

# Theory of Mind and Emotion Recognition in Children with Hearing Loss

## Introduction

Social behaviors, personal adjustment, emotion regulation, and emotion understanding can be adversely affected for children with hearing loss (Wake et al., 2004; Yoshinaga-Itano & deUzcategui, 2001). These delays are influenced by speech and language ability, but other factors, such as emotion recognition and 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 different from their own and influence one's behavior. This understanding underlies the development of many abilities that involve social cognition, including symbolic play, role-taking ability, and referential communication (Remmel et al., 2001). Deaf children with hearing parents and those with cochlear implants are delayed in ToM development (Moeller, 2007; Moeller & Schick, 2006; Peterson, 2004; Peterson & Siegel, 2000; Schick et al., 2007).

## Purpose

This study proposes that delays in emotion recognition and ToM are two aspects of human development that underlie the social deficits in children with hearing loss. The primary research objective of the current project is to control for variance in performance due to language ability and examine the following primary question:

- Is there a relationship between emotion recognition and ToM beyond that which can be explained by language ability?

Emotion recognition ability, one factor involved in social development, is not well defined in children with hearing loss. A second research question is:

- How do the emotion recognition abilities children with hearing loss and children with normal hearing compare?

Historically, children who are deaf or hard of hearing have been shown to have delayed or impaired social development compared to children with normal hearing (Cambra, 2005; Most, 2007; Wake, et al., 2004; Yoshinaga-Itano & Abdala de Uzcategui, 2001). Current data regarding the psychosocial development of children are needed. Therefore, additional research questions for this project are:

- What is the current state of social and emotional development in children with hearing loss?

## Methods

### Participants

	Children with Hearing Loss (≥ 41 dB HL PTA bilaterally)	Children with Normal Hearing (≤ 15 dB HL PTA bilaterally)
4-6 years	n=7	n=9
10-12 years	N=2	n=5

Recruitment Goal = 10 children in each group.

### Materials and Procedures

#### Emotion Recognition

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

#### Theory of Mind (ToM)

- Knowledge Access (KA)
- False-Belief (FB)
- Real-Apparent Emotion (RA)

#### Language

- Oral and Written Language Scales (OWLS)
- Elicited Complex Syntax Task

#### Social and Emotional Behaviors

- Strengths and Difficulties questionnaire (SDQ)



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



Figure 2. Example of a test of knowledge access. The contents of a box are unknown to children at the beginning of a test of knowledge access. After children respond to the question, "Do you know what is inside of my box?", the contents are revealed.

## Preliminary Findings

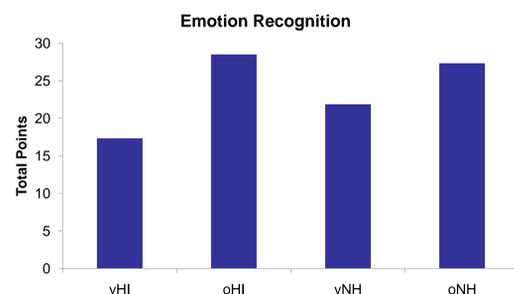


Figure 3. Emotion Recognition scores for children with hearing loss and children with normal hearing.

- Younger children with hearing loss identified fewer emotions correctly than older children with hearing loss,  $t(6)=-4.84$ ,  $p<0.05$ .
- Younger children with normal hearing identified fewer emotions correctly than older children with normal hearing,  $t(12)=-2.65$ ,  $p<0.05$ .
- Younger children with hearing loss identified fewer emotions correctly than younger children with normal hearing,  $t(13)=2.61$ ,  $p<0.05$ .

## Preliminary Findings

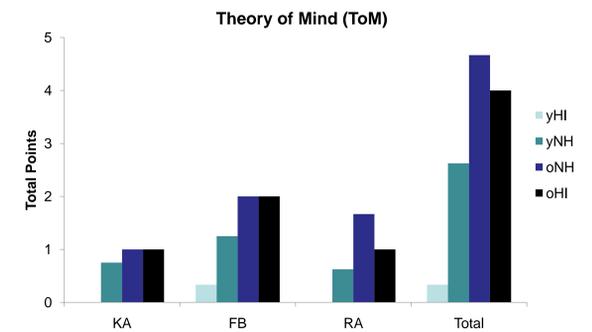


Figure 4. Theory of Mind scores for children with hearing loss and children with normal hearing.

- Younger children with hearing loss scored lower than older children with hearing loss for Total ToM score,  $t(6)=-4.76$ ,  $p<0.05$ .
- Younger children with normal hearing scored lower than older children with normal hearing for Total ToM score,  $t(12)=-2.26$ ,  $p<0.05$ .
- Younger children with hearing loss scored lower than younger children with normal hearing for Total ToM score,  $t(13)=3.18$ ,  $p<0.05$ .

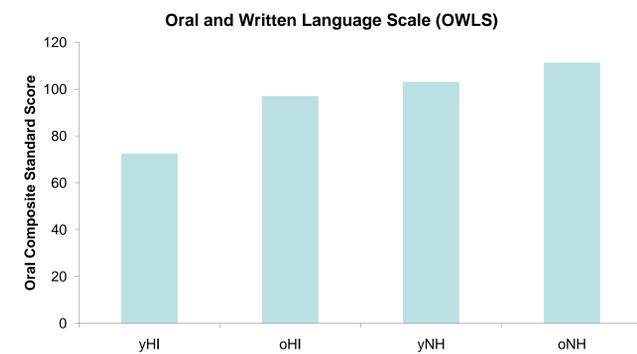


Figure 5. OWLS scores for children with hearing loss and children with normal hearing.

- Younger children with hearing loss scored lower than older children with hearing loss for OWLS oral composite standard score,  $t(6)=-5.37$ ,  $p<0.05$ .
- Younger children with normal hearing scored lower than older children with normal hearing for OWLS oral composite standard score,  $t(12)=-2.10$ ,  $p<0.05$ .
- Younger children with hearing loss scored lower than younger children with normal hearing for OWLS oral composite standard score,  $t(13)=5.96$ ,  $p<0.05$ .

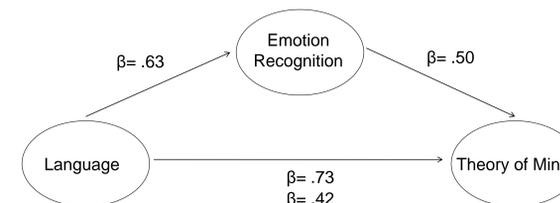


Figure 6. Results from regressions testing the hypothesis that emotion recognition mediates the effect of language on ToM.

- OWLS score significantly predicts emotion recognition,  $R^2=.35$ ,  $\beta=.63$ ,  $p<0.05$  and Theory of Mind score,  $R^2=.53$ ,  $\beta=.73$ ,  $p<0.05$ .
- Emotion recognition accounts for significant variance in Theory of Mind score  $\Delta R^2=.15$ ,  $\beta=.50$ ,  $p<0.05$  after variance due to OWLS scores has been removed,  $R^2=.53$ ,  $\beta=.42$ ,  $p<0.05$ .

## Conclusions

Preliminary findings suggest:

- Younger children score lower on a test of emotion recognition, Theory of Mind tasks, and a standardized language test than older children in both groups (i.e. hearing loss and normal hearing).
- Standardized language scores predict performance on tasks of emotion recognition and Theory of Mind. Further, emotion recognition predicts variance in Theory of Mind ability beyond that which can be explained by language ability alone.
- Younger children with hearing loss were reported to have greater emotional stress than younger children with normal hearing,  $t(12)=0.62$ ,  $p<0.05$ .
- Older children with hearing loss were reported to have greater overall stress and behavioral difficulty than older children with normal hearing,  $t(5)=-2.69$ ,  $p<0.05$ ,  $t(5)=-2.88$ ,  $p<0.05$ .
- Data collection for this study is ongoing.

## Acknowledgements

This publication was made possible in part by the U.S. Department of Education (CFDA 84.325D), Grant Number T73MC00050 from HRSA, Maternal and Child Health Bureau, and the Department of Hearing and Speech Sciences at Vanderbilt University. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the HRSA or the Bureau of Maternal and Child Health.

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