Investigating the interlanguage stages of two vowel phonemic distinctions among French speakers of English

This talk will exemplify detailed analyses of fined-grained phonemic annotations of a longitudinal spoken learner corpus. In this cross-sectional study, it is investigated whether patterns reflecting interlanguage stages exist in the vocalic realisations of twenty-two French undergraduate students at the University of Paris-Diderot recorded over three years.

A fine-grained phonemic annotation is obtained by feeding short sound and transcription files into SPPAS (Bigi 2012) which returns automatically aligned textgrids compatible with praat (Boersma & Weenink 2013). A script then reintegrates these into a single textgrid and collects phonetic and phonological data shown in Table 1. The neighboring consonants of each vowel are noted and expressed as natural classes along with the main acoustic properties (frequencies of formants F1 to F4 and duration).

B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
SPEAKER	SESSI	WORD	PHONE	LOCINFILE	F1	F2	F3	F4	DURA	PHONBEF	BEFVOICE	BEFMOA	BEFPOA	PHONA	AFTVOICE	AFTMOA
DID0020	S001	ve	i:	18,202711	318,528	1040	2802,42	3621,79	0,18	v	VOICED	FRICATIVE	LABIODENTAL	b	VOICED	PLOSIVE
DID0020	S001	been	I	18,572711	804,907	2779	3404,28	4567,89	0,19	b	VOICED	PLOSIVE	BILABIAL	n	VOICED	NASAL
DID0020	S001	everything	i:	23,18556	448,769	2002	2547,5	3921,08	0,03	r	VOICED	LIQUID	POSTALVEOLA	T	VOICELESS	FRICATIVE
DID0020	S001	everything	I	23,32556	569,69	2586	3033,22	4173,78	0,03	T	VOICELES	FRICATIVE	INTERDENTAL	N	VOICED	NASAL
DID0020	S001	trip	I	29,886694	431,246	1980	2594,81	3792,81	0,1	r	VOICED	LIQUID	POSTALVEOLA	p	VOICELESS	PLOSIVE
DID0020	S001	big	I	37,258073	431,241	2436	3078,44	4134,9	0,05	b	VOICED	PLOSIVE	BILABIAL	g	VOICED	PLOSIVE
DID0020	S001	pizza	i:	48,862681	358,961	2449	3175,57	4187,79	0,08	p	VOICELES	PLOSIVE	BILABIAL	t	VOICELESS	PLOSIVE
DID0020	S001	pizzas	i:	51,104101	353,479	1922	2594,72	3457,77	0,1	p	VOICELES	PLOSIVE	BILABIAL	t	VOICELESS	PLOSIVE
DID0020	S001	big	I	56,020461	477,268	2600	2859,93	3185,26	0,08	b	VOICED	PLOSIVE	BILABIAL	g	VOICED	PLOSIVE
DID0020	S001	full	U	58,191009	775,181	1734	2997,84	4204,92	0,04	f	VOICELES	FRICATIVE	LABIODENTAL	l	VOICED	LIQUID
DID0020	S001	good	U	63,4463	445,282	1524	2666,72	3808	0,08	g	VOICED	PLOSIVE	VELAR	d	VOICED	PLOSIVE
DID0020	S001	impress	I	67,491044	474,852	1380	2703,66	3415	0,08		NA	NA	NA	m	VOICED	NASAL
DID0020	S001	thinks	I	89,942303	621,231	1882	3031,53	4046,24	0,03	T	VOICELES	FRICATIVE	INTERDENTAL	N	VOICED	NASAL
DID0020	S001	big	I	106,33352	438	2553	3086,51	4449,18	0,03	b	VOICED	PLOSIVE	BILABIAL	g	VOICED	PLOSIVE
DID0020	S001	big	I	110,79352	466,709	2213	2928,64	4273,07	0,04	b	VOICED	PLOSIVE	BILABIAL	g	VOICED	PLOSIVE
DID0020	S001	thing	I	124,21628	513,217	2295	3098,26	4354,41	0,04	T	VOICELES	FRICATIVE	INTERDENTAL	N	VOICED	NASAL
DID0020	S001	city	I	134,61339	428,013	1234	2979,39	3727,58	0,13	s	VOICELES	FRICATIVE	ALVEOLAR	4	VOICED	PLOSIVE
DID0020	S001	city	i:	134,86339	544,38	2782	3512,94	4319,81	0,113	4	VOICED	PLOSIVE	NA		NA	NA
DID0020	S001	think	I	160,00702	594,213	2280	3030,5	3508,37	0,05	T	VOICELES	FRICATIVE	INTERDENTAL	N	VOICED	NASAL
DID0020	S001	city	I	162,4907	337,187	2715	3105,53	4460,3	0,1	s	VOICELES	FRICATIVE	ALVEOLAR	4	VOICED	PLOSIVE
DID0020	S001	city	i:	162,6807	393,58	2717	3388	4626,17	0,102	4	VOICED	PLOSIVE	NA		NA	NA
DID0020	S001	actually	i:	163,08236	447,21	2515	3101,31	4185,33	0,207	l	VOICED	LIQUID	ALVEOLAR		NA	NA
DID0020	S001	city	I	170,04638	1175,65	2676	3453,09	4429,07	0,04	s	VOICELES	FRICATIVE	ALVEOLAR	4	VOICED	PLOSIVE
DID0020	S001	city	i:	170,21638	424,133	2881	3739,67	5039,07	0,05	4	VOICED	PLOSIVE	NA	i	NA	NA
DID0020	S001	couldn	U	193,05007	1057,49	1947	2671,23	3827,47	0,12	k	VOICELES	PLOSIVE	VELAR	d	VOICED	PLOSIVE
DID0020	S001	see	i:	193,65007	509,97	2241	2415,53	3139,27	0,12	s	VOICELES	FRICATIVE	ALVEOLAR	D	VOICED	FRICATIVE

Table 1 : Sample features extracted from the X corpus

The study first focuses on the acquisition of /ɪ/ of /i:/and /ʊ/ vs. /u:/ (respectively I, i:, U and u: in the shaded phone column). The prosodic context (focus, position in the prosodic hierarchy) has not been taken into account in this study but this dataset allows for regression modeling of the formant values of the two series of vowels under study. The acquisition stages of the two vowel sets can be compared in this longitudinal investigation and the effects of the different parameters can be systematically tested, such as the effect of place of articulation of the preceding and following consonants.

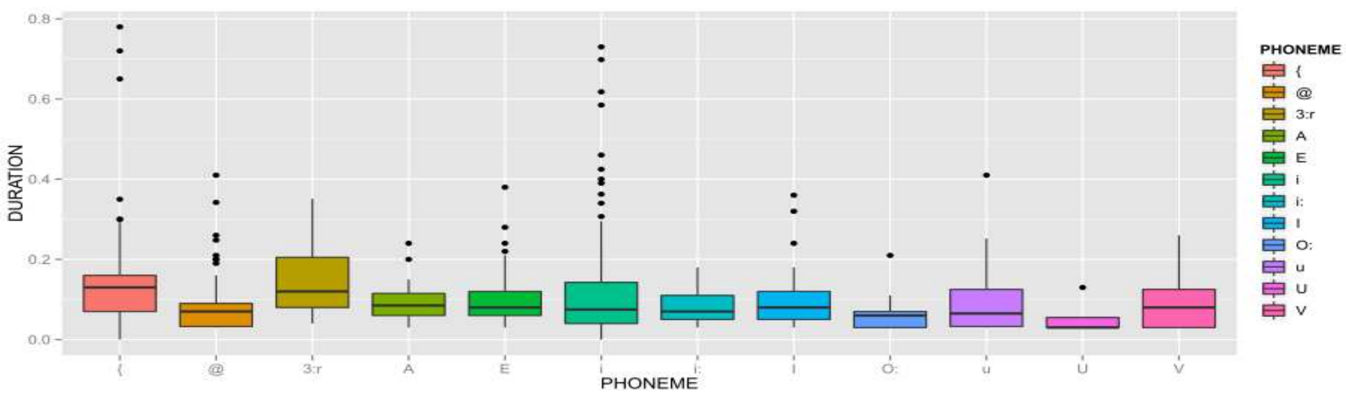

Figure 1 : Sample durations (in seconds) of phonemes extracted from speaker 20 (3rd year recording)

Figure 1 sums up the boxplots of the duration of the tokens of each monophthong. Data were processed using R, representing phonemes with SAMPA transcriptions (Wells 1997). The happy tensing (i), long (i:) and short (I) realisations will be compared (and for F1/F2, distance from the native targets estimated in Bark distance as in Méli 2013). Frequency effects are to be tested, among them the hypothesis that some words like *people* for French learners seem to work like lexical 'magnets' structuring realisations. This comparative investigation of the distinction and acquisition of /u:/ and /ʊ/ (distance from the native targets estimated in Bark distance as in Méli 2013) contributes to the debate on the quantic zone of /i:/ (Stevens 1972,1989) and on the '*perceptual magnet effect*' (Kuhl 1991, Iverson & Kuhl 1995, Sussmann et al. 1995).

The gradual distinction of /ɔ:/ vs. / əʊ/ vs. / ɒ/ and the role of syllable structure in L1 is also investigated with the same technique. Up to a late stage (speakers are undergraduate students of English), confusions remain in closed syllables, which allows the testing of the hypothesis that French speakers gradually acquire the relevant targets of back vowels of English from the native complementary distribution (/ɔ/ in CVC syllables vs. /o/ in CV syllables). 'Templatic effects' or templatic transfers are systematically investigated with this annotation and phonetic interlanguage stages can be hypothesised by spotting the realisations of the vowels according to the syllable templates.

Keywords: spoken learner corpora, SLA research, fine-grained annotation schemes, purpose-oriented annotation, hypothesis-testing corpus approaches.

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PROJET DE DATA-MINING à partir des données collectées par Adrien Méli dans le cadre de son doctorat

Les données portent sur 7 locuteurs enregistrés au cours de leur cursus d'anglais. On a mesuré la longueur des voyelles et les formants (F1 à F4, plusieurs mesures sur la durée de la voyelle) dans des mots différents. La sortie CSV est le résultat de plusieurs traitements, notamment sous praat. On cherche à savoir

- Si les réalisations sont conformes au « modèle des natifs » : une fois normalisées, les valeurs vocaliques peuvent être représentées (Méli 2013) et comparées aux valeurs de référence pour l'anglais (Ferragne & Pellegrino 2010). Typiquement, on représente les voyelles par un vowel plot où F2 est en abscisse et F1 en ordonnée cf http://www.linguistics.ucla.edu/people/hayes/103/Charts/VChart/

- L'effet de la consonne qui précède ou qui suit sur les réalisations vocaliques (les trois propriétés des consonnes, les trois traits « phonologiques » sont listés dans le tableau). La théorie prédit que le trait VOICED allonge la durée de la voyelle. Les autres traits influencent-ils les réalisations des formants ?

- Si les réalisations sont stables dans le temps et comment elles évoluent (six enregistrements sur trois ans pour chaque locuteur).

- S'il y a des effets « mots », des stabilités dans les réalisations observables dans des mots particuliers : une réalisation dans un mot « prototypique » qui se diffuserait à l'ensemble du lexique sur l'ensemble des années

- S'il y a des effets de fréquence (colonnes à rajouter : fréquence chez les natifs, fréquence chez les non-natifs)

- S'il y a un effet de la structure de la syllabe sur les réalisations. Une colonne sur la structure de la syllabe (CV : syllabe ouverte comme dans <gogo>) ou CVC (syllabe fermée, comme dans <pomme> sera ajoutée. La théorie de NB prédit que pour les valeurs proches de la voyelle de GO seront plus fréquentes en syllabe ouverte et les valeurs proches de celles de la voyelle de DOOR plus fréquentes en syllabe fermée. On s'attend donc à un transfert de la structure des francophones.

Il y a plein de package sous R pour le traitement des voyelles

Travail présentable à PAC (Montpellier, mai), Poznań (Septembre) en 2015 aux JEP : http://www-lium.univ-lemans.fr/jep2014/ ou à Glasgow (IPCHs : http://www.icphs2015.info/)