Findings

Introduction

Social behaviors, personal adjustment, emotion regulation, and emotion understanding can be adversely affected for children with hearing loss (Wierson et al., 2004; Yoshima-Iwasaki & DeLucatégui, 2001). These delays are influenced by speech and language ability, but other factors, such as emotion recognition and Theory of Mind (ToM), might influence development of social and emotional abilities in children with hearing loss as well.

Emotion recognition, including the ability to discriminate the various expressions of emotions in facial, gestural, and verbal display, is not well defined for children with hearing loss. ToM refers to the understanding that people have intentions, desires, knowledge, and beliefs, and that these mental states might be held within and influence one’s behavior. This understanding is important as it underlies the development of many abilities that involve social cognition, including symbolic play, role-taking ability, and referential communication (Remmel et al., 2001). Research suggests that deaf children with hearing parents and those with cochlear implants may be delayed in ToM development (Moeller, 2007; Moeller & Schick, 2006; Peterson, 2004; Peterson & Siegel, 2000; Schick et al., 2007).

Purpose

Language experiences are important for emotion recognition and ToM understanding (Dick et al., 2004; Hughes & Dunn, 1988; Moeller & Schick, 2006; Ruffman, Slade, & Crowe, 2002). Delays in auditory access to spoken communication, less-than-optimal hearing in some social situations, and reduced “over hearing” for children with hearing loss might result in language delays, but also in delayed emotion recognition and ToM. Therefore, the first objective of this project was to examine the following questions:

- How do the emotion recognition abilities of younger and older children with hearing loss compare to the abilities of younger and older children with normal hearing?
- How do the ToM abilities of younger and older children with hearing loss compare to the abilities of younger and older children with normal hearing? At approximately what age do children with and without hearing loss acquire ToM concepts?

In addition, the association between emotion recognition and ToM has not been examined in past research. Therefore, the second research objective of this project was to examine the following question:

- Is there a significant relationship between emotion recognition and ToM?

Methods

Participants

- Children with Hearing Loss
  - 4-6 years: n=11
  - 10-12 years: n=10

- Children with Normal Hearing
  - 4-6 years: n=10
  - 10-12 years: n=10

*Forty-six children were consented to participate. Two children with hearing loss were excluded based on non-verbal IQ scores and one child with hearing loss and two with normal hearing were excluded due to experimenter error.

Materials and Procedures

Emotion Recognition

- 30 emotion recognition picture plates using a set of facial images (Tottenham et al., 2009).

Theory of Mind (ToM) Task Category

- Knowledge Access
- False Belief
- Real Apparent Emotion

Findings

Figure 1. Sample of page from emotion recognition task book.

Table 1. Percent of children with hearing loss and normal hearing who mastered the emotion recognition task for children to begin to successfully complete ToM tasks.

<table>
<thead>
<tr>
<th>Age</th>
<th>Children with Hearing Loss</th>
<th>Children with Normal Hearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-6 years</td>
<td>20% 25% 100% 100% 100%</td>
<td>25% 25% 100% 100% 100%</td>
</tr>
<tr>
<td>10-12 years</td>
<td>20% 25% 100% 100% 100%</td>
<td>20% 25% 100% 100% 100%</td>
</tr>
</tbody>
</table>

Figure 2. Example of one ToM task, the test of knowledge access. At the beginning of the test of knowledge access, the contents of a box are unknown to children. After children respond to the question “What do you know what is inside of my toy?” the contents are revealed.

Figure 3. Emotion recognition and total ToM scores for individual children fit to a logistic regression model. yHL=younger children with hearing loss, yNH=younger children with normal hearing, oHL=older children with hearing loss, oNH=older children with normal hearing.

- The relationship between emotion recognition and ToM was not linear.
- The data were fit to a logistic regression model, R2=0.84, R2=0.71. Adjusted R2=0.68, F(3,39)=25.43, p<0.01.

This model suggests a 67% accuracy rate is needed for the emotion recognition task in order for children to begin to successfully complete ToM tasks.

Conclusions

- On average, children with hearing loss had poorer emotion recognition scores than children with normal hearing and younger children had poorer emotion recognition scores than older children.
- Younger children with hearing loss had poorer emotion recognition scores than younger children with normal hearing.
- Emotion recognition was not significantly correlated with language for children included in this study; however, children with higher language scores tended to have higher ToM scores.
- Children with hearing loss demonstrated mastery of ToM tasks at later ages than children with normal hearing, but did so in the same sequence.
- A proficiently rate of 67% was needed for performance on the emotion recognition task for children to begin to successfully complete ToM tasks.

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Selected References