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Lingual ultrasound feedback in L2 pronunciation practice in classroom: a pilot study of French mid front-back vowel contrast

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Lingual ultrasound feedback in L2 pronunciation practice in classroom: a pilot study of French mid front-back vowel contrast

Ultrasound in L2 pronunciation practice

Vowels in French, Spanish and Japanese

Subjects and lessons

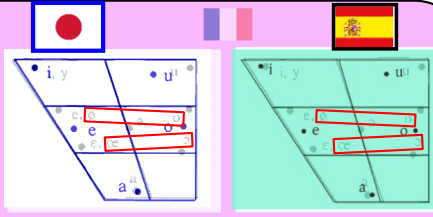
Individual lessons (among others)

- French as a Foreign Language, 7 Japanese learners; /u-y/ contrast (Kocjan ci c et al. 2019)
- Considerable improvement results with Lingual ultrasound visual feedback (LU-VF)

Classroom lessons (2 pilot studies)

- English as a Foreign Language (FL), 7 French learners (Kuhnert et al. 2022), /i-ɪ/ + /æ-ʌ/ contrasts
- Japanese as a FL, 3 American Learners, long V, mora nasals, flaps (Meadows 2007)
- Swedish as a FL, 10 Czech learners, vowels (Kocjan ci c et al. 2024)
- Slightly better results with LU-VF

Goal To observe the evolution in the production and perception of French vowel contrasts following LU-VF in a classroom



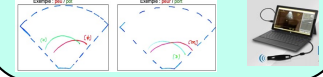
- **Predictions:**
 - assimilation of /ø/ with /o/ and /u/ and /œ/ with /ɔ/
 - difficulties in perception and production: perception precedes production in L2 (Best & Tyler 2007)
- **DIVA Model** (Guenther 1994): production with a feedforward activation of prestored sensory states (...) as a reference point => US generates a new visual sensory state for learners

Subjects (all ♀):

- **Experimental group (EXP):** 2 Japanese- (JP) & 1 Spanish-speaking (HS) adult learners; B2-C1
- **Control (CTR) group:** 2 HS & 6 JP; A2-B2
- 7 French adult native speakers
- Learners attending a 4 month course (12 lessons) in French phonetics
- EXP and CTR in two separate classes

UL-VF lessons for EXP:

- 7 lessons during which each learner practiced with a teacher for 10 min in front of the class with LU-VF
- tasks: (1) observation of their tongue during the production of isolated words and sentences + (2) observing the practice of others



Corpus and recordings

Perception test & questionnaire

Analysis

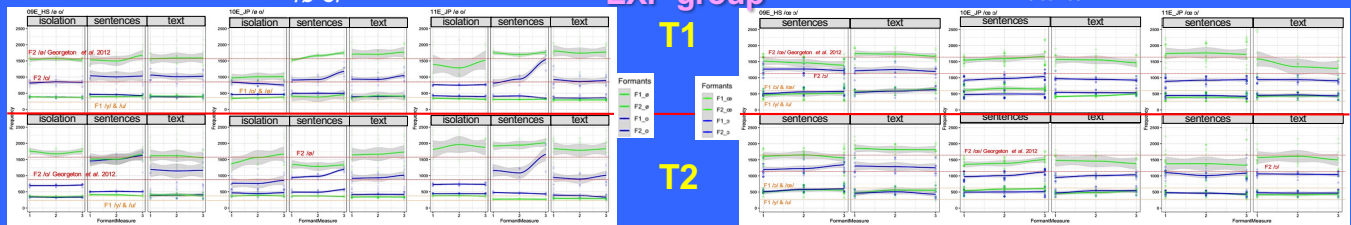
- **Corpus:**
 - French /u, ø, o, y, i, a/ in isolation (V-isol: 5 repetitions),
 - 8 carrier sentences containing /y, u, ø, o/ in /pVɔ/ /pVz/ in phonotactically plausible contexts, and /œ, ɔ/ in /pVɔ/ (8 repetitions)
 - text containing the target vowels in various segmental and prosodic contexts.
- **Recordings** before (T1) and just after (T2) the four-month pronunciation course.
- **Equipment:** Micromic C 520L, Pro Tools 7.4.2

- **Perceptual identification test** at T1 and T2 of /y, u, ø, o, œ, ɔ/ in the same words as used in the production task
- **Questionnaire** at T1 (subjects profile) and T2 (satisfaction for LU-VF)

- F1 and F2 measured at 25%, 50% and 75% of vowel duration
- Formant ceiling: 5500Hz after extensive checking
- F1 and F2 differences between /o/ & /ø/, and /ɔ/ & /œ/ (mid point), for T1 & T2
- no normalization (all ♀, T2 compared to T1)

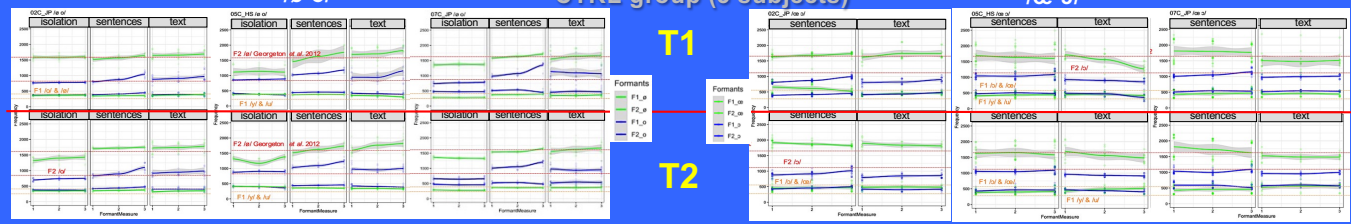
F1 and F2 frequencies

EXP group



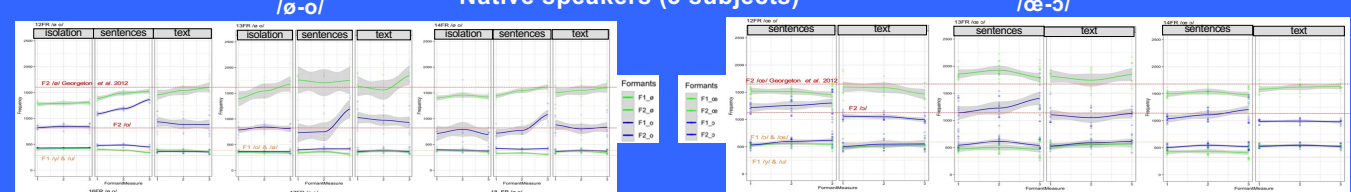
T1: /ø/-/o/: too low F2 for /ø/; /œ/-/ɔ/: too low F1 for both vowels and too low F2 for /œ/; T2: increase in F2 for isolated /ø/, less for /œ/ and /ɔ/

CTRL group (3 subjects)



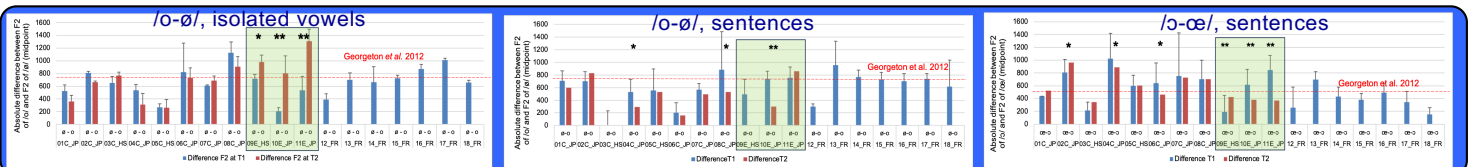
T1: /ø/-/o/: too low F2 for isolated /ø/ (05HS, 07JP); /œ/-/ɔ/: too low F1 for /ɔ/; T2: stability or decrease in F2 for isolated /ø/, /œ/ and /ɔ/, except 2JP

Native speakers (3 subjects)



Variability in the production of female native speakers of French (standard deviation and temporal stability)

F2 differences between /o/ & /ø/, and /ɔ/ & /œ/ (mid point)



- **Forced-choice identification test**
- Near ceiling for most learners (EXP or CTRL)
- Mean correct identification rate (all vowels included)
- CTRL: 90.6% at T1, 94.2% at T2
- EXP: 90.6% at T1, 95% at T2

⇒ Variability in learner recruitment and responses as any teacher may encounter in a language classroom but feasibility of LU-VF in a classroom
 ⇒ Although all learners perceptually identified the vowels in /ø/-/o/ and /œ/-/ɔ/ contrasts correctly, they all had more difficulty in producing them
 ⇒ After the LU-VF training: some acoustic changes, mainly those which might stem from horizontal tongue positioning
 ⇒ Effect of LU-VF on perception, and link between L2 perception and production less clear + All the EXP were very satisfied with LU-VF.
 ⇒ Difficulties in production (DIVA model): speakers with wider regions in the sensory space, less precise in the production of individual sounds. To make a permanent change, the new sound has to be fully acquired so that only this "correct" version of the sensory and motor plan states are activated in production

References

