

Julia Monnin<sup>1,2</sup>, Hélène Løevenbruck<sup>2</sup>, Mary E. Beckman<sup>3</sup>, Jan Edwards<sup>4</sup>

<sup>1</sup>EA CNEP, Université de la Nouvelle-Calédonie, Nouméa, France; <sup>2</sup>Département 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**– Age-typical misarticulations in phonological development that are attested in any given language might be explained by universal “markedness constraints” or by language-specific “phonotactic constraints”.

- **Markedness constraints:** This term refers to universal tendencies that originate from the child's immature motor system (Davis *et al.*, 2002). It has been claimed that marked phonemes are acquired later. For instance, dorsals such as [k] (marked [+posterior]) are claimed to be acquired later than coronals such as [t] (Locke, 1983; Jakobson, 1941; Yamaguchi, 2008; Brandão de Carvalho *et al.*, 2010).
- **Phonotactic constraints:** Other researchers have suggested that language-specific frequencies can modulate markedness constraints. For example, recent cross-sectional developmental studies on Greek (Nicolaidis *et al.*, 2003), Japanese (Beckman *et al.*, 2003) and Drehu and French (Monnin & Løevenbruck, 2010) suggest that the tendency to produce coronals more accurately than dorsals is modulated by language-specific frequencies.

**RESEARCH QUESTION**– Is this language-specific modulation due to consonant frequency *per se* or to the language-specific frequencies of "fronted frames" vs "backed frames" (Davis *et al.*, 2002)?

**CORPUS**–

Productions of [k] and [t] in different vowel contexts [a, i, u]  
 Elicited word initially in a picture-prompted word-repetition task  
 4 groups of about 40 French-acquiring children, aged 2 through 5 years  
 3 groups of about 16 Drehu-acquiring children (Austronesian language from New Caledonia), aged 3 through 5 years

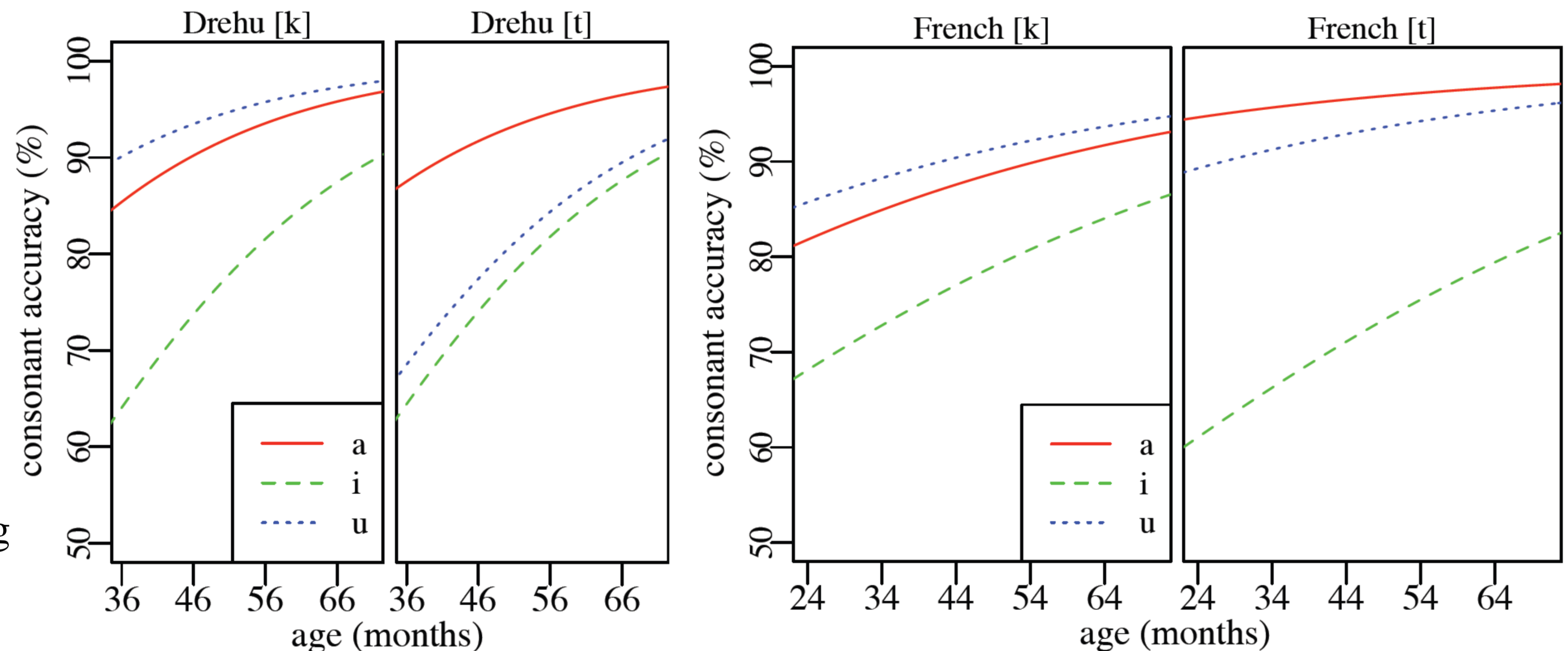
**Figure 1.** Elicitation of French [k] in the context before [a] in *carotte* ‘carrot’



**RESULTS**–

**Evaluation of the vowel context effect**

**Figure 2.** Growth in accuracy of [k] and [t] productions in the context of [a, i, u] for Drehu-speaking children (left) and for French-speaking children (right).

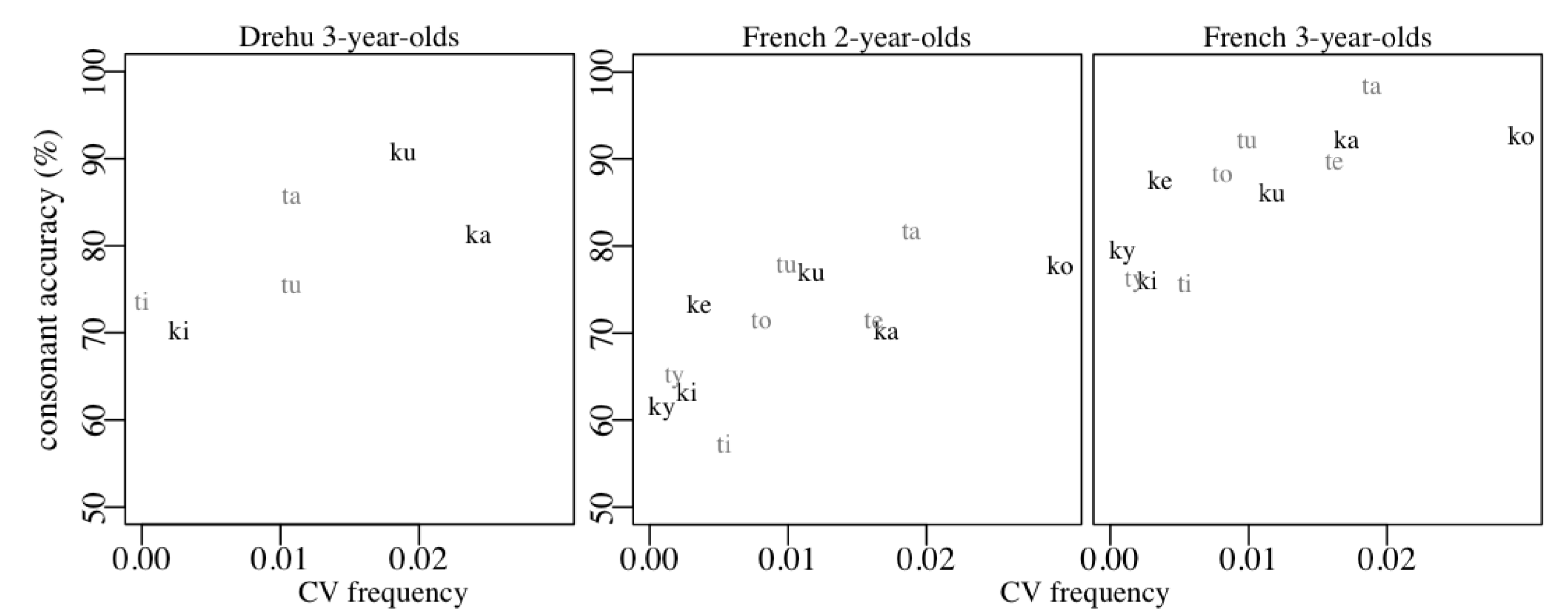


- In both languages: both stops are mastered early, [k] is somewhat more accurate for the youngest children.
  - For Drehu, [t] is less accurate before [u] than [k], in keeping with the "backed frame" hypothesis.
  - For French, [t] is less accurate before [i] than [k], unexpected in a universal account.
- ☞ **The difference in accuracy is modulated by vowel context**

**Evaluation of the frequency effect**

Type frequencies for [k] and for [t] in the [a, i, u] contexts in French and Drehu were estimated using two corpora of child-directed speech (Monnin & Løevenbruck, 2008).

**Figure 3.** Mean accuracy of the initial [k] or [t] plotted against its context-specific frequency for the youngest age groups for each language.



- In both languages : very low frequency of the [ti] sequence
  - For the youngest children, the lower frequency of [ti] relative to [tu] might explain the lower accuracy of [t] in a front-vowel context (relative to a back-vowel context).
- ☞ **The difference in accuracy is modulated by CV frequency in the ambient language**

**CONCLUSION AND FUTURE RESEARCH**–

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 AND ACKNOWLEDGEMENTS**–

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.  
 Brandão de Carvalho, J., Nguyen, N., & Wauquier, S. (2010). *Comprendre la phonologie*. Presses Universitaires de France, collection Linguistique Nouvelle, Paris.  
 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 lautgesetz*. Almqvist & Wiksell; Uppsala.  
 Locke, J. (1983). *Phonological Acquisition and Change*. Academic Press.  
 Monnin, J., & Løevenbruck, H. (2008). Influence des fréquences lexicales des langues française et drehu sur l'acquisition des consonnes initiales de mots. *Proceedings of XXVIIèmes Journées d'Etude sur la Parole (JEP'08)*, Avignon, 9 – 13 juin.  
 Monnin, J., & Løevenbruck, 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.  
 Yamaguchi, N. (2008). Markedness, Frequency: Can We Predict the Order of Acquisition of Consonants? *Proceedings of LingO 2007, Faculty of Linguistics, Philology, and Phonetics, University of Oxford*.

We sincerely thank Anne Vilain for her comments, Fabrice Wacalie and Numa Henesewene for the Drehu transcriptions, Mélodie Artaz and Widad Boumaiz for a validation of the phonetic transcriptions for part of the data, and all the children and parents who participated in the study.