Research Questions

1. Does child-directed speech (CDS) differ between parents of children who are hard-of-hearing (HH) and parents of children who are typically developing (TD)?

2. Overall, does speech differ between:
   a. fathers of HH children vs. TD children?
   b. mothers of HH children vs. TD children?

Background

Studies of child-directed speech have shown that when talking to children, parents systematically use altered linguistic forms: simplified syntax, elevated pitch, and exaggerated duration and prosody. Notable among these is increased fundamental frequency (F0: Ferguson, 1964; Fernald, 1989, 1991; Kuhl, et al., 1997). Similarly, the Lombard effect (Lamborg, 1911; Fairbanks, 1954; Lane & Tranel, 1971) occurs when talkers alter speech production characteristics based on perceived deficiencies of the listener. Notably, increased F0 has been documented when a talker addresses a person with a hearing loss (Summers, et al., 1988; Patel & Schell, 2008). Thus, F0 increases have been documented when talking to children and when talking to a listener with a hearing loss. One study shows that mothers of young children who use cochlear implants modify F0 according to the hearing experience of the children (Bergeson, Miller, & McCune, 2006). No studies to date have looked at parental speech to children with mild-to-severe hearing loss. There is also a dearth of research on father’s CDS to children with hearing loss.

Method

Participants

TD Families
11 families with a typically developing preschooler.

HH Families
22 families with a preschooler with mild-severe hearing loss. Sample included boys and girls (mean age of ~30 months), who were hearing aids and had no other disabilities. All children were involved in a larger longitudinal study.

Materials

- Data was collected using the LENA system (Language Environment Assessment: LENA Foundation, Boulder, CO).
- Digital Language Processor (DLP)
- Automatic Speech Recognition (ASR) software
- Custom software for analysis of F0 developed in MATLAB.

Procedure & Data Analysis

Each family contributed whole-day audio recordings during a typical family day. The DLP was placed in a chest pocket at a fixed position from the child’s mouth (7-10cm). 491.2 recorded hours were collected and processed by ASR software. Recordings were automatically segmented at centisecond resolution, and statistical likelihood techniques of the ASR assigned one of about 60 a priori labels to each segment. Labels include adult male, adult female, key child vocalization, other child vocalization, overlapping vocals, noise, silence, and TV/electronic media. F0 was collected from segments labeled as parent vocalizations. Heats were used to evaluate difference between groups.

Results

1. Parents have increased F0 during CDS

- Mothers of HH children vs. TD children fail to show an effect of CDS.
- Mothers of HH children have a higher overall F0 than TD fathers and (b) mothers of HH children have a higher overall F0 than TD mothers.

Future directions

- Do other factors influence how mothers or fathers talk to their children (degree of hearing loss, age or sex of child, etc.)?
- What are the developmental consequences of asymmetry in parental CDS?
- These results and further research could inform how automatic speech recognition can be used in theoretical and applied language research.

References