Exploring the Relationship Between Mental-State Language and Children's Early Vocabulary Development

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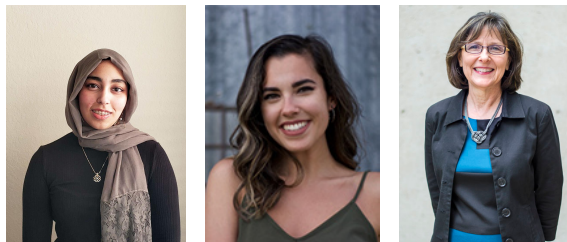
PRESENTED AT:

INTRODUCTION

- Mental state (MS) language is defined as talk referring to one's internal states, including emotions, desires, and beliefs.

- Infant's exposure to MS language is related to their understanding of others as communicative partners with mental states and is also related to children's production of MS language.
  - Mothers' referencing of mental-states with 6- and 9-month-old infants predicts infants' joint attention[2] and gesture use[3].
  - Infant's joint attention skills are also linked to later language development[4], as well as to their production of MS words at 24 and 36 months[12].
  - Mothers' production of MS terms with their 2-year-olds is also related to toddlers' production of MS terms at 3 years[5].

- Children's production of MS language begins and increases between 18 months and 4 years, with younger children producing emotion words (e.g., love, like, mad), while desire words (e.g., want, need) increase from 18-36 months and belief terms (e.g., think, know) increase later [6, 13].

RESEARCH QUESTIONS

1. Is mothers' mental-state language use with their 5-month-olds related to children's production of mental-state language at 24 months or to children's vocabulary size at 24 months?

2. Is there a relationship between children's MS vocabulary and total vocabulary at 24 months?

METHODS

Lab Visit

- Mothers and typically-developing 5-month-old infants (n=31) engaged in a 3-minute free play interaction during a lab visit. Various toys and books were available for the dyad.
- When infants were 24 months old, the Words and Sentences version of the MacArthur-Bates Communicative Development Inventory (CDI) was completed by the mother.

Coding Methods

Maternal Mental-State Language Coding

- Mothers' language to infants was analyzed from videos using Noldus Observer XT.
  - Each mother's MS score was determined by the frequency of MS terms spoken during 2 min of interaction beginning after the first 10 s.
    - Categories of MS terms coded were **basic emotion** (e.g., "happy", "sad"), **physiology** (e.g. "hungry", "tired"), **perception** (e.g. "see", "hear") **intentional agency** (e.g. "try", "going to"), **belief** (e.g. "think", "know"), **desire** (e.g. "want", "wish"), and **attention** (e.g. "ignore", "interested").
      - These categories were determined based off of the coding scheme used by Roberts et al. (2013)[2].
  - Two blind raters individually coded 2 minutes of interaction (Cohen's kappa = 0.79).

Child Language Measures

- Each child's 24-month CDI vocabulary (total words produced) was assessed.
- A child MS score was derived by counting the number of reported MS words in the CDI inventory.
  - This was modeled from the coding scheme used by Brooks and Meltzoff (2017)[7].

Mental-State Terms in the CDI Words and Sentences (2007)		
Emotion Terms	Desire Terms	Belief Terms
Happy	Wanna/Want to	Pretend
Sad	Wish	Think
Mad	Need	
Scared		
Like		
Love		
Hate		

RESULTS & ANALYSES

Research Question 1:

Is mothers' mental-state language use with their 5-month-olds related to children's production of mental-state language at 24 months or to children's vocabulary size at 24 months?

- Scatterplots examining the relation between mothers' MS scores and the two child language measures provided no evidence of correlations.

Research Question 2:

Is there a relationship between children's MS vocabulary and total vocabulary at 24 months?

- A significant relationship was found between the mental-state score produced by children at 24 months and their vocabulary score at 24 months (Spearman rank-order correlation $\rho=0.825$, $p<.001$).
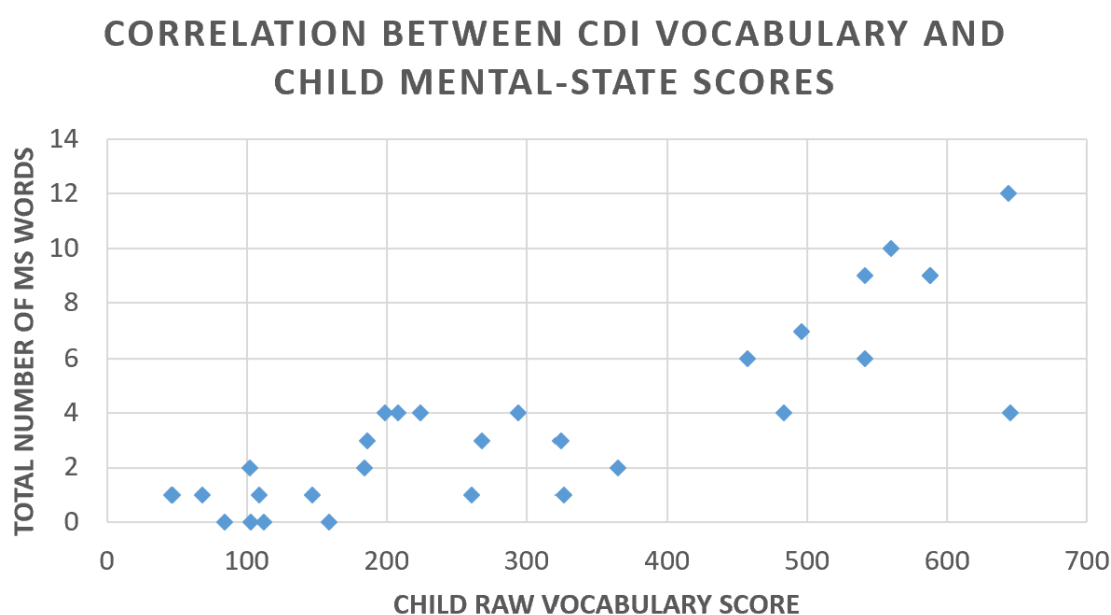
Figure 1. Significant Spearman rank-order correlation ($\rho=0.825$, $p<.001$) between the child MS score and vocabulary score at 24 months.

- To examine if the type of MS word was related to vocabulary size, children's vocabulary scores were then divided into quartiles and the number of emotion words vs. belief-desire words were examined in each quartile.
  - Children in the first quartile produced emotion words only (M=.75, SD=.25).
  - Those in the 2nd and 3rd quartiles produced on average 0.94 words of 5 belief-desire words. These groups produced an average of 2.81 MS words (both emotion and belief-desire words).
  - Only children in the 4th quartile produced more than 2 of 5 belief-desire words (M= 3.33 of 8.25 MS words).

DISCUSSION

Research Question 1:

Is mothers' mental-state language use with their 5-month-olds related to children's production of mental-state language at 24 months or to children's vocabulary size at 24 months?

- The absence of correlation between the mother's MS language to 5-month-olds and the child's MS score at 24 months implies that exposure to MS terms at 5 months may not be directly related to children's later acquisition of MS terms.
  - Mothers' MS language to infants increases significantly between 13 and 28 months of age[8]; the quantity of maternal MS language at 5 months is likely much less frequent and 5-month-olds do not comprehend MS terms.

- The lack of a relationship between the mother's MS language to 5-month-olds and the child's 24-month vocabulary score suggests that mothers' MS language does not impact overall language acquisition at 24 months.

- Other maternal language measures at 5 months such as total maternal language, mean length of utterance (MLU), complexity, or properties of infant-directed speech prosody may be more impactful at this age.

Research Question 2:

Is there a relationship between children's MS vocabulary and total vocabulary at 24 months?

- Children with larger vocabularies at 24 months produced a greater number of the MS words represented on the CDI.

- Earlier research reported that children's first internal-state words were preceded by a rapid increase in vocabulary[6] which typically occurs between 18 & 24 months. In this sample of 24-month-olds, MS score was also related to vocabulary size.

- The smaller proportion of belief-desire words relative to emotion words parallels the ratios of these two categories reported for 28-month[9] and 32-month-olds[10].

- Limitations of these analyses include the CDI having a finite set of mental-state terms in contrast to the set of total vocabulary assessed by the CDI. Additionally, we have no measures of maternal or child language between 5 and 24 months to examine if infants' exposure to properties of maternal language at intervening ages is related to the 24-month CDI measures. Future research should ensure that data is collected at multiple ages and in varying contexts.

- Taken together, these findings add to literature examining the developmental trajectory of mental-state language.

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AUTHOR INFORMATION

Abigail Roberts's work with Dr. Melanie Spence in the Infant Learning Project lab focused on the influence that mental-state language has on language development during the first years of life. She graduated with a BS in Speech-Language Pathology & Audiology from the University of Texas at Dallas (UTD). She is currently pursuing a Master's in Communication Disorders at UTD.

Samia Razvi graduated from The University of Texas at Dallas with a BS in Neuroscience. In the Infant Learning Project lab, she also studied the effect of mental-state language on early child development. Presently, research is focused on the development of laughter perception during infancy.

Melanie Spence is Professor of Psychology at The University of Texas at Dallas (UTD) and serves as the Associate Dean for Undergraduate Education for the School of Behavioral and Brain Sciences at UTD. She received her Ph.D. from the University of North Carolina at Greensboro. She has been recognized as a Fellow of the Association for Psychological Science.

ABSTRACT

Infants' exposure to mental-state language is related to social-communicative skills that impact later language development and to infants' acquisition of mental-state words. Mothers' referencing of 6- and 9-month-old infants' mental states predicts infants' joint attention (Roberts et al., 2013) and gesture use (Slaughter et al., 2008), while these social-communicative skills are linked to later language development (Iverson & Goldin-Meadow, 2005). Mothers' production of mental-state terms with their 2-year-olds is also related to toddlers' production of mental-state terms at 3 years (Furrow et al., 1992). The current study explored whether mothers' mental-state language to their 5-month-olds is related to the child's mental-state language and vocabulary score at 24 months.

Mothers and their 5-month-old infants (n=31) engaged in a 3-min free play lab session. Mothers' language referencing infants' internal states was coded by two blind raters (Cohen's kappa =0.79). The mental-state categories included references to infant emotions, physiology, perception, intentional agency, desire, belief, and attention-cognitive processes (Roberts et al., 2013). Mothers completed the MacArthur-Bates Communicative Development Inventory (CDI) Words and Sentences when their children were 24 months. The CDI vocabulary list contains 12 mental-state words from three categories; emotion, desire, and belief. Using the method reported by Brooks & Meltzoff (2014), the number of mental-state words were compiled into a child mental-state score.

The number of mental-state terms produced by each mother was examined relative to the child's mental-state score and the CDI vocabulary (total words produced). The scatterplot of these data showed no evidence of correlations between mothers' mental-state language and child scores. Mothers' mental-state language to infants increases significantly between 13 and 28 months of age (Beeghly, Bretherton, & Mervis, 1986); the amount of maternal mental-state language at 5 months is likely much less frequent and thus less likely to directly impact 24-month language scores.

A second focus of this study examined the relation between 24-month vocabulary scores and child mental-state scores; prior research reported toddlers begin producing desire terms between 18 and 24 months (Bartsch & Wellman, 1995) and that children's first internal-state words were preceded by a rapid increase in vocabulary (Lamb, 1991). A significant relationship was found between the child mental-state score and 24-month-vocabulary (Spearman rank-order correlation ρ=0.825, p<.001). To examine if the type of mental-state term was related to vocabulary size, vocabulary scores were divided into quartiles, and the number of emotion words vs. belief-desire words were examined in each quartile. Children in the first vocabulary quartile produced emotion words only (e.g., love, happy, like). Those in the 2nd and 3rd quartiles produced on average .94 of 5 belief-desire words (e.g.,need, want). Only children in the 4th quartile produced more than 2 of 5 belief-desire words, (M= 3.33). The smaller proportion of belief-desire words relative to emotion words parallels the ratios of these two categories reported for 28-month (Bretherton & Beeghly, 1982) and 32-month-olds (Poulin-Dubois et al., 2009). Taken together, these findings add to literature examining the developmental trajectory of mental-state language.

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