4-24-2023

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

Sarah D. Screnock
Northern Illinois University, z1862054@students.niu.edu

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

By Sarah Screnock

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

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

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

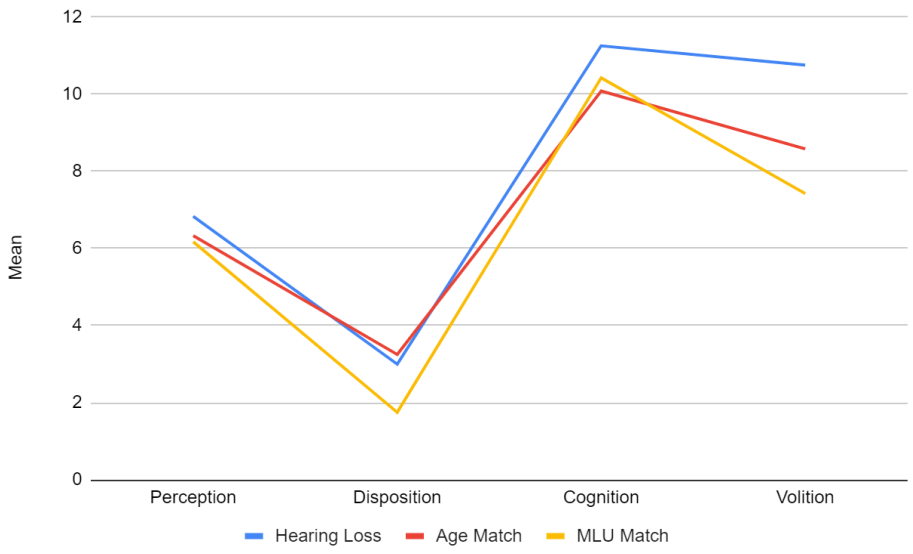
Frequencies of mothers' internal state words

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

Frequency of Mothers' Internal State Words by Group and Category



Proportions of mother's internal state words

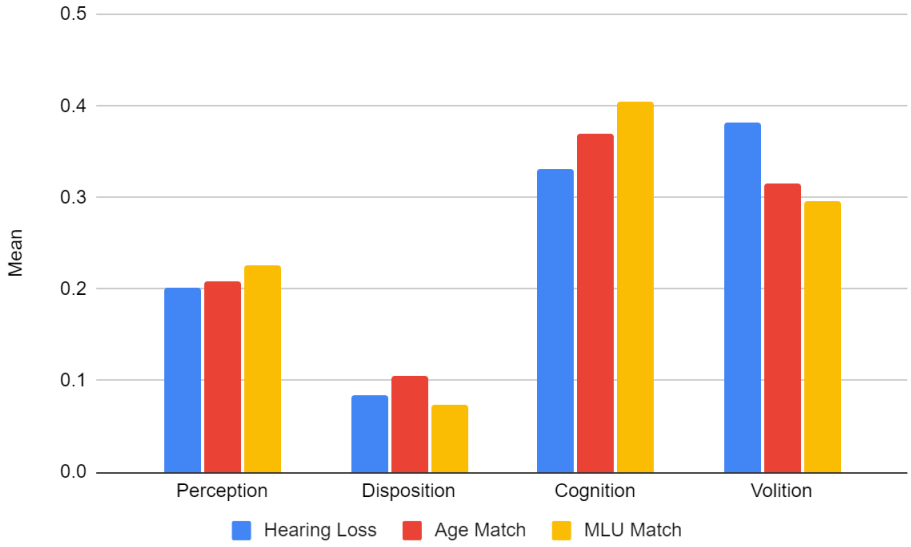
To assess mothers' proportions of internal state words across groups and across categories, a 3 (group: hearing loss, age matched without hearing loss, language matched without hearing loss) x4 (internal state category: perception, volition, disposition, cognition) mixed measures analysis of variance 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

Ambrose, S. E., Walker, E. A., Unflat-Berry, L. M., Oleson, J. J., & Moeller, M. P. (2015). Quantity and quality of caregivers' linguistic input to 18-month and 3-year-old children who are hard of hearing. *Ear & Hearing*, *36*(Supplement 1). https://doi.org/10.1097/aud.0000000000000209

Becker Razuri, E., Hiles Howard, A. R., Purvis, K. B., & Cross, D. R. (2017). Mental State Language Development: The longitudinal roles of attachment and maternal language. *Infant Mental Health Journal*, *38*(3), 329–342. https://doi.org/10.1002/imhj.21638

Beeghly, M., Bretherton, I., & Mervis, C. B. (1986). Mothers' internal state language to toddlers. *British Journal of Developmental Psychology*, *4*(3), 247–261. https://doi.org/10.1111/j.2044-835x.1986.tb01016.x

Bretherton, I., & Beeghly, M. (1982). Talking about internal states: The acquisition of an explicit theory of mind. *Developmental psychology*, *18*(6), 906-921.

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

helping in toddlers. *Frontiers in Psychology. **5**:361*. doi: 10.3389/fpsyg. 2014.00361

Farkas, C., del Real, M. T., Strasser, K., Álvarez, C., Santelices, M. P., & Sieverson, C. (2018). Maternal mental state language during storytelling versus free-play contexts and its relation to child language and socioemotional outcomes at 12 and 30 months of age. *Cognitive Development, 47*, 181–197. https://doi.org/10.1016/j.cogdev.2018.06.009

Fenson, L., Marchman, V. A., Thal, D. J., Dale, P. S., Reznick, J. S., & Bates, E. (2006). *MacArthur-Bates Communicative Development Inventories, Second Edition (CDIs)* [Database record]. APA PsycTests.

Olson, J. & Masur, E.F. (2020) Mothers' talk about perceptions, wants, feelings, and thoughts during play: General or specific relations to infants' internal state vocabularies and gender? *Language Learning and Development*, 16:2, 196-209, DOI: 10.1080/15475441.2020.1722129

Miller, J. & Iglesias, A. (2020). Systematic Analysis of Language Transcripts (SALT), Version 20 [Computer Software]. Madison, WI: SALT Software, LLC.

Morgan, G., Meristo, M., Mann, W., Hjelmquist, E., Surian, L., & Siegal, M. (2014). Mental state language and quality of conversational experience in deaf and hearing children. *Cognitive Development, 29,* 41-49.

Slaughter, V., Peterson, C. C., & Carpenter, M. (2009). Maternal mental state talk and infants' early gestural communication. *Journal of Child Language*, *36*(5), 1053-1074.

Symons, D. K., Fossum, K.-L. M., & Collins, T. B. K. (2006). A longitudinal study of belief and Desire State discourse during mother-child play and later false belief understanding. *Social Development*, *15*(4), 676–692. https://doi.org/10.1111/j.1467-9507.2006.00364.x

Taumoepeau, M., & Ruffman, T. (2006). Mother and infant talk about mental states relates to desire language and emotion understanding. *Child development*, *77*(2), 465-481.

Appendix A

Internal State Words Included in SALT Search

Afraid
Agree
Agreed
agrees
Angry
annoy
Annoyed
Annoying
annoys
Anxious
Asleep
Awake
Believe
Believed
Believing
believes
Bored
boring
Confused
Confusing
Confuses
confuse
Cross
Curious
Decide
Decided
Decides
deciding
Desire
Desires
Desired
desiring
Difficult
Disgusted
Disgusting
Disgusts
disgust
Dislike
Dislikes
disliked
Distressed
distressing
Dream
Dreamed
Dreams
dreaming
Enjoy
Enjoyed

Grumpy
Guess
Guessed
Guessing
Guesses
Happy
Hate
Hated
Hates
hating
hear
heard
hearing
hears
Hope
Hoped
Hoping
hopes
hungry

Hurt
Hurts
hurting
Idea
Imagine
Imagined
Imagining
imagines
Interested
Interests
Interesting
interest
knew
Know
Knowing
knows
Learn
Learnt
Learning
learns
like
likes
liked
liking
Listen
Listens
Listened
listening

Recalling
Recalls
recalled
Reckon
Recognize
Recognized
Recognizing
recognizes
Remember
Remembered
Remembering
remembers
Remind
Reminded
Reminding
reminds
Sad
Scared
Scares
scare
scaring
Scary
See
Saw
Seeing
sees
Serious
Shocked
Shock
shocks
Shy
Sick
Sleepy
Smell
Sorry
Startled
Stressed
Suppose
Sure
Surprised
Surprises
Surprising
surprise
Taste
Tasting
Tastes
tasted
Tasty

Enjoys
enjoying
Excited
Excites
excite
Expect
Expected
Expecting
expects
Fascinated
Fascinating
Fascinate
fascinates
Favorite
Fearful
Feel
Feels
Felt
feeling
Figure
Figured
Figuring
figures
Focused
Focus
Focusing
focuses
Forget
Forgetting
forgets
Forgot
Frightened
Frightening
Frightens
frighten
Frustrated
Frustrating
Frustrates
frustrate
fun
Funny
love
loves
loved
loving
Mad
mean
Mind
minds
Miserable
Missed
Missing
Miss
misses
Mood
Naughty
Need
Needs
Needing
needed
Nice
notice
noticed
notices
noticing
Overwhelmed
Pleased
Prefer
Prefers
Preferred
preferring
pretend
pretending
pretends
pretended
proud
Real
Realize
Realizes
Realized
realizing
Recall
Tease
Teasing
Teased
teases
Think
Thinking
thinks
Thirsty
Thought
Tired
Uncertain
Understand
Understands
Understood
understanding
Upset
Want
Wants
Wanted
wanting
wanna
Watch
Watching
Watches
watched
wish
wished
wishes
wishing
Wonder
Wonders
Wondering
wondered
Worry
Worrying
Worries
worried
yucky