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## Vowel context and frequency effects in dorsal and coronal acquisition in Drehu and French

Julia Monnin<sup>1,2</sup>, H el ene L evenbruck<sup>1</sup>, Mary E. Beckman<sup>3</sup>, Jan Edwards<sup>4</sup>

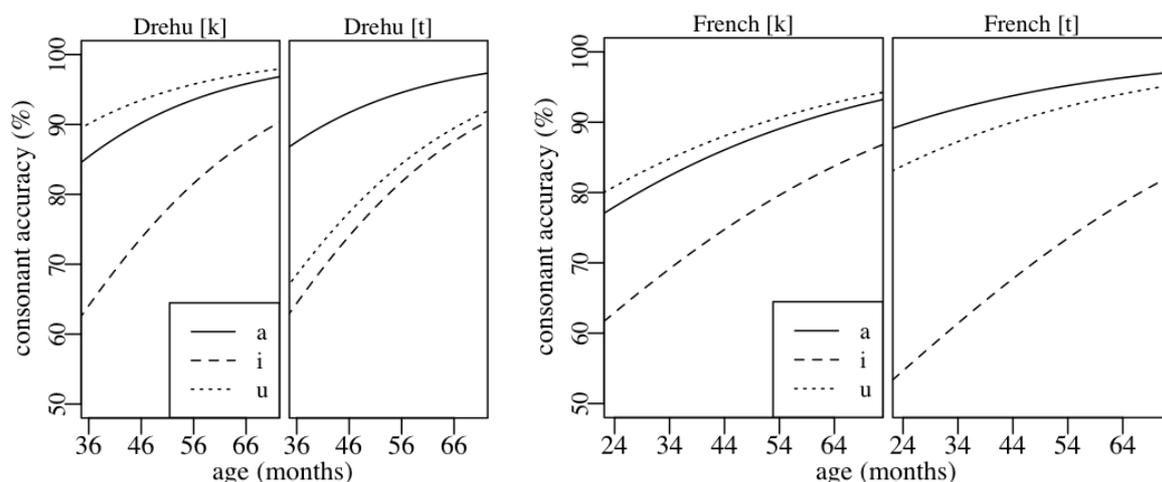
<sup>1</sup>EA CNEP, Universit e de la Nouvelle-Cal edonie, Noum ea, France; <sup>2</sup>D epartement Parole et Cognition, GIPSA-lab, CNRS UMR 5216, U. Grenoble, France; <sup>3</sup>Ohio State U., Columbus, USA; <sup>4</sup>U. Wisconsin, Madison, USA  
monninjulia@yahoo.fr; Helene.Loevenbruck@gipsa-lab.inpg.fr, mbeckman@ling.ohio-state.edu, jedwards2@wisc.edu

### Background and aim

The age-typical misarticulations that often occur in phonological development can be described in terms of the interaction of two types of production constraints: (1) “markedness” constraints that reflect universal age-related differences in vocal tract morphology and the child’s immature motor system (e.g., Locke 1983, Davis, MacNeilage & Matyear 2002), and (2) “phonotactic” constraints that reflect the potentially language-specific distribution in the child’s growing lexicon of elements such as consonants, vowels, and coarticulated consonant-vowel sequences (e.g., Pye, Ingram & List 1987, Edwards & Beckman 2008). One misarticulation that is very typical for young children who are acquiring English or German is “velar fronting” — the substitution of coronal sounds such as [t] for dorsal sounds such as [k]. Based on his review of diary studies and a few larger norming studies of children acquiring English and several other languages, Locke (1983) followed Jakobson (1941) in describing more accurate production of [t] relative to [k] as a markedness universal. More recent cross-sectional studies of children acquiring Greek (Nicolaidis et al. 2003), Japanese (Beckman, Yoneyama & Edwards 2003), and Drehu or French (Monnin & L evenbruck 2010), by contrast, offer evidence suggesting that any tendency to produce [t] more accurately than [k] is modulated by language-specific frequencies. What is not clear is whether the modulation is due to consonant frequency per se. There may instead be phonotactic constraints related to the language-specific frequencies of “fronted frames” versus “backed frames” (Davis, MacNeilage & Matyear 2002). To begin to differentiate the two hypotheses, the present study examines Drehu (an Austronesian language spoken in New Caledonia) and French data on [k] and [t] in different vowel contexts.

### Evaluation of the vowel context effect

Word-initial consonant-vowel sequences chosen for cross-linguistic comparison were elicited from 4 groups of about 40 French-acquiring children aged 2 through 5 years, and from 3 groups of about 16 Drehu-acquiring children, aged 3 through 5. Words in the child’s mother tongue were elicited in a picture-prompted word-repetition task, and target sounds were transcribed by a native speaker.



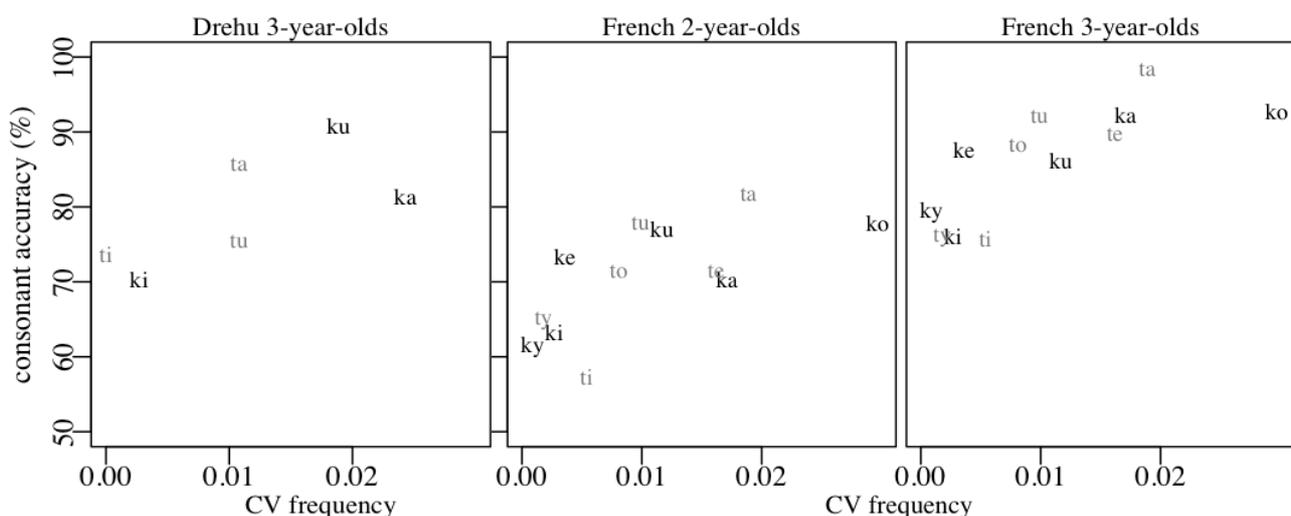
**Figure 1.** Growth in accuracy of [k] and [t] productions in the context of [a, i, u]. Curves are summed coefficients of fixed effects in a mixed-effects logistic regression model with age, consonant, vowel, and the consonant-by-vowel interaction as fixed effects and individual-level intercepts to capture differences in overall accuracy across the children.

Figure 1 shows growth in accuracy by age for word-initial [k] and [t] in the 3 vowel contexts where both consonants were elicited for Drehu. (Here French “[a]” includes all 3 low vowels: /a, ɑ, ɑ̃/.) As the figure makes clear, both stops are mastered early in both languages, but [k] is somewhat more accurate for the youngest children.

This general trend confirms the results reported for this dataset by Monnin and Løvenbrück (2010). What these new figures make clear, however, is that the difference in accuracy is modulated by vowel context. In both languages, the difference in accuracy is substantial only in one of the three vowel contexts, namely [u] for Drehu and [i] for French. The greater accuracy of [k] before [u] in Drehu is in keeping with the intrinsic difficulty of producing coronal constrictions before back vowels described in the frame/content account of markedness universals based on the mandibular cycle. The greater accuracy of [k] before [i] in French, on the other hand, is unexpected.

### Evaluation of the frequency effect

In addition to recording word productions by Drehu- and French-speaking children, we also had recorded and transcribed two small corpora of child-directed speech. We use these two transcribed corpora to estimate the relative type frequencies of all of the word-initial consonant-vowel sequences that we elicited. Figure 2 shows the relationship between mean accuracy of [k] or [t] and these CV frequencies for the youngest group of Drehu-speaking children and for the two youngest groups of French-speaking children. The otherwise puzzling effects of the front-vowel context on accuracy of [t] seem to reflect the very low frequency of the [ti] sequence in both languages.



**Figure 2.** Accuracy of [k] and [t] by CV frequency, in the context of [a, i, u] for Drehu-speaking 3-year-olds (left), and in the 6 contexts in which both consonants were elicited for French-speaking 2- and 3-year-olds (middle and right).

### Conclusion and future research

The relationships plotted in Figures 1 and 2 support the idea that the relative accuracy of [t] and [k] in development reflects the markedness of particular combinations of lingual stop and coarticulated vowel, as modulated by language-specific phonotactics. Future analyses will examine stop burst spectra and vowel formants to evaluate whether there are cross-language phonetic differences in the consonant and vowel targets which might also contribute to the accuracy differences.

### References

- Beckman, M. E., Yoneyama, K., & Edwards, J. (2003). Language-specific and language-universal aspects of lingual obstruent productions in Japanese-acquiring children. *Journal of the Phonetic Society of Japan*, 7, 18-28.
- Davis, B. L., MacNeilage, P. F., & Matyear, C. L. (2002). Acquisition of serial complexity in speech production: A comparison of phonetic and phonological approaches to first word production. *Phonetica*, 59, 75-107.
- Edwards, J., & Beckman, M. E. (2008). Some cross-linguistic evidence for modulation of implicational universals by language-specific frequency effects in phonological development. *Language Learning and Development*, 4(2), 122-156.
- Jakobson, R. (1941). *Kindersprache, aphasie und allgemeine lautgestze*. Almqvist & Wiksell; Uppsala.
- Locke, J. (1983). *Phonological Acquisition and Change*. Academic Press.
- Monnin, J., & Løvenbrück, H. (2010). Language-specific influence on phoneme development: French and Drehu data. *Proceedings of Interspeech 2010*, Makuhari, Japan, September 26-30, 2010, 1882-1885.
- Nicolaidis, K., Edwards, J., Beckman, M. E., & Tserdanelis, G. (2003). Acquisition of lingual obstruents in Greek. *Proceedings of the 6th International Conference of Greek Linguistics*, Rethymno, Crete, September 18-21, 2003.
- Pye, C., Ingram, D., & List, H. (1987). A comparison of initial consonant acquisition in English and Quiché. In K. E. Nelson & A. Van Kleeck (Eds.), *Children's language* (Vol. 6, pp. 175-190). Hillsdale, NJ: Lawrence Erlbaum.