THE UNIVERSITY OF TEXAS AT DALLAS

Developments

INFANT LEARNING PROJECT FALL 2021

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Infant Learning Project

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FALL 2021

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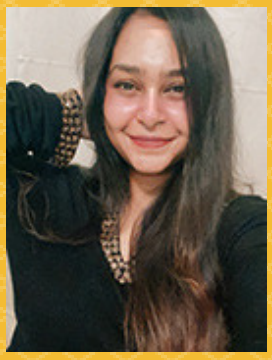
Welcome!

To our new research assistants

We welcomed four new research assistants into our lab this semester!

In order from left to right: Nethra Giri, Lasya Manne, and Anaum Rizvi are our new undergraduate assistants, and Naureen Amjad is our newest graduate student.



Brain Interactions between Adults and Infants

NETHRA GIRI

Communication is a skill that is important and that everyone uses in diverse ways, including infants. Infant communication and interaction skills start developing as early as when they are born, which is a critical time for their learning and growth. Infants are using and learning both verbal and nonverbal communication from their caregivers and others around them. Nonverbal communication includes behaviors like eye gaze, facial expressions, joint attention, emotions, touch, and posture (Hess, 2016). Verbal communication, on the other hand, is known as functional speech, which is spoken language that sends a purposeful message (McDuffie, 2013). When you are interacting with your child, have you ever taken a minute to think about how your brains are interacting as well?

Piazza et al. (2019) decided to investigate how a baby's brain and an adult's brain interact during social and non-social interactions. In an earlier study, Regev et al. (2019), it was seen that when someone was telling or reading a story, similar neural responses were occurring in both the brain of the reader and the listener. Therefore, researchers decided to see if there was also a connection when infants and adults interacted in other ways, versus when they do not interact. Hence researchers wanted to look more into shared understanding, which is when two people take part in the same event and have a mutual understanding that they are discussing that same event, to see if there are shared neural responses in similar brain regions. This can then be interpreted comparably regarding behaviors.

For this experiment, the participants included 18 infants (9 to 15-month-olds) who had no history of hearing problems or developmental delays, their caregiver, and one researcher.

There are two conditions for the experiment: together and apart. For the together condition, the experimenter, an adult who had many parenting experiences, would interact with the infant by playing with a certain set of toys, singing rhythms, and reading a book. During this, the infants sat on the caregiver's lap and the caregivers would not interact with the infant. For the apart condition, the experimenter would face away from the infant and use adult-directed speech while communicating with another adult, while the infant and parent would quietly communicate.

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In the experiment, the interactions were recorded for both video and audio. Then these videos were coded for the infant's behavior, which included nonverbal communication, providing evidence of joint attention. To measure the changes in brain activity of both the infant and adult, an fNIRS approach was used. fNIRS, or functional near-infrared spectroscopy, is a brain imaging tool that measures where blood is flowing in the brain in real-time. The higher the blood oxygen level, the higher the brain's activity level in those areas of the brain. The researchers were primarily interested in shared brain activity when infants and adults were engaging and interacting with each other.

When the adult and infant were together and directly interacting, it was seen that there were many similarities between the adult experimenter and the infant's brain activity. There was a lot of coupling, or similarity of neural activity and mutual understanding, in the brain channels that have to do with prediction, language processing, understanding other people's perspectives, and narrative and social processing. The infant and adult connection comes from the interaction that includes eye contact, facial expressions, speech, among other cues. When the adult was not interacting with the child, the adult sat looking away from the infant and interacted with another adult using adult-directed speech. During this, it was seen that there were no similar neural responses.

An interesting aspect seen in this experiment was that brain activity was starting to increase in similar ways and areas right before the interaction between the adult and infant occurred. For example, the mutual gaze, based on their neural activity, showed that the adult follows the infant with regards to the nonverbal behavior. This also shows that the infant and adult anticipate the event occurring. In addition, there were connections found when just looking at the impact of the adult's speech on the infant. It was noticed that when the adult used infant-directed speech, like when increasing their pitch, the infant had higher activity in the same brain channel as the adult, while that brain channel in the adult was unchanged.

This study helped to shed more light on social interactions between infants and adults, and the impact it has on them. Through this experiment, we saw how brain activity is similar during interactions between infants and adults. We also noticed how infants anticipate events, and both adults and infants use social cues. This experiment has shown the complexity of our brains and how connected we all are.

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The Effects of Pointing on Predicting Language Development in Children

ANAUM RIZVI

A strong predictor of language development in children may lie in their parent's early use of the pointing gesture. Research has shown a link between parental use of pointing with their infant's gestures and language skills. A study done by Choi et al. (2021) investigated whether parent gesture training resulted in increased pointing gestures done by parents of infants aged 10-12 months. This was done to find changes to the communicative intent within parent's pointing gestures and its effects on predicting language development in children at 18 months. The use of facial expressions, gestures, and verbalization when trying to communicate a message can help to convey its communicative intent. Parent-child interactions were measured so researchers could investigate declarative and imperative pointing. Declarative pointing can be defined as pointing "used to share or discuss a joint focus of attention." (Choi et al. 2021, p. 738) such as for an event or object and imperative pointing can be defined as pointing "used to direct or control a specific action from the child." (Choi et al. 2021, p. 738) such as for behavior. Prior research on parents' declarative and imperative pointing has reported that it can predict future vocabulary development outcomes in their children. During development, a child's vocabulary skills can depend on a parent's gestures and the level of a child's comprehension when language learning is taking place. Evidence has shown that declarative gestures used by parents after parent gesture training may increase language learning outcomes in children.

Choi et al. (2021) pursued to investigate the results of parent gesture training on increased parent pointing and whether its communicative intent towards children aged 10-12 months project language development at 18 months. Specifically, researchers trained parents about the significance of pointing in child development, how they could increase the use of pointing with their child, and the differences between declarative and imperative gestures. Many details about the parent-child interactions were recorded; the number of points used by parents in the control and intervention groups during pre-intervention versus post-intervention, and the type of points parents made, such as declarative or imperative points. Forty-seven parent-child dyads participated in the study; children varied in age from 9 months 7 days to 11 months 6 days. 25 of the children were females and the remaining 22 were males.

The data was collected through videotaped play with developmentally appropriate toys in participants' homes when children were aged 10, 12, and 18 months. The developmentally appropriate toys consisted of books, a shape sorter, and a farm set. Three bags of those toys were given to the parent-child dyads to play with for 15 minutes while being videotaped. Those videos were transcribed and coded after their play session had been completed. The dyads were randomly assigned to one of two conditions: control and intervention group. Both groups were taped during the pre-intervention stage to show initial videos of pointing. This pre-intervention stage was to show the number and type of pointing done by parents in the intervention and the control group. In the next stage, parents received a 5-minute video training in the intervention group with education about the significance of pointing and how it could be increased. The video training used examples to demonstrate the differences between declarative gestures such as "while you are reading a book together, you can point to and label the different pictures" (Choi et al. 2021, p. 737) and for imperative gestures "you can point to a toy that is out of your reach and ask your child to hand it to you" (Choi et al. 2021, p. 737). In order to have accurate results, parents in the control group did not receive any video training because they would be compared with the intervention group to study for the training's effects. Afterwards, the parents in the intervention group received weekly texts from the researchers while their child was 10 to 12 months of age, reminding them about the significance of pointing for their child's development. As from before, the parents in the control group did not receive the reminder texts from the researchers either. Following those tasks, when the children reached 12 months of age, the post-intervention stage began. The parent-child dyads ran through the same procedure as before with the 3 bags of toys to play with for 15 minutes while being recorded. Later, when the children reached 18 months of age, parents in both condition groups completed the MacArthur- Bates Communicative Development Inventory, a parent report used to measure a child's vocabulary based on the words and gestures on their list.

The results of this study unveiled many findings, first, in the pre-intervention stage, the data shown between the control and intervention group regarding pointing was surprising. Second, in the post-intervention stage, the intervention group had remarkably higher declarative pointing than the control group, however no difference in imperative pointing was found between both groups. Next, the researchers were able to determine the differences in child vocabulary skills with the intervention and control group based on parent pointing. Surprisingly, children in both groups had no difference in their vocabulary scores at 10, 12, and 18 months (Choi et al. 2021, p. 740). But, when examining if parent's pointing intentions indicated for future child vocabulary skills at 18 months, the parent's in the intervention group's declarative pointing at 12 months positively impacted their child's comprehension scores. For parents receiving an intervention, the amount of declarative pointing they engaged in with their child increased, this increase predicted vocabulary skills at 18 months. While researchers were studying imperative pointing as well, there was no notable increase in it at post-intervention. Despite these differences, the 2 condition groups (intervention or control) did not show a difference in the amount of declarative and imperative pointing during the pre-intervention stage. But other factors of the parent-child interactions did affect the amount of declarative and imperative pointing while with or without intervention training. For example, the increase in declarative pointing by parents could be because they "are more likely to use pointing to share attention with their infants than requesting at this age" (Rowe, 2000; Salo et al., 2019). On the other hand, this data could be explained by how the environment was set up. Since the dyads were seated with toys within their reach, this could have decreased the number of imperative pointings. Moreover, the sum of declarative and imperative pointing did not contribute to predicting vocabulary outcomes.

Choi's research eventually highlighted the significance of increased declarative pointing gestures from intervention training on predicting "vocabulary comprehension scores at 18 months " (Choi et al. 2021, p. 743). Choi taught parents about the differences between declarative and imperative pointing, increasing gesture frequency, and including intentions in their gestures to help facilitate language development in children. Since this was done, parents can increase the length of joint attention episodes which are important for grasping language as a child. Choi's research signified the importance of educating parents on declarative pointing to encourage children's future vocabulary production.

References

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Lab News: What's New this Semester?

This semester the lab has been working on three main projects

Children's Judgement and Recognition of Faces

The purpose of this study is to see how well your child does at recognizing faces depending on the questions they are asked! We are interested in testing 10-year-old children, but anyone can participate. Your child may be shown upright faces (faces shown in the normal orientation) or inverted faces (faces shown upside-down). This is to investigate the different types of processing your child does when learning faces. The study will be conducted on MIT's Lookit and should take between 30-45 minutes to complete. Basically, it can be done anywhere you have an internet connection! If you have any questions, please email the Infant Learning Project or Ginni Strehle (Ginni.Strehle@UTDallas.edu

Infant's Perception of Humor

This study is for infants between the age of 5 and 10 months old and will be conducted on the Lookit platform. Research shows that social interaction is a very important part of humor. Humans rarely engage in humorous behaviors when they're alone! We're interested in better understanding how babies learn to understand the role that social interaction plays in humor. This study specifically will help us determine if infants prefer humorous situations with social interaction versus no social interaction. If you would like more information about participating in this study, contact the Infant Learning Project or email Kaitlin Lawler at kxl190024@utdallas.edu

Infant Response to Faces and Speech

This is a study intended for 4, 5, and 7 months old. It will be conducted on the Lookit platform. In this study, we're interested in examining if infants can tell apart baby talk from adult talk and if both auditory and visual components are needed to differentiate the two kinds of speech. This would give a clearer insight into how babies develop language-learning skills!

This study will be a pilot study for a follow-up study that is similar in format, which will examine whether infants can distinguish between voluntary and spontaneous forms of laughter.

If you have any questions or would like more information about our upcoming studies, please email infantlearningproject@utdallas.edu.

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

ChildrenHelpingScience.com

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!