



Phonological Development in Bimodal Bilingual Children Pseudoword and Pseudosign Repetition

L. Viola Kozak⁽¹⁾, Ronice Müller de Quadros⁽²⁾, Carina Rebello Cruz⁽²⁾, Aline Lemos Pizzio⁽²⁾, Deborah Chen Pichler⁽¹⁾, Diane Lillo-Martin⁽³⁾
(1)Gallaudet University, (2)Universidade Federal de Santa Catarina, (3)University of Connecticut



Bimodal Bilinguals

- Children with access to two languages in two separate modalities (signed and spoken)
 - ASL and English (American group)
 - Libras and Brazilian Portuguese (Brazilian group)
- Three kinds of bimodal bilinguals are part of this study
 - Kodas (hearing children of Deaf parents)
 - CI (implanted Deaf children of Deaf parents)
 - CI (from hearing families (Brazil only))

Age of exposure: first language

• Previous research on CI children has mostly focused on monolingual speakers, who only received exposure to their first language following implantation and activation of their cochlear implant

• These previous studies have dealt with children with *delayed L1 exposure*, and as such, they have performed below their hearing, monolingual counterparts

• A study by Mayberry (2000) on adult bilinguals found that early exposure to an L1, regardless of language family or modality, correlates to superior performance on tests of a later-acquired language

• With this in mind, we hypothesize that CI children with exposure from birth to a signed language will display higher accuracy than their CI counterparts from hearing families, and possibly perform on-par with their hearing bilingual counterparts.

Experiment: Design & Materials

- Question:** How do koda and CI children perform on tests of phonological memory?
- Goal:** Determine phonological memory performance via pseudoword and pseudosign repetition tests

- American group**
- Pseudoword test utilized stimuli from Carter, Dillon & Pisoni (2002);
 - 2-syllable, 3-syllable, and 4-syllable words (15 stimuli total)
 - Analyzed for correct overall and suprasegmental production
 - Seven participants; four koda, 3 CI children ages 5.19-7.41
 - Two koda and 3 CI children analyzed for total consonant accuracy

15 Non-words
71 Target Consonants

	Labial	Coronal	Dorsal
Stop	[pvd] 6/p/ 10/t/	4/b/ 10/d/ 3/l/	4/k/ 3/g/
Fricative	[fvd] 5/f/ 6/s/	3/v/ 2/z/	-----
Nasal	[mvd] 3/m/ 0/n/	0/ŋ/	2/n/
Liquid	[lvd] -----	9/l/ 5/j/	-----

Labials: 19
Coronals: 45
Dorsals: 7
Stops: 30
Fricatives: 14
Nasals: 13
Liquids: 14
Voiceless: 31
Voiced: 40

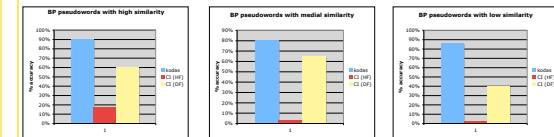
- Pseudosign stimuli comprised of 39 tokens consisting of 11 patterns of internal sign structure
- All stimuli followed permissible phonotactic patterns of ASL
- Six participants; four koda, 2 CI children; ages 5.19-6.01



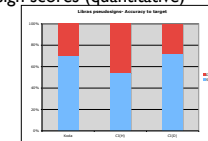
- Brazilian Group**
- Ten participants; 5 koda, 4 CI (HF), 1 CI (DF); ages 4;03-7;05
- Pseudoword test followed Santos and Bueno (2003)
- 33 stimuli, consisting of tokens with low, medial, and high similarity to actual spoken BP words
- Pseudosign test comprised of 33 tokens consisting of 11 patterns of internal sign structure
- All stimuli followed permissible phonotactic patterns of Libras
- Utilized control groups of Deaf children and adult koda

Results

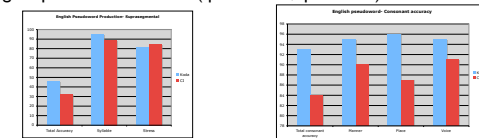
Brazilian Portuguese pseudoword scores



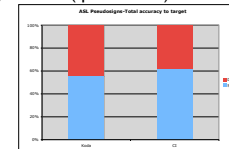
Libras pseudosign scores (quantitative)



English pseudoword scores (quantitative, qualitative)



ASL pseudosign scores (quantitative)



→ CI children from Deaf families performed more on-par with their koda counterparts

→ Findings suggest early exposure to sign language is associated with superior performance in spoken language tests

→ Despite limited exposure to Libras, the CIs from hearing families had superior performance on pseudosign tests compared to the pseudoword tests

• Next steps: Compare groups against monolingual speakers and signers; recruit and analyze more participants

References: Carter, A.K., Dillon, C.M. & Pisoni, D.B. (2002). Imitation of nonwords by hearing impaired children with cochlear implants: Suprasegmental analyses. *Clinical Linguistics & Phonetics*, 16(9), 619-638.

Mayberry, R. 2002. Linguistic ability and early language exposure. *Nature*, 417, 38.

Santos, P. H. & Bueno, O. F. A. (2003). Validation of the Brazilian Children's Test of Pseudoword Repetition in Portuguese speakers aged 4 to 10 years. *Brazilian Journal of Medical and Biological Research*, 36, 1333-1347.

Acknowledgements: We thank the Deaf consultants, research assistants, children, and their families who work with us in our research. The project described was supported by Award Number R01DC009263 from the National Institute on Deafness and Other Communication Disorders. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Deafness and Other Communication Disorders or the National Institutes of Health. Additional support was provided by a Gallaudet priority grant, and by CNPQ Grant #200031/2009-0 and #470111/2007-0. A special thank-you to Naomi Feldman and Shevian Lewis of the University of Maryland for their assistance in the creation of this poster.

Hypotheses & Predictions

	Background	Hypothesis	Predictions
Kodas	• Exposure from birth to spoken and signed languages	• Kodas will display native skills in both languages	• Kodas will perform well on both signed and spoken tests
CIs, Deaf family	• Exposure from birth to signed language, early exposure to spoken language	• CIs will display native skills in signed language, and near-native skill in spoken language	• CIs will perform with greater accuracy on pseudosign tests; • Exposure from birth to signed language will bolster spoken language performance
CIs, Hearing family	• Delayed exposure to spoken language • Limited exposure to signed language	• CIs will not display native proficiency in either language	• This group will perform with less accuracy than the other two groups • Limited exposure to sign language will result in low pseudosign accuracy