Acquisition of syntactic question types in children who are hard-of-hearing

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Research Questions
1. Are there fewer overall questions addressed to hard-of-hearing or typically-developing toddlers?
2. How does the syntactic complexity of presented question type differ between hard-of-hearing and typically-developing toddlers?
3. Does exposure to questions impact the quantity of child question use?

Method
Participants
43 families: TD (n=14), HH (n=29). The sample was 58% girls (mean age = 29.6 months). The HH children were hearing aids (HEPTA = 47.8 dB HL; SD = 11.7 dB; range = 24-70 dB) and had no other known disabilities. All children but one were identified as HH early, with intervention averaging 5.1 months of age. All children were involved in a larger longitudinal study.

Materials
Audio was collected using the LENA system (Language ENvironment Analysis; LENA foundation, Boulder, CO) and custom software developed in MATLAB. A small wearable recorder collects up to 16 hours of audio.

Procedure & Data Analysis
Each of the 43 families contributed a whole-day audio recording during a typical family day. Recordings were processed by LENA automatic speech recognition (ASR) software. Recordings were automatically segmented and labeled for talker and conversational detail. For each recording, the 3 non-adjacent 5-minute segments with the greatest number of conversational turns were excised and transcribed using CLAN (MacWhinney, 2000). 645 total minutes were transcribed by two transcribers. Transcription reliability was assessed by correlations > .77 for all variables of interest (Matalone et al, 2015).

Results

Syntactic complexity of questions

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SUBJECT-AUXILIARY INVERSION</th>
<th>COMPLEXITY</th>
<th>SD</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>TD</td>
<td>YES</td>
<td>&lt;less&gt;</td>
<td>11.7 dB</td>
<td>Who is hungry for lunch at noon?</td>
</tr>
<tr>
<td>HH</td>
<td>NO</td>
<td>&lt;less&gt;</td>
<td>11.7 dB</td>
<td>Is Dorian reading a book?</td>
</tr>
</tbody>
</table>

We do not show a difference in the quantity of question type addressed to HH children compared to their TD peers, although the mean rate of exposure to each question type trended lower in the HH group. Secondly, there was no relationship between the quantity of questions produced in either group or in the pooled group.

Conclusion

On the one hand, these findings are somewhat surprising, given fairly extensive evidence in the literature documenting reduced performance in a number of linguistic domains for children with hearing loss, and in particular showing relationships between language input, language use, and outcomes in a population with hearing loss (Hattenschower et al, 2002; Hattenschower et al, 1991; Blamey, 2001; Nicholas & Geers, 2006; Ambrose et al, 2014; VanDam et al, 2015).

On the other hand, the findings reported here are from a population of children with access to modern intervention including early identification, improved technology, and advantageous educational and policy approaches to children with hearing loss. The observed lack of difference here between TD and HH children may be a positive sign of the success of intervention with children with hearing loss. At the same time, it should be noted that despite lack of statistical difference between the groups, HH trended lower on all measures observed here.

References