



THE UNIVERSITY OF TEXAS AT DALLAS

# Developments

INFANT LEARNING PROJECT

SPRING 2021

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## Infant Learning Project

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CALLIER CENTER  
FOR COMMUNICATION DISORDERS

# Congratulations!

## SARAH REHMAN

M.S. in Communication Disorders

Sarah hopes to complete her clinical fellowship and work as a Speech-Language Pathologist in the adult medical rehabilitation setting with a focus on culturally and linguistically diverse populations. Her time with the lab has been meaningful to her growth as a clinician.



### SPRING 2021

# Infant Learning Project Team

Faculty Lab Director

Dr. Melanie J. Spence, Ph.D.



Research Assistants

Madeline Hale

Ginni Strehle

Isa Hernandez

Samia Razvi

Kaitlin Lawler

Sarah Rehman

# Congratulations!

## MADELINE HALE

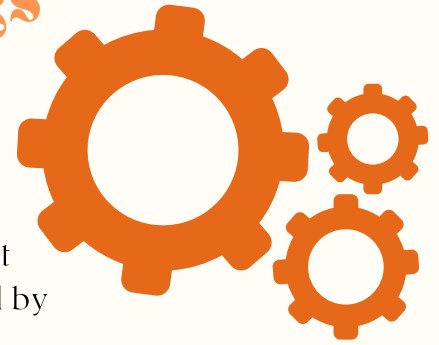
B.S. in Neuroscience and  
Speech-Language Pathology & Audiology

Madeline will attend the University of Wisconsin-Madison for a combined MS/PhD in speech-language pathology. Her research will focus on cognitive-communication changes found in normal aging and neurodegenerative diseases, specifically Alzheimer's disease dementia.



# The Benefits of Parent-Child Interaction in Interactive Settings

ISA HERNANDEZ



As children develop, much of their knowledge is derived from interactions with their parents. Research has previously shown the benefits of parent-child interaction to children's causal reasoning, but most have been carried out in laboratory settings. A study conducted by Willard et al. in 2019 investigated the effects of exploration versus explanation on children's causal reasoning. Causal reasoning is the process of identifying the relationship between a cause and its effect. Parent-child interactions were measured outside of the laboratory in an interactive children's museum so researchers could investigate any effects in a real-world setting. Exploration can be defined as "the process by which individuals act on the world in ways that generate information from others of the environment." (Willard et al. 2019, p. e598) and explanation can be defined as "the verbal information individuals generate about causal mechanisms, causal relations and underlying causal principles that govern those relations." (Willard et al. 2019, p. e598). Previous literature on exploration and explanation has described them independently, each producing different learning outcomes. Throughout development, children are naturally inclined to explore ambiguous (unclear) situations and ask questions to receive causal explanations from adults. There is evidence that an interaction between exploration and explanation ultimately leads to children's causal learning.

Willard et al. sought to investigate the interaction between explanation and exploration in a real-world environment. Parent-child pairs interacted at a children's museum exhibit and parents were given an "instructional intervention" (Willard et al. 2019, p. e599). Essentially, researchers gave instructions to parents to guide their children either toward explanation or exploration. Several aspects of parent-child interaction were measured; parents' behavior changes between the exploration instructions and explanation instructions, whether the changes parents made in their behavior affected their children's behavior or their type of learning and how child and parent behavior affected children's performance on follow-up tasks testing children's causal reasoning.



## References

Willard, A., Busch, J., Cullum, K., Letourneau, S., Sobel, D., Callanan, M., & Legare, C. (2019). Explain This, Explore That: A Study of Parent-Child Interaction in a Children's Museum. *Child Development*, 90(5), e598-e617. <https://doi.org/10.1111/cdev.13232>

*Continued on pg. 4*

Sixty-five parent-child pairs participated in the study; children ranged in age from 4 years old to 6 years old. 30 of the children were females and the remaining 35 were males. Forty-four of the parents were females and the remaining 21 were males. All parent-child pairs were recruited at the museum. Data was collected in a free-play gear exhibit at the Austin Children’s Museum between April and September of 2013. Fifteen unconnected gears were laid on a table (additional gears were available nearby) and parent-child pairs were invited to play with the gear exhibit for 3 minutes while being videotaped. Gears were used because of their unique ability to connect and move together. The pairs were randomly assigned to one of three conditions: baseline, encouraging explanation, and encouraging exploration. Parents received an instruction card with directions for their assigned condition. Following the 3-minute parent-child interaction, children were taken to a separate room to complete follow-up procedures. There were three follow-up procedures given to each child. The first was designed to assess the children’s memory and was included as a control. The second task assessed the children’s understanding of causal reasoning and the final task was a measure of generalization; children were given a similar set of gears to the one in the exhibit and given 4 minutes to build a machine.

The results of this study revealed several important factors, first, parent-child interactions were influenced by instructions given to parents prior to the free-play session. Second, the way parents behaved influenced the way their children interacted with the gear exhibit. Finally, researchers were able to predict how children would understand and create machines in follow-up tasks based on the type (exploration or explanation) of interactions with their parents in the gear exhibit. In the explanation condition, children spent more time spinning the gears and less time connecting gears when compared to the baseline condition (Willard et al. 2019). Moreover, the more explanatory questions parents asked their children, the more time children spent spinning the gear. In contrast, children within the exploration condition spent more time connecting gears and creating complex machines in comparison to the baseline condition. Despite these differences, the condition type (exploration or explanation) did not affect follow-up task performance. However, other aspects of the parent-child interaction did affect the children’s performance on follow-up tasks. For example, the more time children spent struggling while exploring the gear exhibit, the more likely they were to answer follow-up questions regarding memory and simple mechanisms correctly. In contrast, the more time parents spent “troubleshooting” (fixing gears for their children) the less time their children persisted in follow-up tasks where they ran into problems.

Willard’s research ultimately emphasizes the importance of “open-ended” engagement between parents and their children (Willard et al. 2019, p. e614). Willard encourages parents to let their children remain in control when exploring and allow them to solve any problems they may run into during exploration. By doing this, parents can increase the amount of time their children persist when running into difficult tasks. Willard’s research pointed out the importance of exploration guided by the child rather than the parent and its positive effects on children’s causal reasoning.



# What's happening in the lab this semester?

Lab members Samia Razvi and Madeline Hale presented posters at the virtual *Society for Research in Child Development* 2021 Biennial Meeting.

## Exploring the Relationship Between Mental State Language & Children's Early Vocabulary Development

The poster is titled "Exploring the Relationship Between Mental-State Language and Children's Early Vocabulary Development" and lists authors Abigail Roberts, Samia Razvi, Sarah Rehman, Madeline Hale, Meg Mickelsen, Ginni Strehle, Kaitlin Lawler, and Melanie J. Spence. It is from the School of Behavioral and Brain Sciences, The University of Texas at Dallas. The poster is divided into several sections: Introduction, Methods, Results & Analyses, Discussion, Research Questions, and Acknowledgements. The Introduction defines mental state (MS) language as talk referring to one's internal states, including emotions, desires, and beliefs. The Methods section describes a lab visit with 5-month-old infants and the use of the MacArthur-Bates Communicative Development Inventory (CDI). The Results & Analyses section includes two research questions: "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?" and "Is there a relationship between children's MS vocabulary and total vocabulary at 24 months?". A scatterplot shows the correlation between CDI vocabulary and child mental-state scores. The Discussion section notes that the absence of correlation between mother's MS language and 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. The Acknowledgements section thanks all families who participated in the study, research assistants at the Infant Learning Project, and Dr. Kate Shepard.

**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

**Research Questions**

- 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?
- 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

**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  $\rho=0.825$ ,  $p<.001$ ).

**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.

**Acknowledgements**

Special thanks to all the families who participated in our study, the research assistants at the Infant Learning Project, and to Dr. Kate Shepard, who made this study possible.

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*Presented April 7 by Samia Razvi*

In this study, we explored how mother's talk about the mental states of 5-month-old children (i.e., their emotions, desires, beliefs) affects the child's language development at 2 years of age. We also studied if there was a link between the child's mental-state language and their vocabulary size when they were 2 years old.

While we found no link between the mother's mental-state language at 5 months and the child's vocabulary size or mental-state speech at 2 years, this suggests that mother's mental-state language may be more impactful later in the child's development. It gives us a better look at the overall timeline of how their language skills may form. Also, we discovered that 2-year-old children with larger vocabulary sizes talked about mental states more frequently. Taken together, our findings shed light on the developmental trajectory of mental-state language in children.

# What's happening in the lab this semester?

Lab members Samia Razvi and Madeline Hale presented posters at the virtual *Society for Research in Child Development* 2021 Biennial Meeting.

## Acoustic Properties of Infant-Directed Speech are Similar in Video Chat vs. In-Person Interactions

**Acoustic Properties of Infant Directed Speech are Similar in Video Chat Versus In-Person Interactions**  
Madeline R. Hale and Melanie J. Spence  
School of Behavioral and Brain Sciences, The University of Texas at Dallas

**Introduction**

- Caregivers speak to infants using infant-directed speech (IDS), and infants respond to IDS with positive affect and attention<sup>1,2</sup>.
- IDS differs from adult-directed speech (ADS) by acoustic properties of high and variable fundamental frequency (mean- $F_0$  and  $F_0$  range, respectively), short utterances, long pauses, and vowel alterations, which collectively contribute to the prosody or melodic properties of speech<sup>3</sup>.
- The prosody of IDS communicates caregivers' emotional intent<sup>4</sup> and recruits infants' emotional regulation<sup>5</sup> and recruits

**Research Question**

Does the change in context between in-person versus video chat interactions affect the acoustic properties of mothers' IDS?

**Methods**

**Participants**

- 29 mothers and their 5-month-old infants participated in free-play and video chat during a lab visit.
- 75% of participants reported their ethnicity as Caucasian, 10% as Hispanic, 7% as Asian, and 4% as African American.

**Pitch Analysis**

- Audio samples from 29 mothers were collected in three experimental contexts:
- 1. 3-min free-play interaction of mothers with their 5-month-old infant

**Results**

**Mean Fundamental Frequency ( $F_0$ ) by Condition**

**Mean Frequency ( $F_1$ ) Range by Condition**

**Descriptive Statistics**

	Mean- $F_0$ (Hz)	$F_0$ Range (Hz)
Free-Play	239.87 (5.58 SE)	345.76 (13.89 SE)
IDS	248.98	357.48

**Conclusion**

- The mean- $F_0$  and  $F_0$  range values for free-play and Skype IDS differed from those collected for ADS, as is typical in the literature<sup>6</sup>.
- No significant acoustic differences were found between mothers' IDS for in-person versus Skype interactions.
- This suggests that adults' speech to infants over video chat conveys some of the salient prosodic properties of IDS that communicate caregiver affect, regulate infants' emotion, and direct infant attention.
- This finding extends our knowledge that video chat can affect infant attention and learning to providing specific data on the actual input infants receive<sup>7</sup>.
- Further work is needed to explore additional characteristics of IDS prosody in

**References & Acknowledgments**

**References**

- Fernald, A., Teeschner, T., Dunn, J., Papoušek, M., De Boysson-Bardies, B., & Fukui, I. (1989). A cross-language study of prosodic modifications in mothers' and fathers' speech to preverbal infants. *Journal of Child Language*, 16(3), 477-501.
- Fernald, A. (1992). Meaningful melodies in mothers' speech to infants. In H. Papoušek, U. Jürgens, & M. Papoušek (Eds.), *Studies in emotion and social interaction: Nonverbal vocal communication: Comparative and developmental approaches* (p. 262-292). Cambridge University Press, Editions de la Maison des Sciences de l'Homme.
- Bryant, G.A., & Barrett, H.C. (2007). Recognizing

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Presented April 9 by Madeline Hale

With the increasing use of technology to communicate, heightened by the COVID-19 pandemic, infants are increasingly participating in virtual interactions to build relationships with relatives separated geographically. In this exploratory study we investigated the changes in acoustic properties of infant-directed speech from in-person versus video chat interactions. Specifically, we analyzed the mean and range of the fundamental frequency of mother's speech to their 5-month-old infant in a free-play situation and over a Skype conversation, as well as during a Skype call with an adult. We found that the two measures did differ significantly between when the mother spoke to an adult versus speaking to her infant in either situation. However, there was no significant difference found between mothers' speech to their infant in the face-to-face and Skype interactions. These results suggest that mothers' speech to infants over video chat conveys some of the salient prosodic properties of IDS that communicate emotion and direct attention.

# What's Coming up in the lab?



## Participation in Upcoming Studies for the Infant Learning Project

We are planning on beginning a virtual study on face perception with 10-year-olds by the end of this summer.

Coming up this fall, we are conducting a virtual study on the Lookit platform concerning humor and social perception in infants 4-12 months old.

If you have any questions or would like more information about our upcoming studies, please email [infantlearningproject@utdallas.edu](mailto:infantlearningproject@utdallas.edu).

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Thank  
♥  
you!

We greatly appreciate all of the infants & parents who have participated in our studies. Without you, our research would not be possible!

# Research Opportunities

from Home!



## Children Helping Science



Dr. Candice Mills from UT Dallas is one of six scientists from six universities who joined forces to launch the Children Helping Science project. This website has studies you and your child can participate in from your home. There are studies for all families, and each study indicates who it is for, so you can find the perfect one for your child to help science.

## Lookit

the online child lab

Your family can contribute to research about how children learn by doing fun activities together, right in your web browser. You can participate with your child from any computer with a webcam.

Visit <https://lookit.mit.edu/> to get started!

