3aSC3. Prosodic characteristics of speech directed to adults and to infants with and without hearing impairment

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Introduction

- The prosody i.e., rhythm and pitch of maternal speech differs between infant-directed speech (IDS) and adult-directed speech (ADS) (Burnham et al., 2002; Fernald et al. 1989; Fernald & Mazzie 1991).
- Prior research suggests prosodic characteristics of IDS may facilitate word learning and language development (Bryant & Barret 2007; Fernald 1989; Fernald & Kuhl 1987; Thiessen et al. 2005; Trainor & Desjardin 2002).
- Children with hearing impairments (HI) tend to have language delays (e.g., Shatz et al. 2008), which could be exacerbated if the prosody of input they receive is of lower quality. Little research examined prosody of speech directed to infants with cochlear implants (CI) as compared to normal hearing (NH) infants. Kondaurova and Bergeson (2013) did not control linguistic content. Differences do exist in linguistic content directed to children with HI as compared to children with NH (Hagler & Cooper, 1993), and prosody depends on lexical content and syntactic structure (Nehru-Hughes & Turk, 1996).
- A categorical difference may exist in the distribution of linguistic-prosodic constructs associated with meaning differences (i.e., prominences and phrase boundaries) in acoustic-prosodic characteristics (i.e., fundamental frequency (F0) and timing), or both. A more detailed understanding of prosodic input to children with HI may help develop better interventions to maximize HI children’s overall language development.

Research Question:

Is there a difference in acoustic-prosodic and/or linguistic-prosodic characteristics of speech to infants with cochlear implants compared to infants with normal hearing, when syntactic structure and lexical content are controlled?

Methods

Participants

- CI Group: 12 mothers of hearing-impaired infants prior to cochlear implantation (CI) aged from 8.2 to 23.0 months (M = 15.2, SD = 4.7).
- HEM Group: 12 mothers of normally hearing infants aged from 8.6 to 23.5 months (M = 15.2, SD = 4.7).
- CAM Group: 11 mothers of infants post-CI with 2.5 to 4.0 months (M = 3.2, SD = 0.4) of hearing experience, aged from 14.3 to 24.8 months (M = 19.2, SD = 2.5).

Pre-intervention:

- CI Group: 11 mothers of infants post-CI with 2 to 6 months (M = 3.4, SD = 1.0) of hearing experience, aged from 16.3 to 26.4 months (M = 19.1, SD = 2.5).
- HEM Group: 12 mothers of normally hearing infants aged from 14.3 to 23.5 months (M = 19.2, SD = 2.5).
- CAM Group: 10 mothers of infants post-CI with 2.5 to 4.0 months (M = 3.2, SD = 0.4) of hearing experience, aged from 14.3 to 24.8 months (M = 19.2, SD = 2.5).

Materials

- Each mother read to her hearing-impaired infant who was scheduled to receive a cochlear implant (CI) at the DeVault Otologic Lab at Indiana University School of Medicine.
- Chronicling Age Match (CAM) Group: Each mother read to her HI infant matched to an infant in the CI group whose amount of pre-intervention hearing loss experience was equivalent.
- Hearing Experience Match (HEM) Group: Each mother read to her HI infant matched to an infant in the CI group whose amount of post-intervention hearing loss experience was equivalent.

Prosody Labeling:

- Two analysts coded each file separately, and their labels were combined to create a consensus transcription of prosodic attributes.

Conclusions

• When looking at acoustic-prosodic differences, mothers produced less variable F0 in speech to CI children than in speech to NH children of the same chronological age. Also, the temporal characteristics of mothers’ utterances in speech to children with CI were more similar in speech to children matched on chronologically age than amount of hearing experience.

• When looking at linguistic-prosodic differences, mothers produced a comparable strength and density of prosodic phrase boundaries in speech to children with CI’s and in speech to matched control groups. However, mothers tended to produce fewer, but stronger, prominences in their speech to children with CI’s as compared to speech to both matched control groups.

• Mothers of any group did not differ in the prominence density of linguistic-prosodic acoustic-prosodic characteristics at the pre-intervention- or 3-month intervals studied.

• Given findings that prosodic phrase boundaries and prominences assist with word segmentation and word learning in typically-developing infants (Christophe et al. 2010), our results suggest possible benefits of developing therapies aimed at increasing the density of prosodic prominences on words, and increasing the density and/or strength of prosodic phrase boundaries between words in speech directed to infants with hearing loss. These issues should be examined in future research to determine the exact clinical applications and benefits.

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