Analysis of “s” and “sh” in Children with Cochlear Implants

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Introduction

- Children with cochlear implants (CIs) exhibit delays in speech-production relative to normally hearing (NH) children.
- The contrast of /s/ and /ʃ/ may be difficult for children with CIs because the concentration of energy characteristics of /s/ is above 4000 Hz, while the filter bands in CIs are assigned to frequencies above 4000 Hz.
- The current study used transcription and spectral analysis to describe the production of /s/ and /ʃ/ by children with CIs.
- The current study compares children with CIs to NH children of similar chronological ages (CAs) and to NH children of similar hearing ages (HA).

Questions

- Do children with CI’s show less distinction between /s/ and /ʃ/ than NH children?
- Do children with CI’s show more variability in their production of /s/ and /ʃ/ than NH children?

Method

Participants

- Eighteen 4- to 9-year-old children with bilateral CIs.
- Average age of implantation: 1.8 years.
- Twenty-six 2- to 5-year-old NH children.
- Passed a hearing screening.
- All children spoke English as a first language.

The children with CIs were compared to NH children of similar chronological ages (HA). A subset of children with CIs were also compared to NH children of similar chronological ages (CA).

Results from Spectral Analysis

CI group compared to HA group

Correct production of /ʃ/ and /s/:
- CI: 1/1
- HA: 0/1

CI group compared to CA group

Correct production of /ʃ/ and /s/:
- CI: 1/1
- CA: 0/1

Results from Transcription

Accuracy

Group Correct /ʃ/ Correct /s/
CI (n=18) 66% 84%
HA 68% 78%

The children with CI’s and the HA group showed similar percent correct of /ʃ/ and /s/.

Conclusion

- The acoustic analysis revealed group-differences that did not show up in the transcription analysis.
- The centroids of /ʃ/ produced by children with CI’s were lower in frequency than those of NH children, which may be due to CI’s providing poor frequency resolution above 4000 Hz.
- Reduced variability was apparent in the centroids of /ʃ/ and /s/ produced by children with CI’s. Further research is needed to examine whether the reduced variability is related to reduced coarticulation.
- The children with CI’s exhibited a wide range of performances. Further research is needed to determine what characteristics distinguish children who perform similarly to NH children from those who do not.

Acknowledgments

This research is supported by NIH Grant R01 DC013633 (Litovsky), NIH Grant R01 DC04532, and NSF Grant BCS-0725140 (Edwards). I would like to thank the members of the Biannual Hearing and Speech Laboratory and the members of the Cross-Linguistic Phonology and Word-Learning Laboratory.