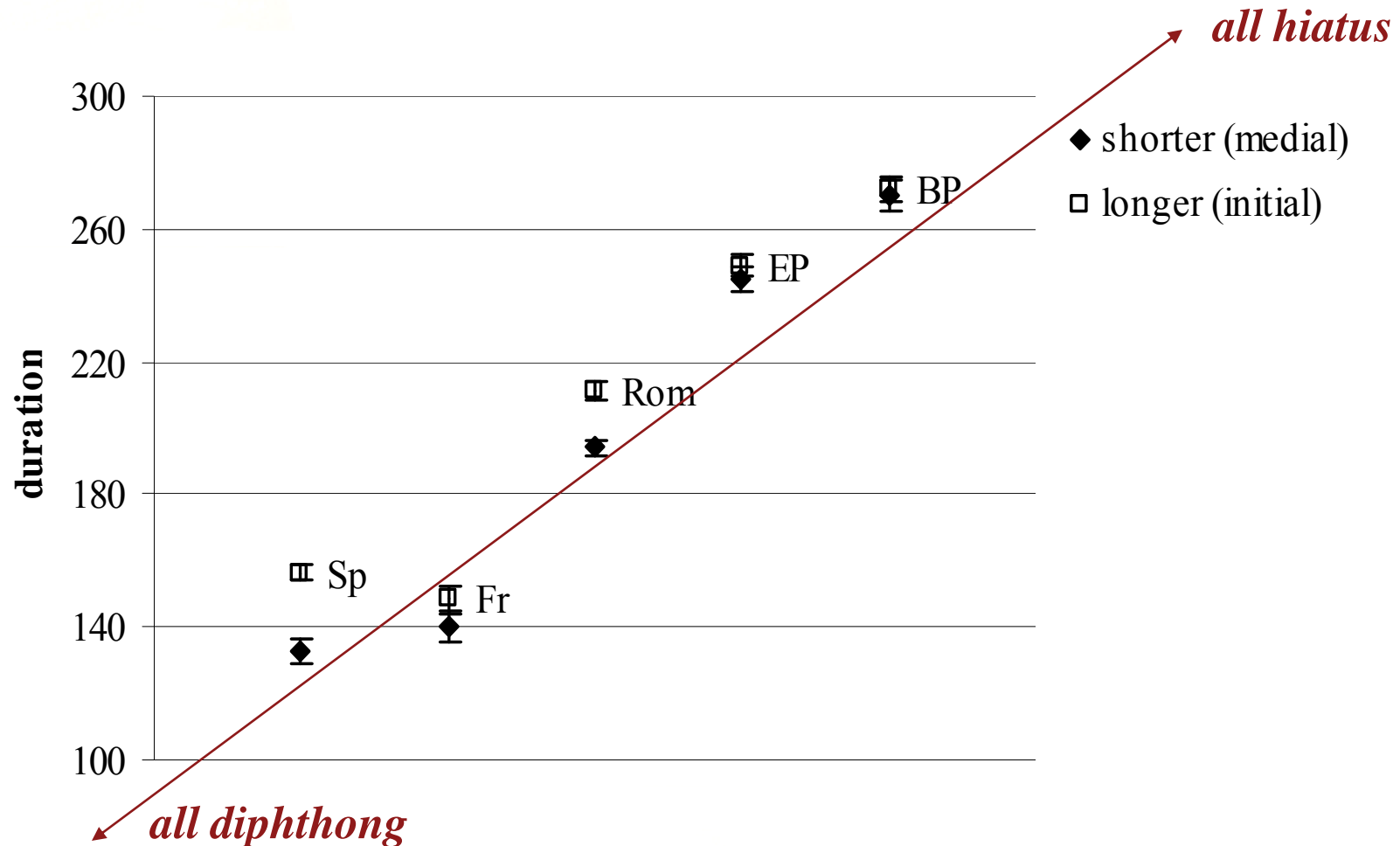
Variation along the diphthong-hiatus continuum is the result of the interaction of these factors

Summary

Different synchronic reflexes of Latin **iV*

- Stable coordination of diphthongs as articulatory attractors (*general direction of change*)
- Pre-existing unambiguous diphthongs from other sources as language-specific attractors (*speed*)
- Prosodically determined lengthening of *iV* which can inhibit diphthongization, resulting in gradient hiatus to diphthong shifts (*trajectory*)

Distribution of languages plotted as the acoustic duration of iV sequences (means)





Thank you

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