On the Disparity between Within- and Cross-Language Segmental Similarity

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Outline

Why care about phonological similarity?

PHONOLOGICAL SIMILARITY: similarity between two sound structures (segments, syllables, prosodic patterns, etc.).

Phonological similarity is invoked to explain:

- substitution patterns in **L1 production** [Page et al. 2007]
- substitution patterns in **L2 production** [Major 1987]
- L1-L2 correspondences in **loanword phonology** [Kang 2008]
- perceptual assimilations in **L2 perception** [Best and Tyler 2007]
- cross-language linkages in **bilingualism** [Flege 1995, Laeufer 1996]

Phonological similarity within a language

Two phones are similar if they:

1. are acoustically/auditorily close
2. do not contrast in the inventory
3. participate in a productive alternation [Johnson and Babel 2010]

e.g.: English speakers perceive [d] as similar to [ɾ], while Spanish speakers perceive [d] as similar to [ð]. [Boomershine et al. 2008]

Encoding phonological similarity in the grammar

A language-universal "P-map": phonological similarity effects emerge from a set of ranked constraints relating perceptually similar vs. dissimilar forms. [Steriade 2009]

- e.g.: *D–DV/_$ ≫ *D–T/_$

... *D$ is repaired by devoicing (not epenthesis)

Prediction of the P-map: output patterns follow perceptual similarity relations between an input and its possible outputs.

What about cross-linguistic mapping?

Unfaithful production of novel input clusters does **not** follow from perceptual similarity. [Shaw and Davidson 2011]

- fricative-stop clusters (e.g., [fp]): most perceptually similar to əFS, but produced as FəS
- influence of **recoverability** and **uniformity**

Cross-linguistic phonological similarity

Why does the P-map seem to be suspended in cross-linguistic circumstances?

> Useful heuristic for determining similarity between L1 and L2 segments: "phonetic symbol test" (supplemented with acoustic and perceptual data). [Flege 1996]

A "phonetic symbol test" $\sim$ cross-linguistic phonemic analysis.

Cross-linguistic phonological similarity

HYPOTHESIS: paradigmatic comparisons between languages at the phonemic level are predominant in bilinguals' mapping of L2 segments to L1 segments.

- **relative** position in acoustic space (e.g., English /u/ is located at the NE corner of F_1 x F_2 space, like the /u/ of Mandarin, French, etc.)
- distributional patterns (e.g., English /u/ has a restricted distribution with the glide /w/, like the /u/ of Mandarin, French, etc.)

PREDICTION: L2 users will show L1-L2 mappings that follow phonemic similarity over acoustic/auditory and phonetic similarity.

Perceptual similarity $\neq$ acoustic similarity

Perceptual similarity does not follow straightforwardly from acoustic similarity.

e.g.: perceptual assimilation of unfamiliar vowels to phonemically similar vowels (instead of acoustically closer vowels)

- L1 Canadian English speakers perceive German /u/ as a better exemplar of English /u/ than German /y/. [Polka and Bohn 1996]
- L1 American English speakers perceive French /y œ/ and German /y ʏ ø œ/ as closer to English back rounded vowels than English front unrounded vowels. [Strange et al. 2004]

Americans' production of French /u/ and /y/

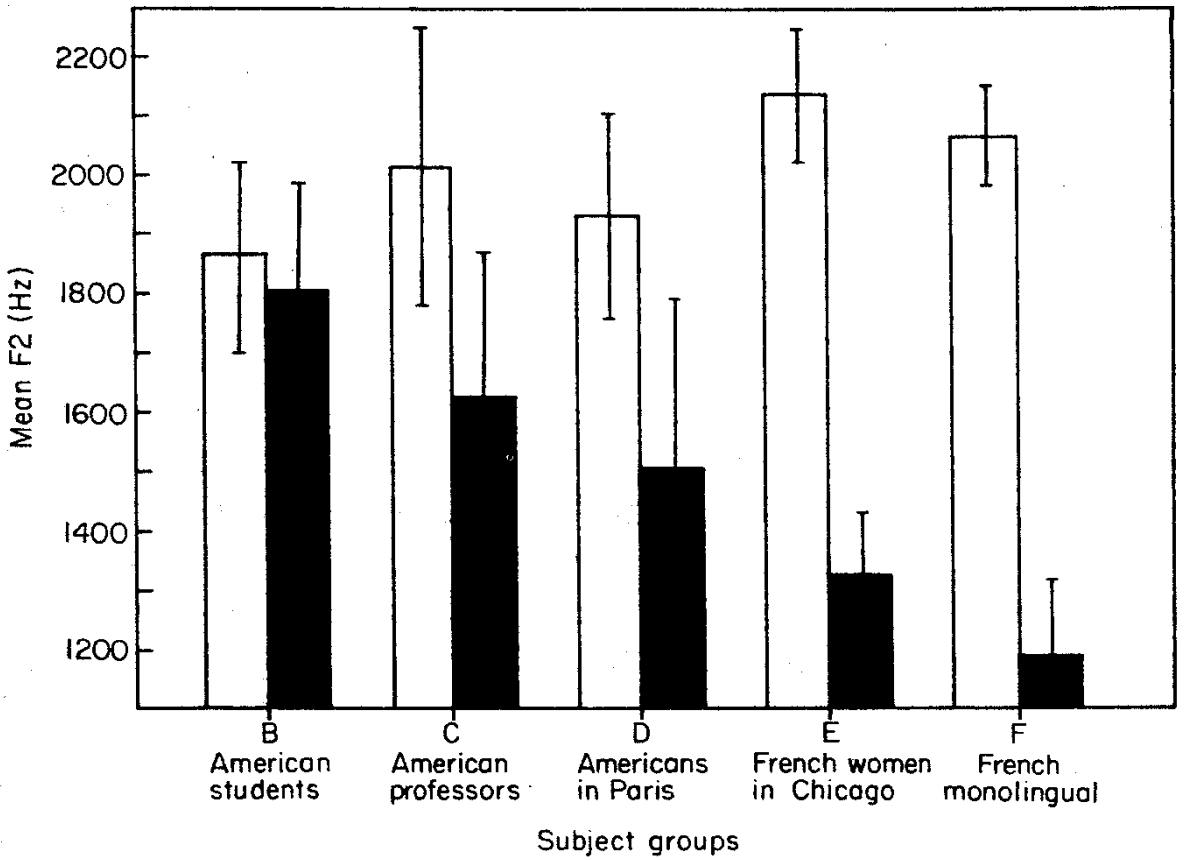
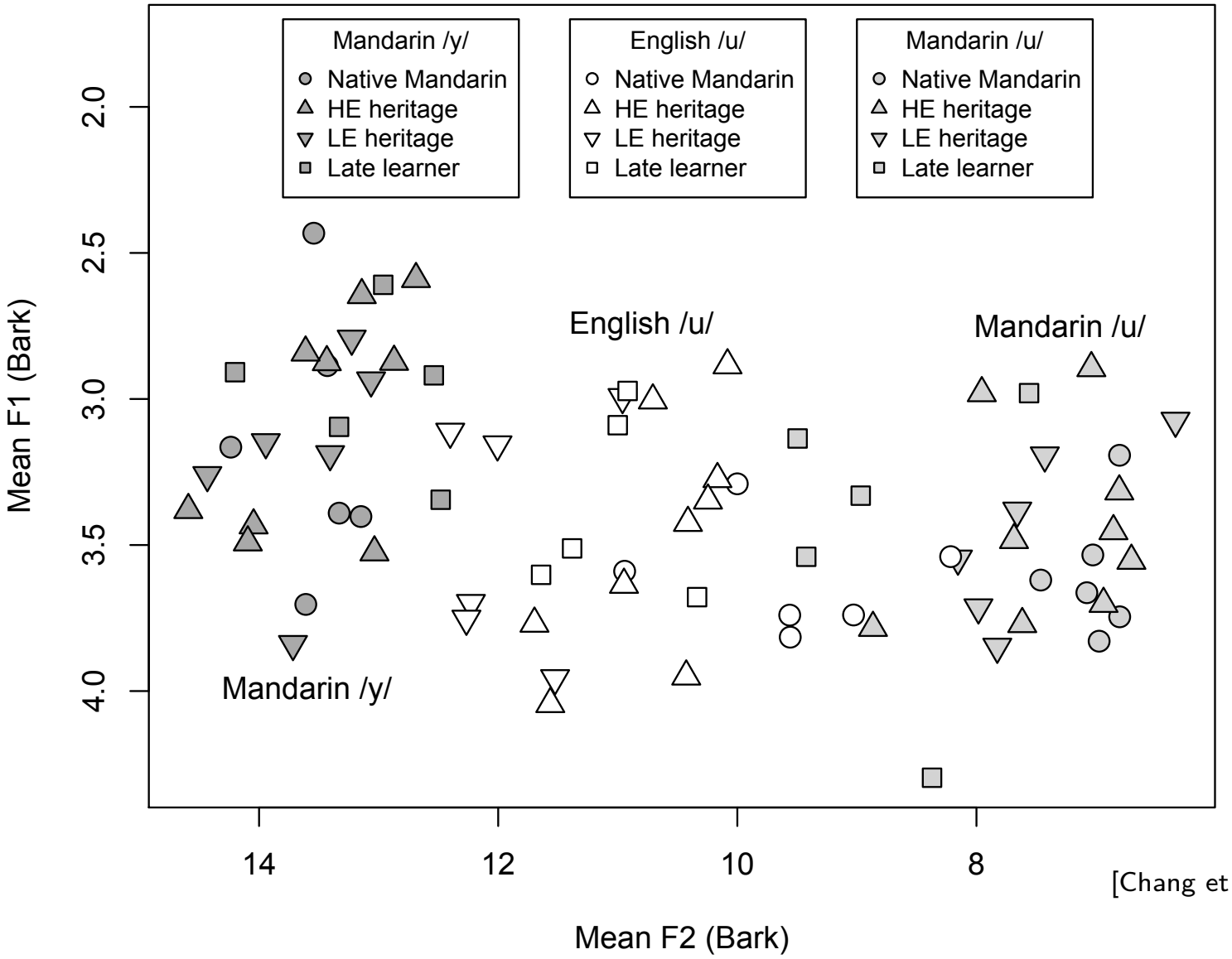


Figure 3. The mean F_2 frequency, in Hz, in tokens of /u/ in *tous* (■) and /y/ in *tu* (□) produced by four groups of L2 learners and a group of monolingual speakers of French. Most mean are based on 70 observations; the brackets enclose ± 1 standard deviation.

- French /y/: produced close to French norms
- French /u/: influenced by English norms

[Flege 1987]

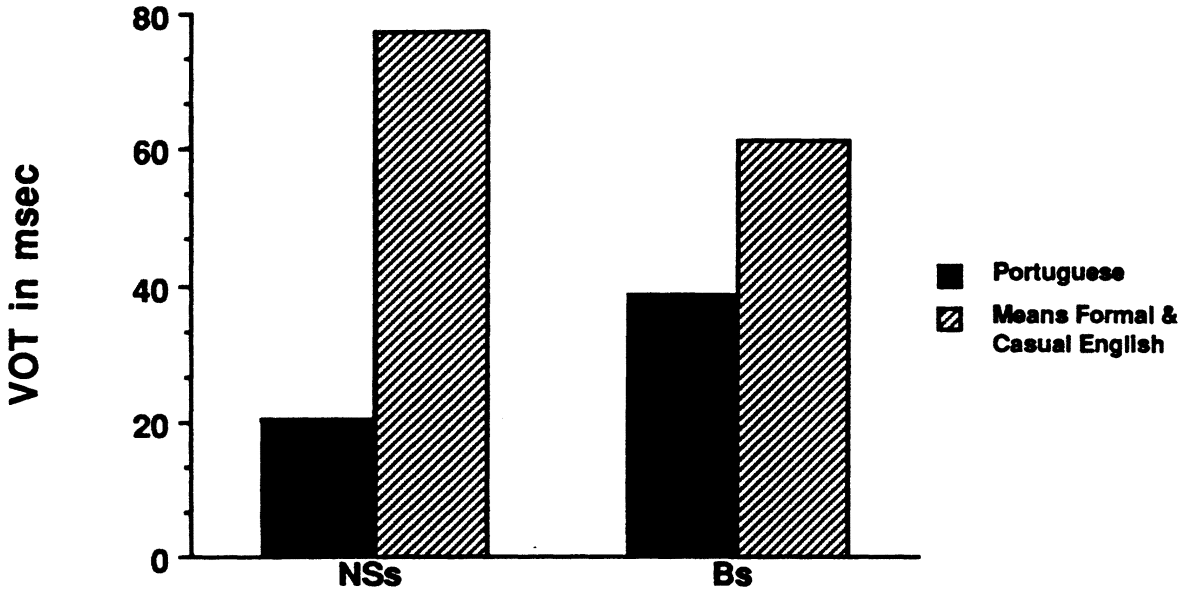
Americans' production of Mandarin /u/ and /y/



[Chang et al. 2011]

Americans' production of Portuguese /p t k/

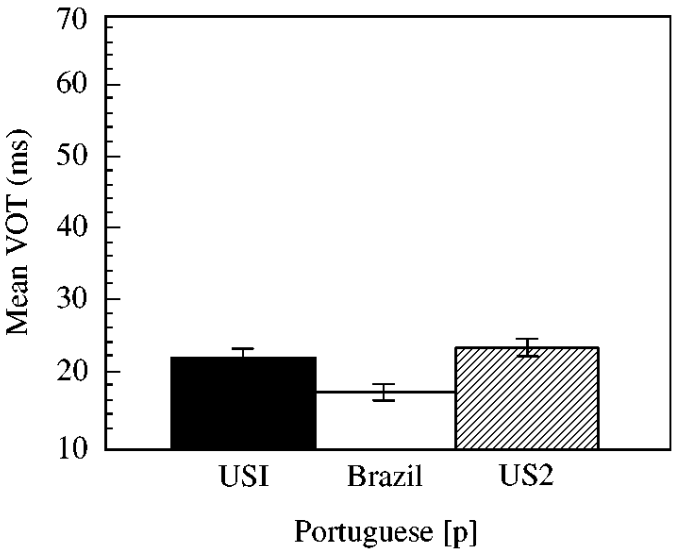
FIGURE VII
Native Speaker and Bilingual /p t k/: Portuguese and Means of Formal and Casual English, All Speakers Combined

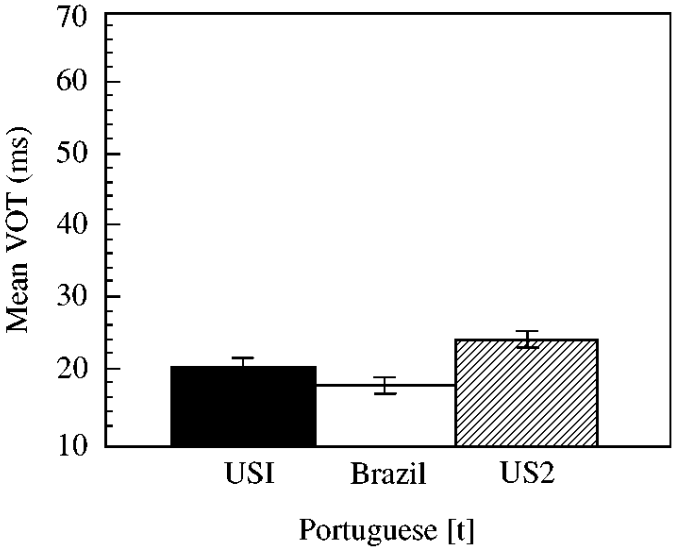


- Portuguese /p t k/: influenced by English long-lag **voiceless** (not voiced) stops

[Major 1992]

A Brazilian's production of Portuguese /p t/





- Portuguese /p t/: influenced by English long-lag **voiceless** (not voiced) stops

[Sancier and Fowler 1997]

French-English bilinguals' production of French /t/

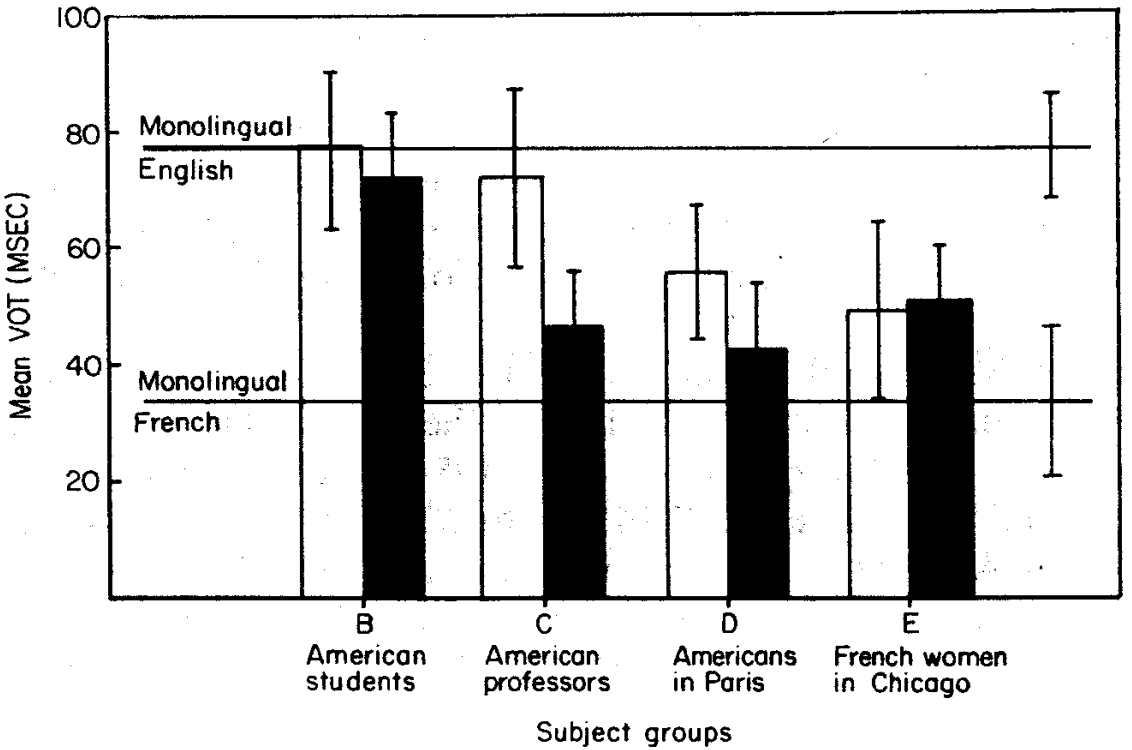
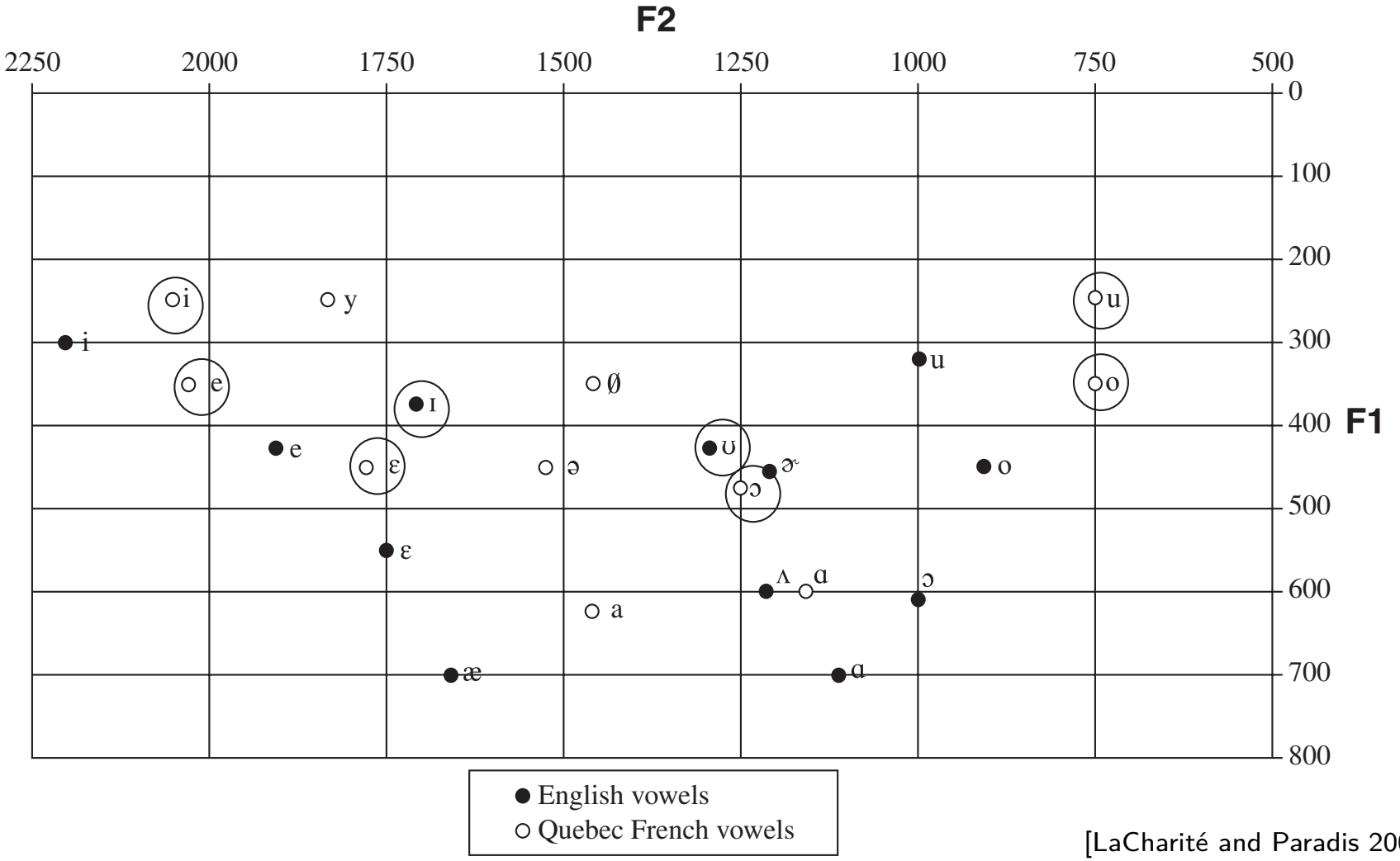


Figure 1. The mean voice onset time, in ms, in tokens of /t/ in *tous* (■) and *two* (□) by the L2 learners in four groups (represented by bars) and by monolingual native speakers of English and French (represented by horizontal lines). Most means are based on 70 observations (7 subjects × 2 conditions × 5 replicate tokens); the brackets enclose ±1 standard deviation.

- French /t/: influenced by English long-lag /t/ (not /d/)

[Flege 1987]

Phonemic adaptation of vowels



[LaCharité and Paradis 2005]

Figure 1
Diagram of the formants for English and Quebec French vowels

Phonemic adaptation of vowels

English /ɪ, ʊ/ > Quebec French /i, u/ (not /e, o/).

(11) *Examples of the adaptation of English /ɪ/ and /ʊ/ to /i/ and /u/ in Quebec French*

	English	IPA	QF
/ɪ/	clipper	[klɪ̲pəɹ]	[kli̲pəʀ]
	(to) drill	[dɹɪ̲l]	[dʀi̲l-e]
	hippie	[hɪ̲pi]	[i̲pi]
	gyprock	[dʒɪ̲pɹɑk]	[ʒi̲pʀɔk]
/ʊ/	push up	[pʊ̲ʃʌp]	[pu̲ʃɔp]
	woofer	[wʊ̲fəɹ]	[wu̲fəɹ]
	(to) book	[bʊ̲k]	[bu̲k-e]
	pusher	[pʊ̲ʃəɹ]	[pu̲ʃəɹ]

[LaCharité and Paradis 2005]

Phonemic adaptation of sonorant consonants

English /ɹ/ > Japanese /r/ (not /w/).

(23) *Examples of the treatment of onset /r/ ([ɹ]) in English loanwords in Japanese*

	English		Japanese	
a. race	[ɹes]	→	[res:ɯ]	*[wes:ɯ]
b. rock	[ɹɑk]	→	[rok:ɯ]	*[wok:ɯ]
c. cherry	[tʃɛɹi]	→	[tʃɛri:]	*[tʃɛwi:]
d. truck	[tɹʌk]	→	[torak:ɯ]	*[towak:ɯ]
e. scrap	[skɹæp]	→	[sɯkɯrap:ɯ]	*[sɯkɯwap:ɯ]

[LaCharité and Paradis 2005]

Phonemic adaptation of obstruent consonants

English /b d g/ > Mexican Spanish /b d g/ (not /p t k/).

(26) *Statistics on the treatment of voiced onset stops in English loanwords in Mexican Spanish*

		/b/	/d/	/g/	Total
MS1	Number of cases	289	161	116	566
	Phonetic approximation cases (devoicing)	0	0	0	0
	Same phoneme cases	289 (100%)	161 (100%)	115 (99.1%)	565 (99.8%)
	Deletion cases	0	0	1 (0.9%)	1 (0.2%)
MS2	Number of cases	394	229	179	802
	Phonetic approximation cases (devoicing)	0	2 (0.9%)	0	2 (0.2%)
	Same phoneme cases	393 (99.7%)	226 (98.7%)	179 (100%)	798 (99.5%)
	Deletion cases	1 (0.3%)	1 (0.4%)	0	2 (0.2%)

[LaCharité and Paradis 2005]

Phonemic adaptation of obstruent consonants

English /b d g/ > Mexican Spanish /b d g/ (not /p t k/).

(27) *Examples of unchanged voiced stops in English loanwords in Mexican Spanish*

		English		Spanish	
/b/	bar	[b̲ɑɹ]	→	[b̲aɾ]	*[p̲aɾ]
	baseball	[b̲esb̲ɑl]	→	[b̲esb̲ɔl]	*[p̲esp̲ɔl]
/d/	dip	[d̲ɪp]	→	[d̲ip]	*[t̲ip]
	darling	[d̲ɑɹlɪŋ]	→	[d̲aɾlin]	*[t̲aɾlin]
/g/	golf	[g̲ɑlf]	→	[g̲ɔlf]	*[k̲ɔlf]
	gang	[g̲æŋ]	→	[g̲aŋ]	*[k̲aŋ]

[LaCharité and Paradis 2005]

Phonemic adaptation of obstruent consonants

English /p t k/ > Burmese /p t k/ (not /p^h t^h k^h/).

Table 4. Corpus figures for adaptations of aspirated stop allophones

INPUT	*n*	UNASPIRATED	ASPIRATED	% UNASPIRATED
[p^h]	21	21	0	100.0 %
[t^h]	17	15	2	88.2 %
[k^h]	36	34	2	94.4 %

[Chang - to appear]

Phonemic adaptation of obstruent consonants

English /p t k/ > Burmese /p t k/ (not /p^h t^h k^h/).

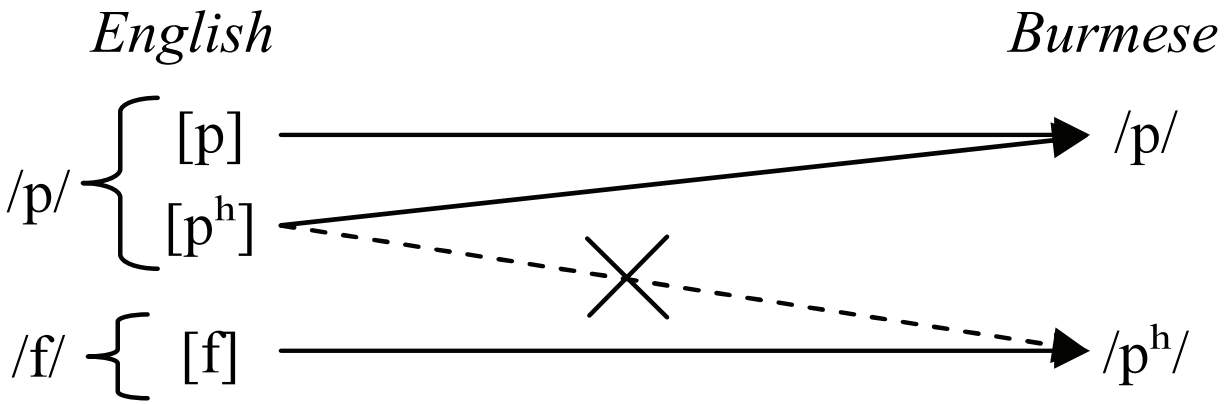
(1)	a.	*penguin*	>	[pĩ˜.gwĩ˜]	b.	*Poland*	>	[pòù.lã˜]
	c.	*plastic*	>	[pə.laʔ.sə.tɪʔ]	d.	*police*	>	[pə.leiʔ]
	e.	*Japan*	>	[dʒə.pã˜]	f.	*computer*	>	[kòũ˜.pjù.tà]
	g.	*champagne*	>	[ʃã˜.péĩ˜]	h.	*ball pen*	>	[bɔ́.pĩ˜]

[Chang - to appear]

Phonemic adaptation of obstruent consonants

English /p t k/ > Burmese /p t k/ (not /p^h t^h k^h/).

Figure 1. Maintenance of source phonemic distinctions in adaptation



[Chang - to appear]

Integrating phonetic and phonemic information

PRIVILEGED STATUS OF PHONEMICS:

- When phonemic information is available, it tends to outrank conflicting phonetic information.
- Late L2 learners differ significantly from naive non-natives.

MALLEABILITY OF PHONOLOGICAL SIMILARITY:

- How is L1-L2 similarity initially determined in L2 learning?
- How does perceived L1-L2 similarity change over the course of L2 learning?

Tracking influence of phonemic information

If L2 sounds undergo automatic EQUIVALENCE CLASSIFICATION with L1 sounds: [Flege 1995]

- Beginning L2 learners must link L1 and L2 sounds on the basis of low-level information.
- Advanced L2 learners may link L1 and L2 sounds on the basis of higher-level information.

How does the changing level of cross-linguistic linkage influence the production and perception of L1 and L2 sounds? [Chang 2010]

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