Mothers’ Use of Internal State Words with Toddlers with and without Hearing Loss during Natural Play

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NORTHERN ILLINOIS UNIVERSITY

Mothers’ Use of Internal State Words with Toddlers with and without Hearing Loss during Natural Play

A Capstone Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Honors

College of Health and Human Sciences

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DeKalb, Illinois

May 13, 2023
Abstract

This study examined differences between mothers’ use of internal state words with toddlers with hearing loss and toddlers without hearing loss. Mothers’ speech to toddlers without hearing loss and mothers of toddlers with hearing loss while engaging in natural play was transcribed and analyzed using Systematic Analysis of Language Transcripts (SALT) software. Twelve toddlers with hearing loss were age matched with 12 toddlers without hearing loss and were also language matched with twelve additional toddlers without hearing loss to create three participant groups- hearing loss, age matched, and MLU matched controls. Mothers’ internal state words were identified and categorized by type as perception, volition, disposition, and cognition. There was no significant difference between the frequency or proportion of mothers' internal state words between toddlers with hearing loss and toddlers without hearing loss. Across all three groups, mothers used fewer disposition and more cognition words.

Introduction

Mothers’ use of internal state words changes as toddlers get older and their use of internal state words is linked to toddlers’ use of internal state words (Olson & Masur, 2020; Razuri, Howard, Purvis, & Cross, 2017). At the beginning of toddlers’ second year of life, mothers use perception and volition words but begin to introduce disposition and cognition words by 21 months of age. Importantly, mothers' use of different kinds of internal state words is related to their toddlers’ use of those words and is related to their later social emotional understanding. For example, Farkas, del Real, Strasser, Alvarez, Santalices, & Sieverson (2018) found that mothers’ use of internal state words correlated to their children’s socioemotional skills at 30 months of age. Taumoepeau and Ruffman (2006) also found that mothers' use of desire language correlated
to their 15-month-olds later mental state language and performance on emotional understanding tasks. Finally, in a study of 43 mothers, Symons, Fossum, and Collins (2006) found mothers’ affect and cognition words to their 2-year-olds as they played was related to how often their toddlers used cognition words during play. Mothers’ desire words were also related to their toddlers’ use of desire words during play.

Less is known about how mothers use internal state words with toddlers who have hearing loss. There is evidence from one study that mothers use internal state words differently with toddlers who have hearing loss when they look at pictures of emotional and mentalized scenarios than they do with toddlers who do not have hearing loss (Morgan, Meristo, Mann, Hjelmquist, Surian, Siegal, 2014). Morgan, et al. (2014) conducted a study that observed twenty mothers from the United Kingdom and Sweden to determine how mothers used internal state words and how they participated in conversational turn taking with their hearing and d/Deaf infants between 17 and 35 months of age. Morgan and colleagues coded disposition, cognition, and volition words but did not code perception words. The study included 10 infants without hearing loss (four female) and 10 d/Deaf infants (six female) whose parents were all hearing. Of the ten d/Deaf infants, 5 used cochlear implants and five used hearing aids. The children’s vocabulary was assessed with the British Sign Language (BSL) Communicative Development Inventory (Woolfe, Herman, Roy, & Woll, 2010) and the English MacArthur Bates Communicative Development Inventories (CDI) (Fenson, Marchman, Thal, Dale, Reznick & Bates, 2006). The infants’ understood an average of 195.43 words on the BSL CDI and 236.42 words on the English CDI. Infants produced an average of 112.50 words in BSL and 144.89 words from the English CDI. The study concluded that mothers of hearing toddlers used more cognitive words when looking at pictures of emotional pictures than the mothers of toddlers with hearing loss. However, it is not known if the differences in mothers’ use of cognition words were
a function of differences in toddlers’ language levels or their hearing loss. Mothers could have adjusted their speech due to the child's language level and not because of the hearing loss. It also is not known how mothers of toddlers with hearing loss use perception words because Morgan and colleagues (2014) did not include them, and it is not known how mothers provide internal state words to toddlers with hearing loss in natural play. Therefore, the current study examined the differences between mothers’ use of four categories of internal state words (perception, volition, disposition, cognition) with toddlers with hearing loss and children without hearing loss who were matched for age and language level during 10 minutes of free play. The current study asked the following research questions

Do mothers of toddlers with hearing loss use internal state words differently than mothers of children without hearing loss who are age matched compared to children who are language matched?

Do mothers of toddlers without hearing loss use internal state words differently than mothers of age matched toddlers with hearing loss?

It was predicted that the mothers of toddlers with hearing loss would use fewer overall internal state words than mothers of toddlers without hearing loss who are age matched but would use the same amount of internal state words as mothers of toddler without hearing loss who are language matched. It was predicted that mothers of toddlers with hearing loss would use more volition and perception words while the mothers of toddlers without hearing loss would use more disposition and cognition words than the age matched control group.

Method

Participants
Twelve toddlers with profound sensorineural hearing loss were age matched and language matched with 24 toddlers without hearing loss. Mean length of utterance (MLU) was calculated for the toddlers and was used to language match toddlers with and without hearing loss to create two control groups- an age control and a MLU control group. See Table 1. Mothers reported the following ethnicities: 2 African American, 2 Asian, 1 mixed, 1 Asian/African American, and 28 white.

Table 1.

**Participants**

<table>
<thead>
<tr>
<th></th>
<th>Hearing loss</th>
<th>Age control</th>
<th>MLU control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td>7 boys</td>
<td>7 boys</td>
<td>6 boys</td>
</tr>
<tr>
<td><strong>Years (mean and range)</strong></td>
<td>3.18, 2.5-3.92</td>
<td>3.15, 1.7-4.7</td>
<td>2.97, 2.42-3.75</td>
</tr>
<tr>
<td><strong>MLU (mean, s.d., and range)</strong></td>
<td>2.18 (.79), 1.51-3.64</td>
<td>3.18 (.85), 1.69-4.5</td>
<td>2.33 (.70), 1.67-3.6</td>
</tr>
</tbody>
</table>

**Procedures**

This study used an existing dataset of mothers’ speech to their 2- to 3-year-old toddlers as they played with a standard toy set for 15 minutes. The toy set included animal figurines, little people and cars, a stuffed animal bear, and a plastic feeding set (plates, bottles, spoon, forks, and teapot). Mothers’ speech was transcribed with Systematic Analysis of Language Transcripts software (SALT) as part of a previous study (Miller & Iglesias, 2015). For this study SALT was
used to identify mothers’ internal state words and categorize them by type as perception (e.g., see, hear), volition (e.g., want, need desire), disposition (e.g., like, fun), and cognition (e.g., know, think) (Bretherton & Beeghly, 1982, Olson & Masur, 2020, Slaughter, Peterson, Carpenter, 2009) (see Appendix A for a list of words used in the search). The proportion of mother’s internal state words in each category was calculated for each group by dividing the number of mental state words in a specific category by the total number of mental state words.

Results

Frequencies of mothers’ internal state words

To assess mothers’ frequency of internal state words across groups and across categories, a 3 (group: hearing loss, age matched without hearing loss, language matched without hearing loss) x 4 (internal state category: perception, volition, disposition, cognition) mixed measures analysis of variance was completed. It was predicted that the mothers of toddlers without hearing loss would use more overall internal state words than the mothers of toddlers with hearing loss, however, analyses did not support that hypothesis.

There was no main effect of group, and no interaction of group and internal state word category for frequencies of mothers’ internal state words (main effect of group, $F(3,33) = .803, p = .457$; group by category interaction, $F(6, 99) = .59, p=.74$) Mothers in the three groups: hearing loss, age matched, and MLU matched used internal states words with similar frequencies. Analyses did reveal a main effect of category, $F(3,99) = 22.64, p < .001$. Mothers used fewer disposition words than all other categories ($p=.01; p<.000; p<.000$). Mothers also used fewer perception words than cognition words ($p=.001$). Mothers use of cognition and volition words did not significantly vary ($p=1$). See Figure 1.

Figure 1
To assess mothers’ proportions of internal state words across groups and across categories, a 3 (group: hearing loss, age matched without hearing loss, language matched without hearing loss) x 4 (internal state category: perception, volition, disposition, cognition) mixed measures analysis of variance was completed. It was predicted that mothers of toddlers with hearing loss would use more volition and perception words than disposition and cognition words. It was also predicted that mothers of toddlers without hearing loss would use more disposition and cognition words than volition and perception.

Analyses revealed no significant differences in the proportion of internal state words mothers used by group and no significant interaction of group by internal state word category, main effect of group, $F(1,33) = .8, p = .46$; group by category interaction, $F(6, 99) = .59, p = .742$. Analyses did reveal a significant main effect of internal state word category for proportions
of mothers’ internal state words, main effect of category, \( F(3,99) = 22.64, p < .000 \). Pairwise comparisons revealed that the proportion of internal state words that were disposition words was lower than all other categories (all \( ps < .000 \)). Mothers also used a lower proportion of perception words than cognition words (\( p < .000 \)). The proportion of cognition and volition words did not significantly vary (\( p=1 \)).

**Figure 2**

*Proportion of Mothers’ Internal State Words by Group and Category*

**Discussion**

The findings of this study were not what was predicted. There wasn’t a significant difference in mothers’ use of internal state words between the mothers of children without hearing loss and the mothers of children with hearing loss. Analyses were not significant for frequencies or for
proportions of mothers’ internal state words. This contrasts with a previous study reporting that mothers of children without hearing loss used more cognitive words than mothers of children with hearing loss (Morgan et al., 2014). This could be because the current study used a natural play sample and Morgan and colleagues (2014) elicited maternal language with a picture book designed to elicit emotion words. Other studies have found that the context of the interaction influences how mothers use internal state words (Beeghly, Bretherton, Mervis, 1986; Drummond, Paul, Waugh, Hammond, Brownell, 2014; Farkas et al., 2018). Findings in the current study also contrast with findings from a study conducted by Ambrose, Walker, Unflat-Berry, Lauren, Oleson, Jacob, Moeller, Mary (2015). That study concluded that mothers of toddlers with hearing loss used fewer overall words, while the current study concluded that mothers of toddlers with hearing loss used similar amounts of internal state words as mothers of toddlers without hearing loss. There were no previous studies that looked at mothers’ use of perception words in toddlers with hearing loss.

Limitations

One limitation to the current study is that the toddlers with hearing loss had wide variation in degree of hearing loss. This is a limitation because while we expected to see variability in mothers’ language to their d/Deaf toddlers, mothers’ language to their toddlers with mild hearing loss may be similar to speech to toddlers without hearing loss. In addition, the variety of internal state words mothers used was not examined, only the quantity of internal state words was considered. If the variety of internal state words was examined, there may have been a difference in the number of different internal state words mothers used. For example, Olson & Masur (2019) found that the types of internal state words mothers used predicted infant internal state vocabulary size not the total number of internal state words. Another limitation is that the toddlers with hearing loss varied greatly in age. A sample including toddlers with hearing loss at
similar ages may yield results that differ from the current study. It is possible that mothers consider their toddlers' overall cognitive and emotional development as they introduce internal state words. Finally, there also might have been a main effect of group if there was a larger sample size. Future studies should use a larger sample size, include toddlers with hearing loss at similar ages, and include toddlers with similar degrees of hearing loss.

References

https://doi.org/10.1097/aud.0000000000000209


https://doi.org/10.1111/j.2044-835x.1986.tb01016.x


Drummond J, Paul EF, Waugh WE, Hammond SI and Brownell CA (2014). Here, there and everywhere: emotion and mental state talk in different social contexts predicts empathic


Appendix A

Internal State Words Included in SALT Search
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<thead>
<tr>
<th>Afraid</th>
<th>Grumpy</th>
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Expecting
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Fascinating
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Fearful
Feel
Feels
Felt
feeling
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Figured
Figuring
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Focused
Focus
Focusing
focuses
Forget
Forgetting
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Forgot
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Frustrated
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Frustrates
frustrate
fun
Funny
love
loves
loved
loving
Mad
mean
Mind
minds
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Missing
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Realize
Realizes
Realized
realizing
Recall