

Organization of simplex and complex onsets in 5 and 6-year old children's productions

Sandra Peters & Felicitas Kleber

Institute of Phonetics and Speech Processing, Ludwig-Maximilians-University of Munich
{sandra | kleber}@phonetik.uni-muenchen.de

Aims

1. How do children articulatorily coordinate complex onsets?
2. Do pre-school children show the same articulatory timing mechanisms as adults?

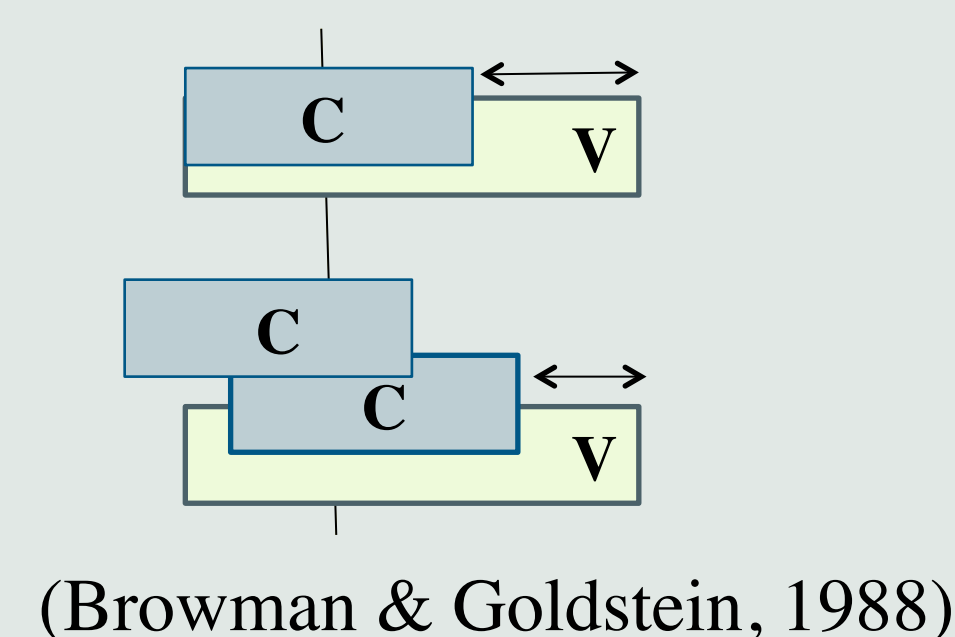
Background

Children's productions of complex onsets

- ability to produce clusters in the 2nd year of life (Lleo & Prinz, 1996)
- protracted development until adult-like mastery (Smit et al., 1990)
- variability in gestural coordination of complex onsets

Adult's coordination of complex onsets

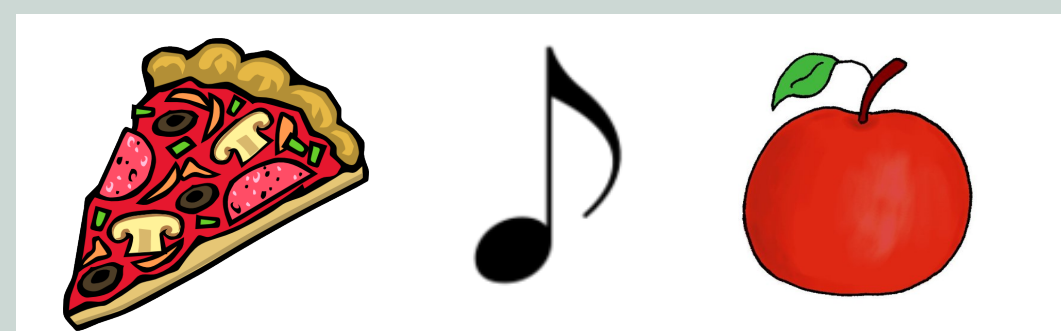
- shift into the vowel in complex onsets
- global organization of onset clusters



Method: Doing EMA with children

- four L1-German children aged between 5;10 and 6;10 were recorded with AG501
- existent words containing either **simplex** (/lak/, /no:tə/, /lastə/, /last/) or **complex onsets** (/klak/, /kno:tən/, /pflastə/, /plats/)
- embedded in /a/-context (optimal tracking of speech articulators):

/pitsa/ [target word] /apfəl/ “Pizza [target word] apple”



1st repetition



2nd repetition



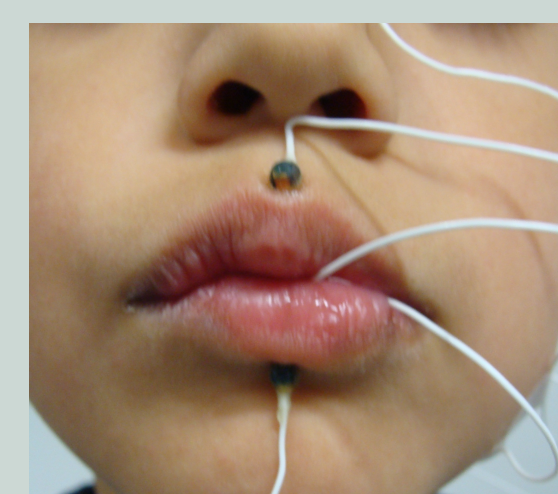
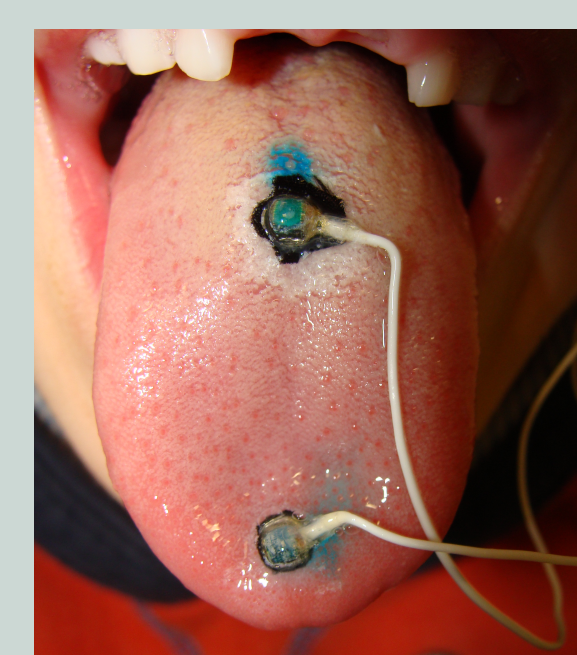
3rd repetition

- to motivate children, they saw a pirate getting closer to a treasure after every repetition

EMA:

Two sensors on the tongue

- **tongue back** to track the velar /k/
- **tongue tip** to track the alveolars /n/ and /l/

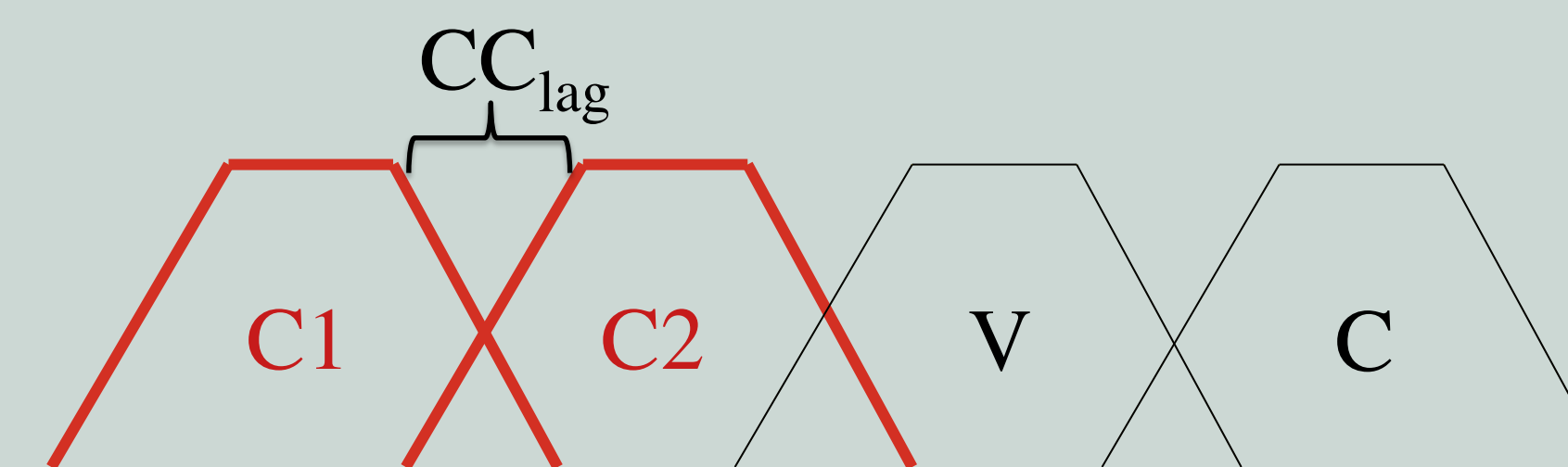


- additional sensors on **upper** and **lower lips**
- **lip Aperture** calculated for the labials /p/ and /pf/

Measurements

(1) Consonant-to-consonant timing

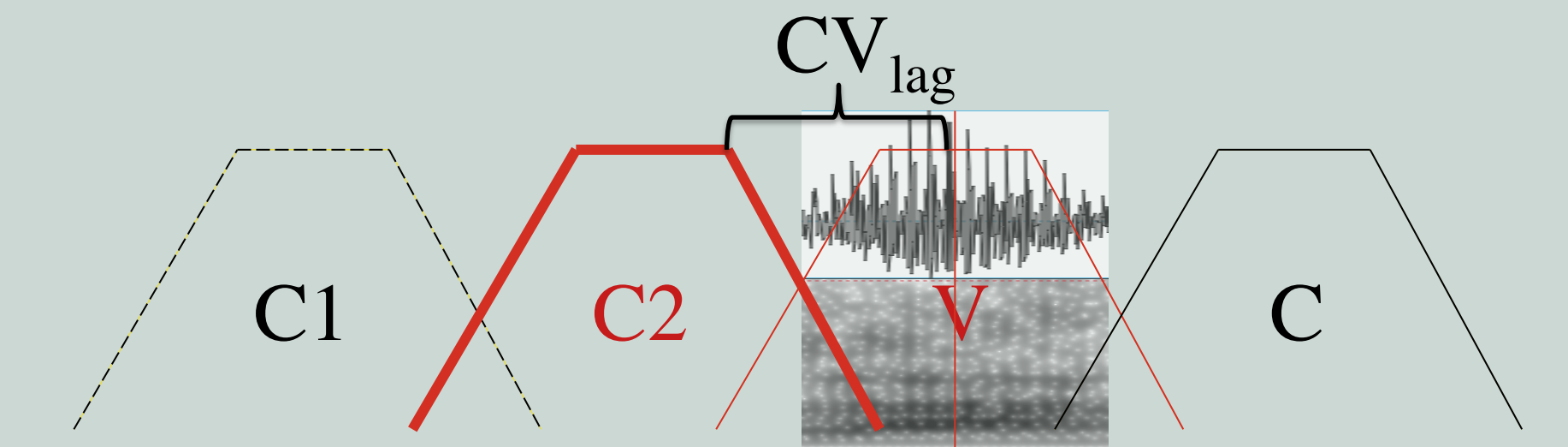
$$CC_{lag} = PlateauOnset_{C2} - PlateauOffset_{C1}$$



→ lower lag values = more overlap

(2) Consonant-to-vowel timing

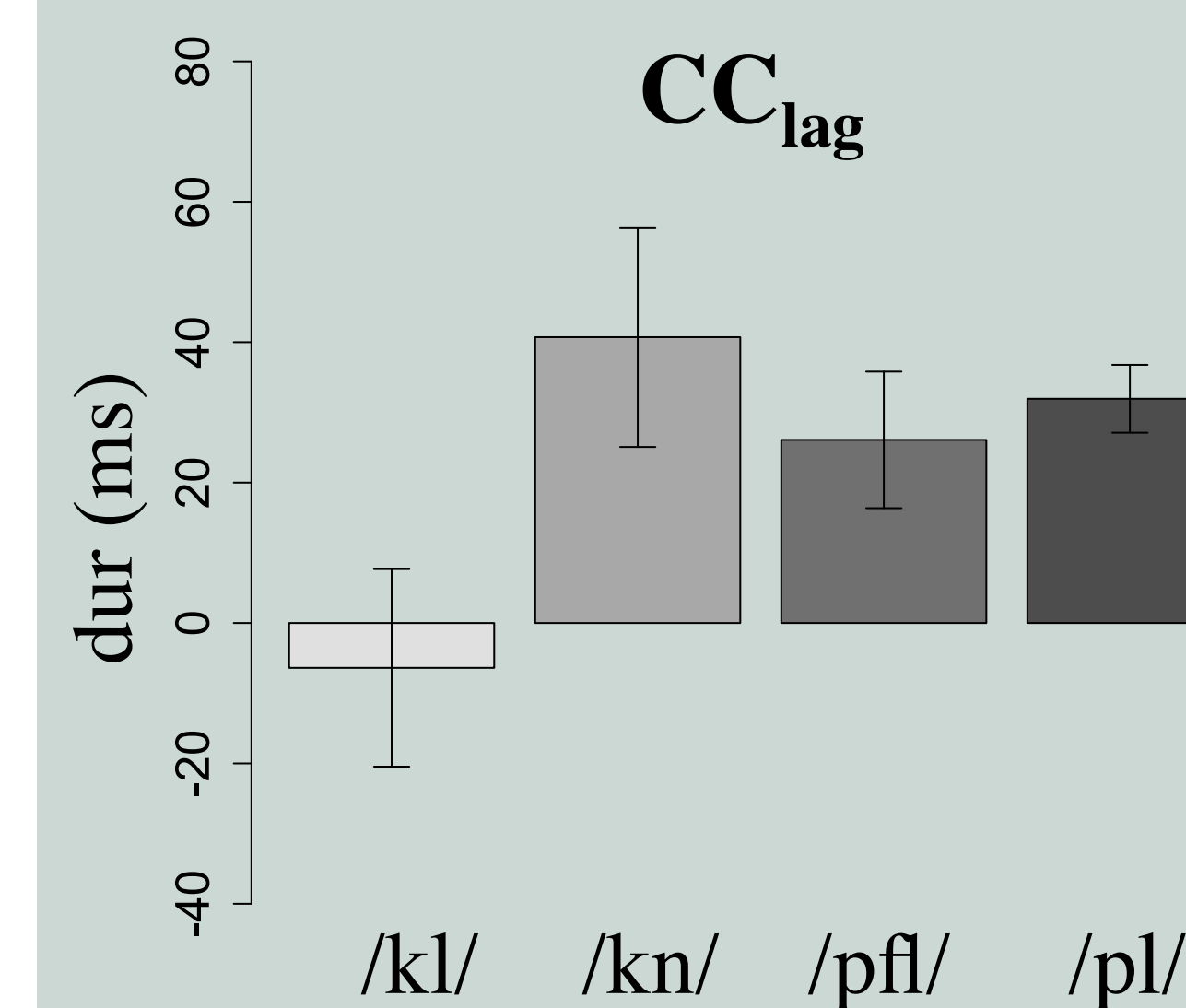
$$1. CV_{lag} = Mid_{Vowel} - PlateauOffset_{C2}$$



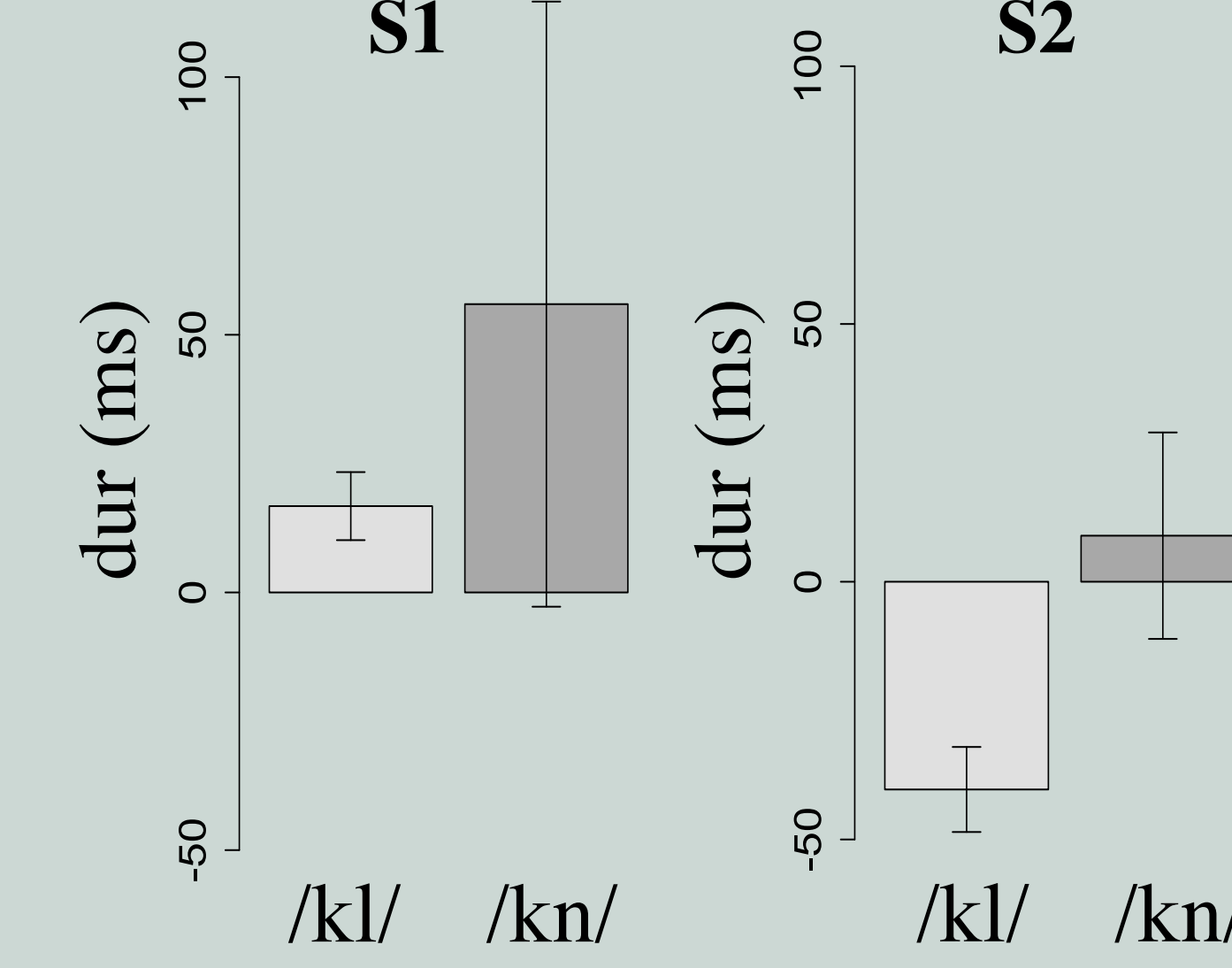
$$2. lag_{ratio} = \frac{CV_{lag}^{simplex}}{CV_{lag}^{complex}}$$

→ values above 1 = shift towards the vowel

Results

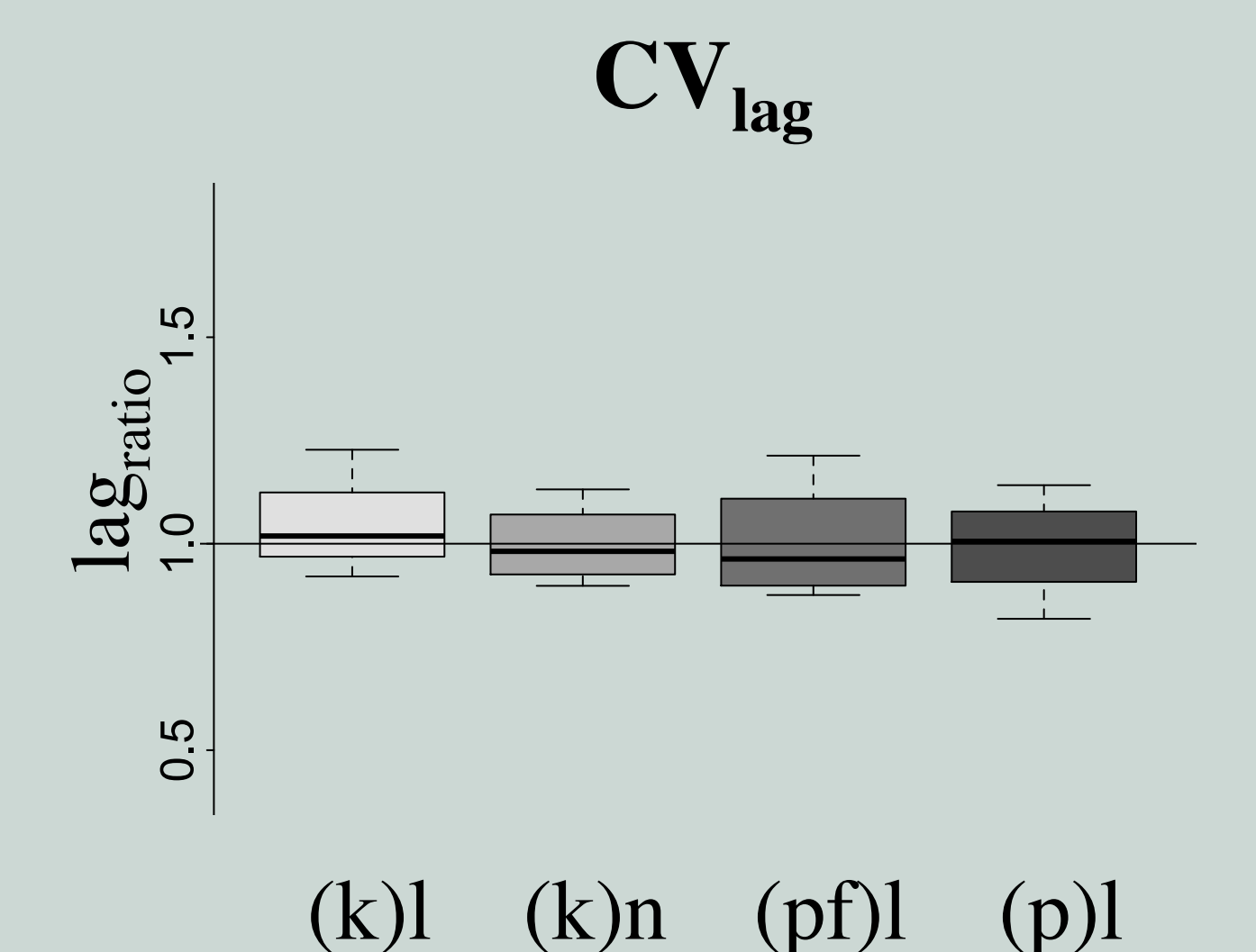


- no differences between /pfl/ and /pl/
- more overlap in /kl/ than in /kn/



- speaker-dependent differences in the degree of overlap

Simplex vs. complex onsets



- lag ratios around 1
- no shift towards the vowel in complex tokens

Discussion

Consonant-to-consonant timing:

- all children showed more overlap in /kl/ than in /kn/

→ adult-like coordination (see Bombien, 2011) ✓

Consonant-to-vowel timing:

- no shift towards the vowel in complex onsets

→ no support for globally organized onset clusters ✗

Conclusion

Children seem to acquire adult-like consonant-to-consonant timing before consonant-to-vowel timing

Acknowledgements and References

This research was supported by ERC grant no. 295573 ‘Sound change and the acquisition of speech’ to Jonathan Harrington.

Lleo, C. & Prinz, M. (1996). Consonant clusters in child phonology and the directionality of syllable structure assignment. *Journal of Child Language*, 23, 31-56. | Smit, A.B., Hand, L., Freilinger, J.J., Bernthal, J.E., & Bird, A. (1990). The Iowa articulation norms project and its Nebraska replication. *Journal of Speech and Hearing Disorders*, 55, 779-798. | Browman, C., Goldstein, L. (1988). Some notes on syllable structure in articulatory phonology. *Phonetica*, 45, 140-155.