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Influence of French Cued Speech exposure on consonant production in children with cochlear implants: an ultrasound study

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CONTEXT & AIMS

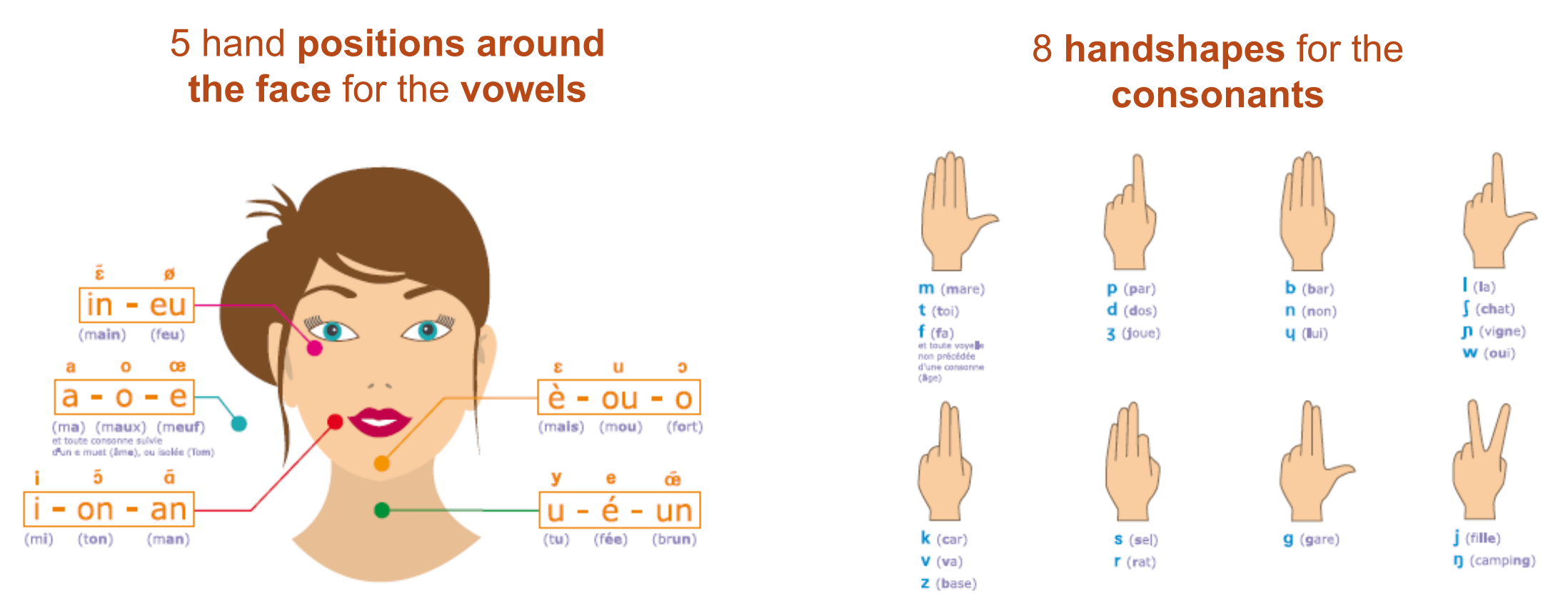
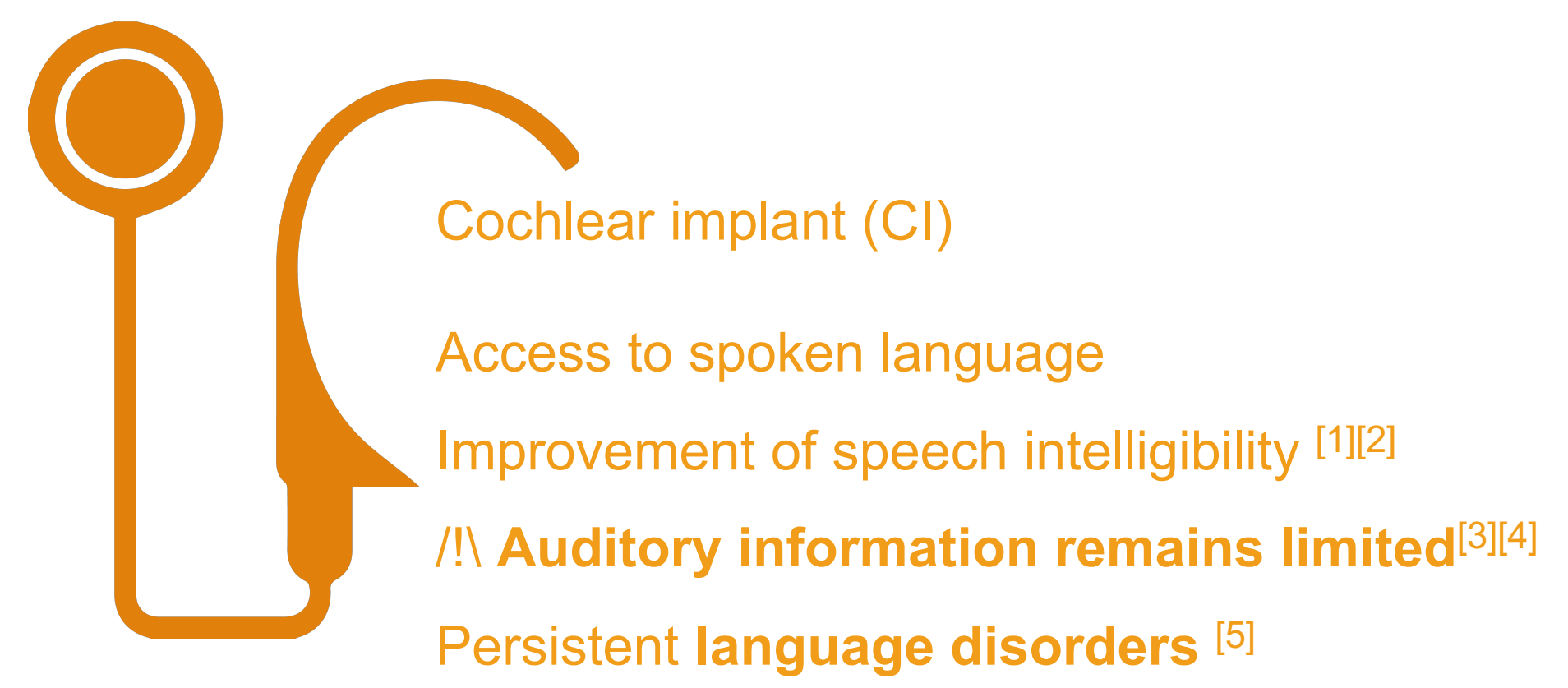


Fig. 1: Positions and handshapes of Cued French
Source: <https://alpc.asso.fr>

Research questions

- (1) **Relevance of the Mean Curvature Index (MCI) measure [9] for the characterization of stop production in children**
- (2) **Influence of Cued French on articulatory precision in children with cochlear implants: do children with cochlear implants have a better representation of speech sounds when they benefit from Cued French? Are their articulatory gestures more accurate? Are their lingual configurations comparable to those of children with typical development?**
- (3) **Impact of simultaneous speech and Cued French production on articulatory accuracy: does combining speech production with manual cues improve articulatory control in children with cochlear implants?**

METHODS & PARTICIPANTS

Task

Picture-naming task: word-initial consonants in vowel /a/ context (stops, nasals and sibilants)
Ultrasound recording of lingual movement during production with or without simultaneous Cued French gesture production

Participants

10 children from 52 to 137 months with typical hearing (mean=96;sd=25.7)
4 children with cochlear implants, aged from 89 to 121 months, exposed to Cued French and able to use Cued French during speech production (mean=103.8;sd=11.8)

Data processing and analysis: preliminary analysis restricted to stop consonants

Tongue shapes are extracted 30ms before burst using the SLURP software [11]
Tongue curvatures are characterized with the MCI measure [10]

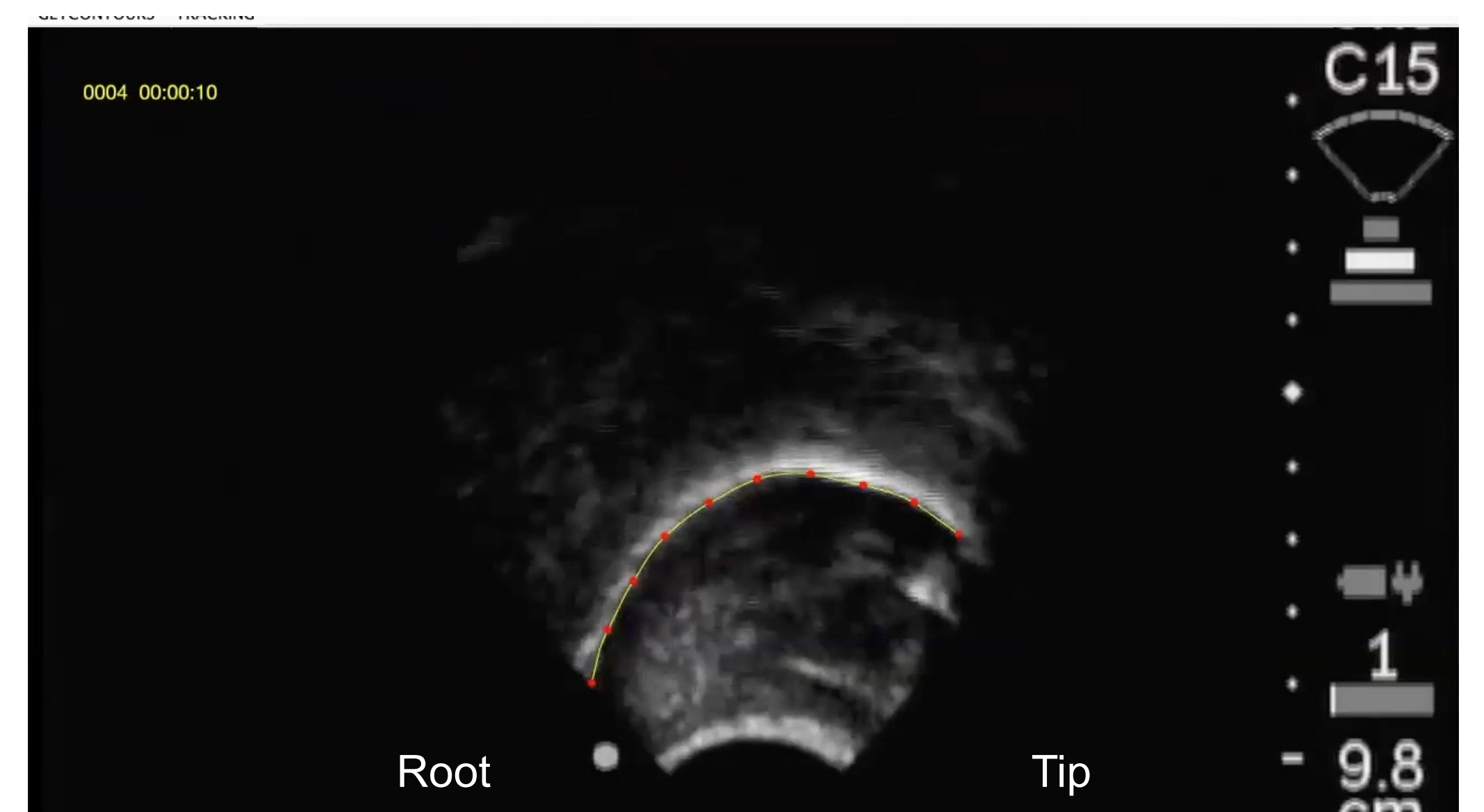


Fig. 2: SLURP software tracking tongue shapes during the production of the sentence /selekaʁot/ by a child with cochlear implants who is simultaneously cueing

PRELIMINARY RESULTS

Tongue curvature

Mean curvature index (MCI) seems well-adapted to the description of children stop production

- /t/ and /k/ are well distinguished in both normal hearing children and children with cochlear implants
- MCI measures are consistent with those of Dawson et al. (2015) [10]: higher curvature for dorsal /k/ than coronal /t/ stops

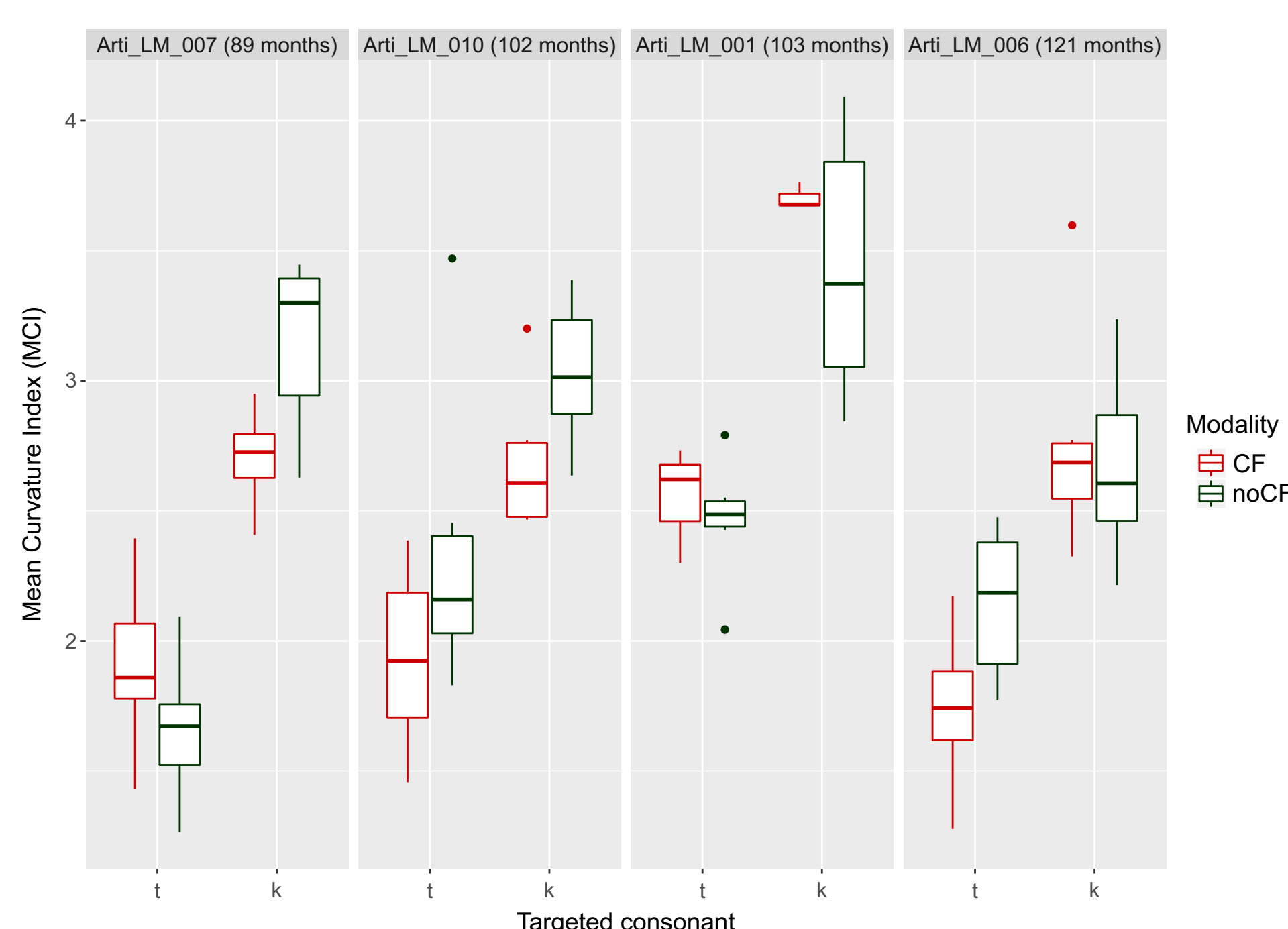


Fig. 3: Mean curvature index (MCI) for /t/ and /k/ in children with cochlear implants

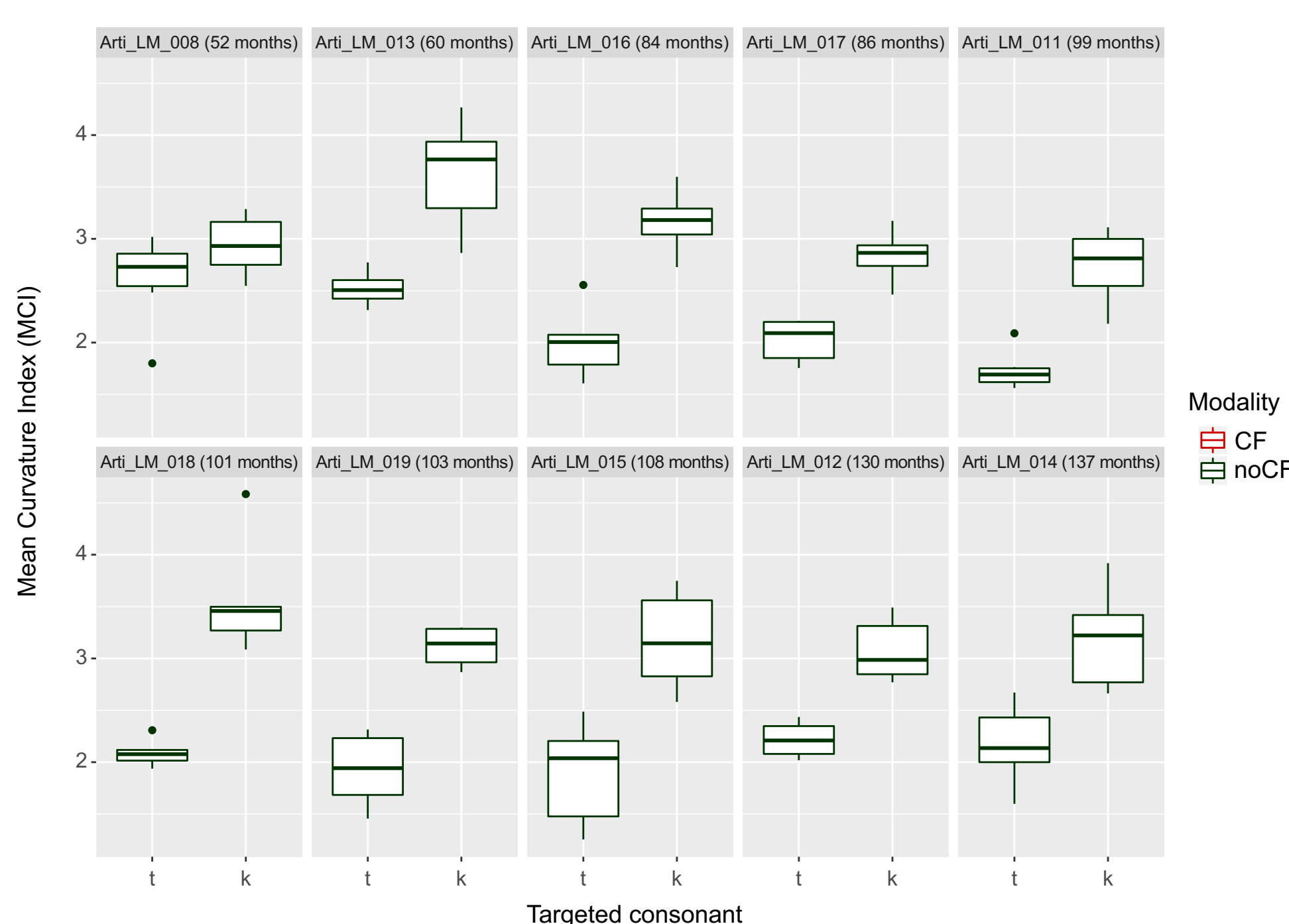


Fig. 4: Mean curvature index (MCI) for /t/ and /k/ in children with normal hearing

DISCUSSION & PERSPECTIVES

Discussion

- **MCI seems applicable** to tongue shape description during coronal and dorsal stop production in children
- Children with cochlear implants and exposed to Cued French display **similar tongue curvature patterns to their hearing peers**
- Children with cochlear implants and exposed to Cued French **produce clear articulatory distinction between dorsal and coronal stop and the addition of the hand does not interfere with their production**

Perspectives

- Comparison with children with cochlear implants and never exposed to Cued French
- Analysis of fricative (/f/ vs /s/) and nasal (/n/ vs /ɲ/) consonants: confrontation of articulatory measures with acoustic characterization for all consonants (formant transition, spectral moments, formant values)

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