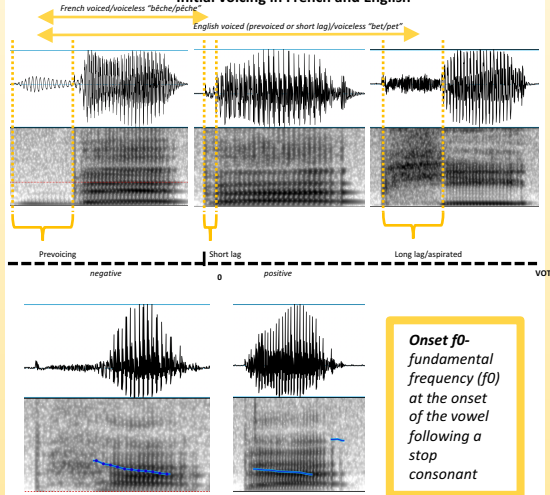# An analysis of voice onset time and onset f0 in L2 learners of French

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BACKGROUND

Initial voicing in French and English

French voiced/voiceless "bêche/pêche"

English voiced (prevoiced or short lag)/voiceless "bet/pet"

Prevoicing — Short lag — Long lag/aspirated

negative — 0 — *positive* — **VOT**

Pitch in long lag 'pat' — *Pitch in short lag 'bat'*

Onset f0- fundamental frequency (f0) at the onset of the vowel following a stop consonant

- Prevoiced and short lag VOTs will have the same onset f0 in English because they are variants of the same phoneme, but French VOTs will have a different onset f0 because prevoiced and short lag represent different voicing categories (Kirby and Ladd, 2016, Dmitrieva et al., 2015).
- Chang (2013), suggests that beginner learners might experience back transfer (L2->L1) in a complete immersion environment.

METHODS

Participants:
Learners
- 19 native speakers of Mid-Western English learning French at Purdue University
- 201 Level French (3rd semester) or above

Control
- 33 monolingual native speakers of Mid-Western English

Task:
- Words on screen
- Three randomized blocks
- Presentation: 2 seconds
- ISI 0.5 seconds

Measurements:
- VOT (initial stops)
- Onset f0 (measured at the beginning of the vowel)

Stimuli:
- Four French, voiced/voiceless, bilabial stop minimal pairs with vowels /i/, /ɛ/ and /a/ (bêche/pêche)
- Four English, voiced/voiceless, bilabial stop minimal pairs with vowels /i/ /ɪ/, /ɛ/ and /a/ (bet/pet)
- 8 distractor minimal pairs were also displayed

RESEARCH QUESTIONS

1. How does proficiency level effect the type of VOT produced by English learners of French?
2. If learners distinguish French and English VOT categories, do they also exhibit the same distinction in onset of f0?
3. Is there a back transfer effect occurring in English learners of French and if there is, are these effects happening with both VOT and onset of f0?

VOT RESULTS
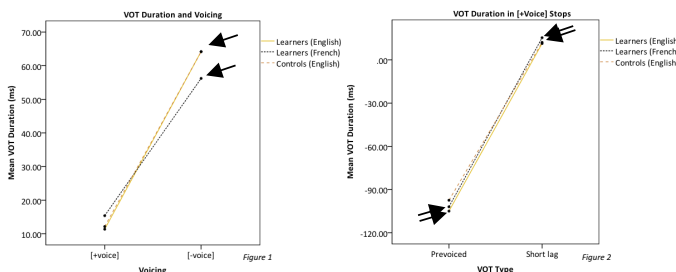
Figure 1

Figure 2

- *Figure 1*: Learners are producing long lag VOTs (>40 ms) in French [-voice], but their VOTs are shorter than in English.
- *Figure 2*: Learners do not distinguish a separate voicing category in French (vs. English) when producing [+voice]. Whenever learners produce prevoiced [+voice], their English and French VOTs have the same duration.
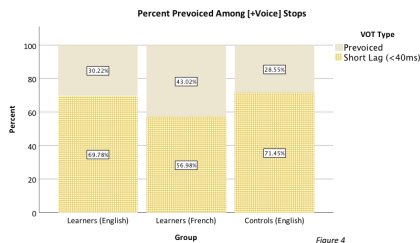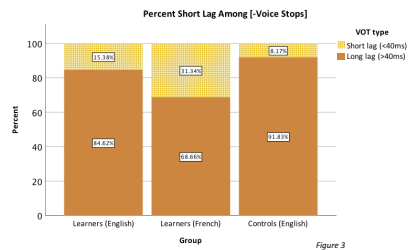

Figure 3

- Learners are producing more [-voice] short lag stops in French than they do in English. This therefore makes them produce fewer long lag VOTs, which do not occur in French.

Figure 4

- Learners are using more [+voice] prevoiced stops in French than in English. However, they are not exclusively using prevoiced VOT, as found in native French speech.

Note: Short lag <40ms and long lag >40ms

ONSET F0 RESULTS
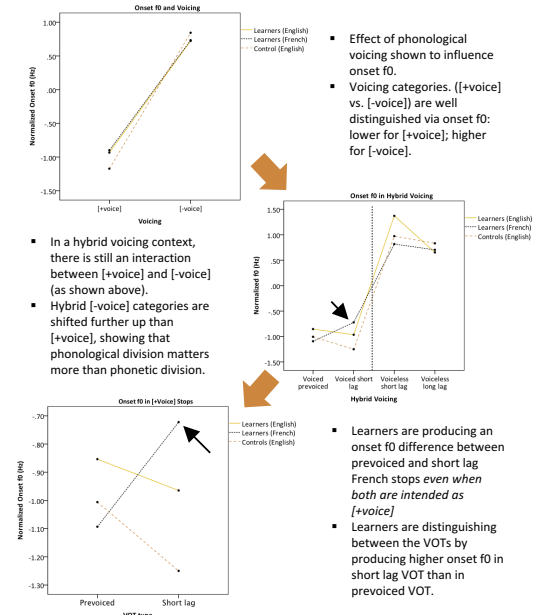
- Effect of phonological voicing shown to influence onset f0.
- Voicing categories. ([+voice] vs. [-voice]) are well distinguished via onset f0: lower for [+voice]; higher for [-voice].

- In a hybrid voicing context, there is still an interaction between [+voice] and [-voice] (as shown above).
- Hybrid [-voice] categories are shifted further up than [+voice], showing that phonological division matters more than phonetic division.

- Learners are producing an onset f0 difference between prevoiced and short lag French stops *even when both are intended as [+voice]*
- Learners are distinguishing between the VOTs by producing higher onset f0 in short lag VOT than in prevoiced VOT.

DISCUSSION

- Although learners are not completely eliminating long lag VOTs in French, production of [-voice] VOTs is shifting in more native-like direction despite learning in a classroom context.
- **No back transfer occurred in these data**. We speculate that this might be because learners are not receiving input from native French teachers.
- Learners seem to be producing the correct onset f0 between different L2 categories (lower onset f0 in [+voice] and higher onset f0 in [-voice]). However, they are producing French [+voice] short lag VOT with higher onset f0 (like [-voice] short lag). Learners are acquiring the distinction, but not disassociating these cues completely.
- In terms of onset f0, phonological division appears to matter more than phonetic division.

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