

# Infant & Child Studies

@ The  
University of  
Maryland

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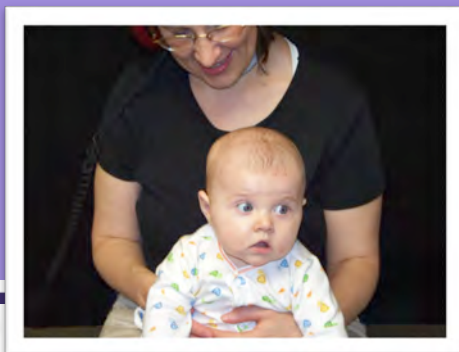
## Your guide to child development research

This issue of our newsletter highlights some current studies from our various offices as well as recent findings. Our work is made possible by the participation of local families, just like you! Our research group, comprised of professors, graduate students, post-doctoral fellows, undergraduate students, post-baccalaureate researchers, and lab managers hopes you enjoy reviewing our exciting progress made this year.



## We all want what is best for our children!

Children are brilliant- but they still vary in how well they succeed. We're trying to figure out how to help all children achieve their potential, by better understanding the way children learn and grow. You can help us by telling other families about us, or posting about us on Facebook or your listservs!



# Hearing and Speech

The goal of the HESP department is to improve speech, language, and hearing through continuous research efforts.

## Unfamiliar accents and short-term memory

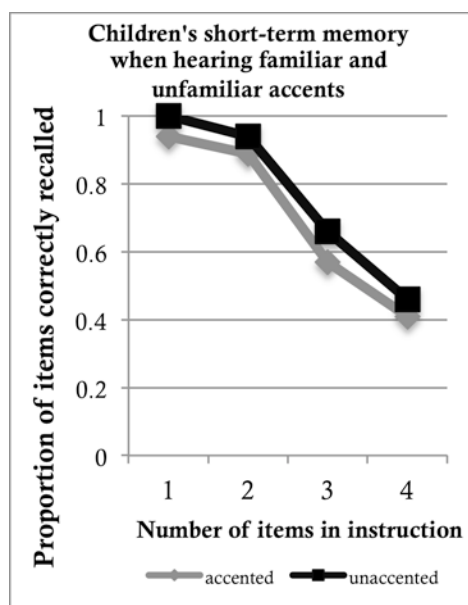
When children begin school, they are more likely to hear unfamiliar-sounding speech, including foreign-accented speech. Children have shorter memory spans than adults, and it's possible that the extra effort needed to understand someone with an unfamiliar accent could detract from their ability to later recall what that speaker said.

This study explored the effect of a foreign accent on children between the ages of 4 and 6 years old as they participated in a short-term memory instruction task. Participants heard instructions from an American English speaker and a Slavic-accented English speaker, and pointed to the pictures on a computer screen that corresponded to the instructions.

To test children's memory, the instructions varied in length, from one-step instructions ("Point to the dog") to four-step instructions ("Point to the shoe, then point to the car, then point to the pizza, then point to the house.")

Regardless of the speaker, all children had more trouble

remembering longer instructions than shorter ones. Children also seemed to have a little more difficulty understanding the instructions from the foreign speaker than from a speaker with their own accent. However, we found no evidence that the difference in speaker accent affected children's memory more on the longer instructions than the shorter ones. This has important implications for children in school because it shows that even if a speaker has a foreign accent, children may not have trouble recalling the information they hear.



- Language Development Lab

## It's playtime! Can your baby hear you?

When Gio, a former graduate student in the **Language Development Lab**, got a popular jumper toy for her baby, she was struck by how loud its music was. Could her son even hear what she was saying over the noise? We designed a study in the **Language Development Lab** to find out!

After about 4 months of age, infants show a reliable preference for listening to their own names over unfamiliar ones. We can use this preference to find out when infants can recognize speech in noise. If they can pick out their own name, they should listen to it longer than other names. But if the noise is too loud or distracting, and prevents them from distinguishing the different names, they will listen to all of them equally.

To understand the listening conditions created from the music of this toy, Gio measured how loud the sound would be to her son as he sat in the jumper: 77 dB SPL, which is as loud as a vacuum cleaner or a blender. Conversational speech is usually around 60 dB SPL, and even

adults have trouble listening in noise that much louder than speech. So we tried an easier situation, where infants heard music and speech that were equal in volume.

We presented 8-10 month old infants with their own names and three unfamiliar names, each played with music from the jumper toy. Even though the music was played more softly relative to the speech than it would be with the actual toy, the infants did not demonstrate a preference for listening to their own names, suggesting that the noise was still too loud or distracting for them to be able to recognize speech. Now, we're looking at how much softer the music needs to be in order for infants to succeed in recognizing their names.

The speech that children hear around them is very important for their language development, and creating easier listening conditions can help infants learn as much as possible from what they hear. This study suggests that while toys with music and sounds can be very fun for playtime, it may be best to turn them off for talk time! –[Language Development Lab](#)

### Word learning and music

Many of the studies in the **Language Development Lab** look at how background noise impacts children and adults' ability to understand and learn from the speech they hear. We usually find that noise adversely affects performance, either by covering up the speech signal, distracting the listener, or (most typically) a mixture of both.

However, people often enjoy a little background noise (especially

music) while working on tasks, and a recent study suggests that adults can learn more from listening to foreign language lessons as soft background music plays. Because listening to music is enjoyable, perhaps people are more attentive and engaged in listening when there is music in the background, and therefore learn more from the speech they hear.

An upcoming study in our lab will look at whether we see this kind of benefit with toddlers participating in a word learning task. Children will see objects that are named either in quiet or with instrumental music in the background, then be tested on their learning of those names. There are some reasons to expect that toddlers will do worse with background music, despite the benefit of music found in the study with adults. Toddlers can have difficulty with noise levels that adults find relatively easy. They also are especially distracted by noise that changes in pitch and intensity over time. And if the music is *too* much fun to listen to, they may ignore the speech and pay attention to the music instead!

However, music is a type of background noise that children often encounter, and it's extremely common in certain contexts like educational apps and TV shows. We're hoping to gain a better understanding of how this music affects children's learning! –[Language Development Lab](#)

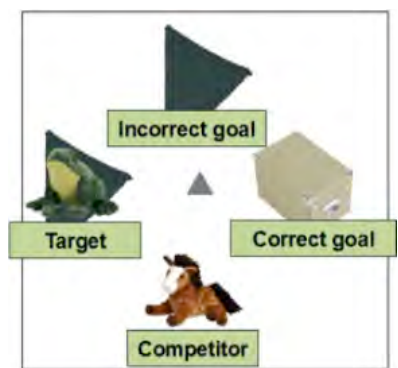
### Cognitive Control and Language Comprehension

Ever notice how children find some sentences more difficult to understand than others? This confusion may actually be related to impulse control!

Prior research shows children have more trouble "revising" their interpretation of sentences than adults. The **Language and Cognition Lab**, directed by Dr. Yi Ting Huang,

investigated the role of "cognitive control" in children's ability to revise sentence interpretations. Cognitive control is the ability to regulate and adjust behavior when necessary. For example, when we ask children to learn that a red dog is named "Green," we are asking them to use this cognitive control.

We learned 4- and 5-year-olds find ambiguous sentences, like the one below, harder to interpret when they used cognitive control in a prior task.



**"Put the frog on the napkin on the box"**

Temporarily ambiguous as the listener often believes the "napkin" to be the destination before they hear "box."

Children listened to different sentences while an eye tracker recorded where their eyes were moving. Using this information, we can determine how long it takes children to revise their interpretations of these sentences. When children just used cognitive control, they spent a longer time revising, suggesting this difficulty is due to limited cognitive control abilities. We plan on conducting a follow ups study to test whether completing any difficult task before hearing the sentence would lead to poor revision. Results of this new study will be featured soon! - [Language and Cognition Lab](#)

## Development of infant brain responses to speech

The infant brain is primed to respond to speech input, and development of auditory skills occurs rapidly during the first few years of life. To better understand this development, the **Hearing Brain Lab**, led by Dr. Samira Anderson, recorded neural responses to speech syllables in 56 infants ranging in age from 2 to 12 months, and compared their responses to those of young adults.

We placed electrodes on the surface of the head and ear to measure electrical activity produced by the brain in response to the speech syllables. This electrical activity is an indirect measure of neural speech processing, and does not require any response from the baby.

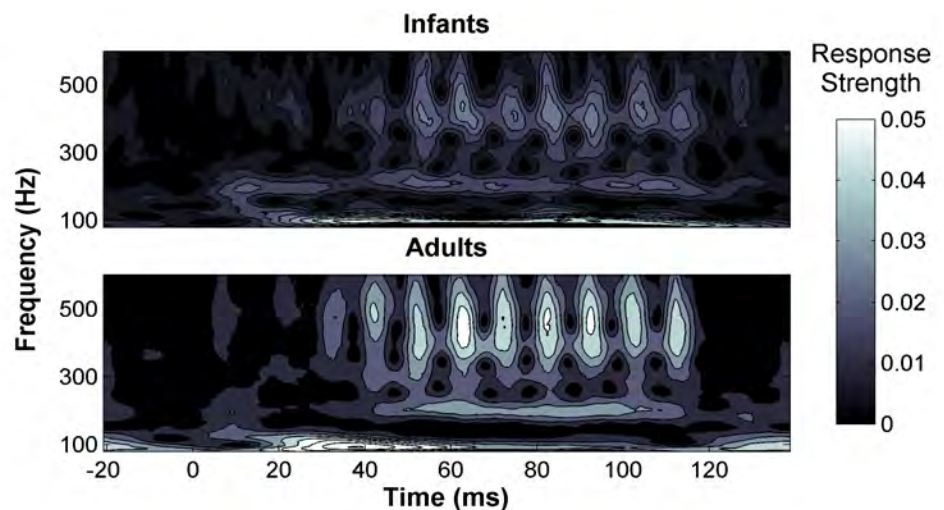
We found that the infant brain is more sensitive to low-frequency components of speech than to high-frequency components. The picture below shows the strength of the brain's response to the syllable /ba/ in infants versus young adults. Lighter color indicates stronger responses. The infants responses to low frequencies (~100 Hz) is equivalent to those of young adults, but their responses to higher frequencies (200-500 Hz) are weaker compared to young adults.

These differences may be present because infants are exposed to more low frequency sounds before they are born. The uterus is like a wall between rooms. Low frequencies can pass through without much reduction in volume, but high frequencies lose a lot of energy when passing through the wall. This is why you might be able to hear your neighbor's voice but not understand what he or she is saying.

Previous studies have shown that the brains of infants are shaped by exposure to specific speech sounds. Newborn infants show different brain patterns to contrasting speech sounds if they have been exposed to these contrasts before birth, whereas infants without this exposure do not show these same brain patterns. Therefore, infants may have stronger responses to low frequencies because they were

exposed to this frequency range while in the womb.

This study contributes to the understanding of auditory development in infants and provides a baseline for expected brain patterns to speech in typically developing infants. Currently, newborn infants are screened for hearing by measuring electrical activity in response to simple tones and clicks, but their responses to more complex sounds like speech are not being evaluated. If we could develop a test of speech processing for infants, we might be able to use this test for early identification of disorders that are associated with language impairment, like Autism Spectrum Disorder. – Hearing Brain Lab



## Announcements from Hearing and Speech

- **Giovanna Morini**, a recent PhD alumna from the Language Development Lab, accepted a faculty position at the University of Delaware. Congratulations Gio!
- **Alyssa Ambielli**, **Kelly Cavanaugh**, and **Lauren Steedman** graduated in Spring 2016 after working in the Language Development Lab as undergraduate research assistants. Kelly and Lauren are now pursuing Master's degrees in Speech-Language Pathology here at UMD, and are continuing in the lab as graduate assistants!

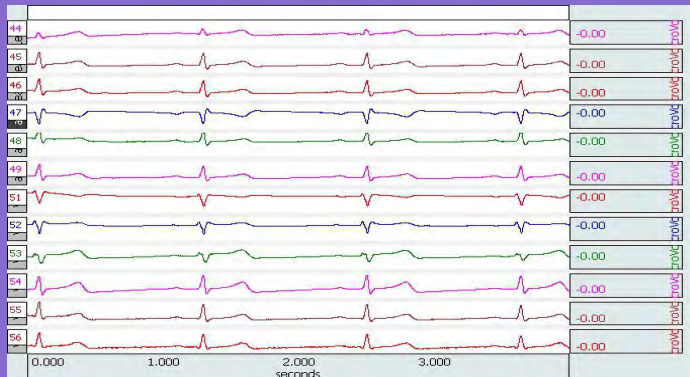
# Human Development

The core mission of the Human Development department is to advance our knowledge on the growing human across varying levels. This can range from an individual’s genetic make up to the overarching society.



## New Equipment in the CDL!

The Child Development Lab is very excited to begin using our new equipment to calculate heart rate variability (HRV) during the completion of social tasks. Here’s an example of the cardiology data we will be collecting!

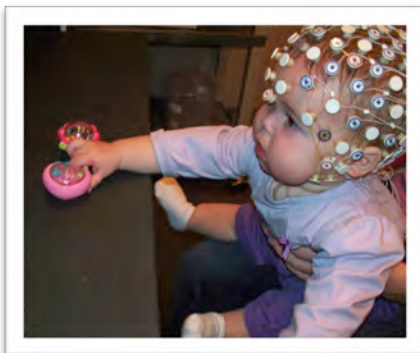


## Functions & Development of the Mirror Neuron System

The **Child Development Lab**, directed by Dr. Nathan Fox, recently received funding from the NIH to continue our research examining a neural system known as the Mirror Neuron System. It’s named “mirror” because this system is active both when we perform an action and when we see someone else perform that same action. Findings from the **Child Development Lab** and others labs around the world indicate the mirroring system is functional very early in life and may play an important role in social-cognitive development.

This project is a collaboration involving the University of Chicago (Dr. Amanda Woodward), the University of Maryland, College Park (Dr.s Nathan Fox and Elizabeth Redcay), the CNRS-Lyon (Dr. Pier Francesco Ferrari) and Boston University (Dr. Helen Tager-Flusberg).

At UMD we use electroencephalography (or EEG) to measure the electrical activity of the brain that reflects the activity of this mirroring system. We are working with infants, children, and adults to understand how this system develops and how it might interact with the development of other important milestones, such as communication and motor skills. – Child Development Lab

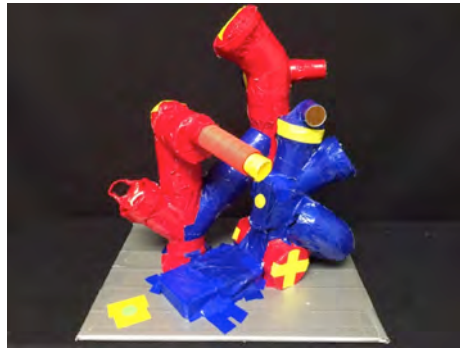


## Fostering Curiosity with Explanations

Children are naturally curious, and every parent knows that they ask a lot of questions about why things are the way they are. But how do our responses to those questions shape children’s curiosity? In a recently-completed study, we asked whether children who received good explanations in response to their questions would be more curious and discover more when they had the opportunity to learn through their own exploratory play.

To examine this, we presented 4-5 year-old children with unusual items (e.g., a book that would not open; a puzzle with a piece that didn’t fit) that elicited spontaneous questions. Half of the children heard explanatory responses to their questions (e.g., “This piece is too big because two puzzles got mixed up”) or non-explanatory responses that did not answer their questions (e.g., “All the other pieces fit in this puzzle”).

Then, children had the opportunity to play with a new toy that they had never seen before. There were 6 functions (e.g., a doorbell, a kaleidoscope) that a child could discover by exploring the toy.



**A new and novel toy!**

We found that children who had heard explanatory responses to their questions were more curious, exploring the toy more and discovering more about it. The results of this study suggest both that children are highly sensitive to how adults respond to their information-seeking attempts, and that those responses affect their curiosity when they have the chance to explore and generate explanatory information on their own. Specifically, hearing consistently satisfactory explanations in response to their inquiries led children to explore and discover more when they had the opportunity to generate causal evidence, relative to having their inquiries met with non-explanatory responses.

This research suggests that the way children’s early curiosity shapes their approach to learning may be

fundamentally shaped by the social context in which it occurs. Current research in our lab is following up on this result, investigating exactly what it was about the explanatory responses that seemed to foster children’s curious exploration. – *Cognition & Development Lab*

The Cognition and Development Lab welcomes their new lab coordinator, Nadia Tavassolie, and their new PhD student, Hailey Gibbs!



**Nadia Tavassolie**



**Hailey Gibbs**

Thank you to the following local businesses and organizations for their support in our community outreach efforts:





# Psychology

Our researchers in the Psychology Department are committed to understanding the mind and behavior of humans, especially children!

## Do children get better remembering details with age?

Early childhood is a time of rapid memory development. But how do children remember *details* from events they experience? What allows children to remember not just facts, but where and from whom they learned the fact? How does this ability change over time?

In one recent project, we explored how children's memory for details changes between 4 and 8 years of age. We showed children a set of different popular animated characters (like Ariel, Mickey Mouse, and SpongeBob) and taught them specific items that belonged to each character.

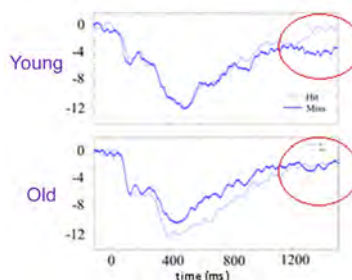


As children learned these pairs, we recorded their brainwaves, using electroencephalography, (EEG). Next, we showed children a new set of pictures. Some of these pictures were of new items and the

rest were items they had seen during the learning phase. Then, we asked children if they had seen the item before. If they said yes, we asked what character paired with this object.

We found that older children were better than younger children at identifying objects they've already seen. And surprisingly, younger children did just as well as older children on remembering each character and item pairing.

We also compared the EEG signals collected when children were shown items they remembered versus the ones they forgot. In the figure below, we saw among top performing children, neural signatures differed between older and younger children. Even though they all did well on the task, older children showed more activity in fronts of their brain than younger kids did while remembering objects.



However, for low performing children, there was no difference in the neural signature between older and younger children. This study suggests that differences in older children's brain activity is not simply due to age; it reflects a combination of maturation and ability to complete the memory task. These findings help us understand why some children perform better than others on memory tasks and how memory improves as a function of age. - Neurocognitive Development Lab

## New Episodic Memory Study!

Episodic memory is the ability to encode and retrieve specific details of life-experiences, in such a way that an individual can "mentally time travel" to re-experience an event. The ability to recall these episodic memories and discriminate between them is thought to be supported by two distinct neural processes: pattern completion and pattern separation. Pattern separation, for example, is used when you differentiate the memory of what you ate for breakfast today versus

yesterday. The ability to recall episodic memories and discriminate between them improves with age, suggesting a role of pattern separation. Yet, children can also outperform adults on memory tasks when they have ample experience with the stimuli involved (e.g. child chess experts are able to recall game board arrangements better than adults), suggesting experience contributes.

Age and experience are difficult to distinguish during development because both contribute to memory improvement. A new study in the **Neurocognitive Development Lab** will examine how each contributes to improvements in memory. In the study, children will see pictures of different computer generated faces. Next, they will be tested on their memory for the faces they viewed versus faces that they did not view. Using experience with different types of faces as a measure, performance among children and adults of different races will be compared understand what role pattern separation and experience play in the growth of episodic memory. - *Neurocognitive Development Lab*

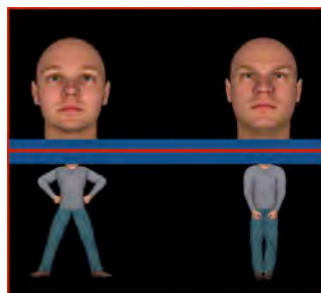
### Who's the boss: do children see social hierarchy?

The social world is complex and presents many cognitive challenges for children. Children must keep track of a daunting variety of people, and each person exhibits different personalities and capabilities. For example, some people are warm and friendly while others are cold and unfriendly, and some people are athletic and strong while others are not. As children keep track of people's varying personalities and capabilities, they also need to discover the nature of

others' social relationships. They should learn that some people are in charge and tell others what to do, while others do not have that same authority.

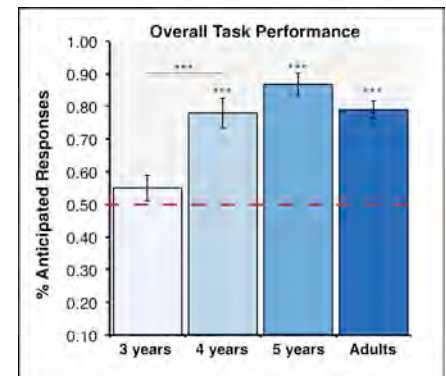
Adults make sense of this complex social environment by judging two people's social relationship on the basis of their traits or capabilities. For example, adults are more likely to think that a person who is strong is also in charge of others. Adults make these types of inferences systematically on the basis of a person's physical appearance (facial features) or nonverbal behaviors (postures).

In the **Lab for Early Social Cognition**, we investigate whether children, like adults, can infer that a "strong" person is also "in charge." To do this, we play a fun game with children where they see images of two people. Half of these images include people who differ in their facial features, while the other half of images include people standing in different postural expressions. For each image, we ask children to point to who they think is either "in charge" or the person they think is "stronger."



Because of the generosity of families like you, we've learned something exciting! By the age of 4, children begin to respond like adults and infer that a person who looks "strong" is also more likely to be "in charge" and vice versa. And just like adults, they respond by using differences in two people's facial structure or their body postures. In upcoming projects in our lab, we will continue to explore how children understand physical strength and what it means to be in charge of others. With

your continued support, we will learn more about children's knowledge of social power and its precursors in the modern world.



Children and adults' tendency to select mature, masculine faces and assertive, expansive postures as both "stronger" and "in charge".

- *Lab for Early Social Cognition*

### The protection of reputation

How do children react when someone's reputation is threatened? The **Lab for Early Social Cognition** is exploring this question by presenting 6-year-old children with a situation where one character is justly or unjustly blamed for ruining the possession of another character.

Children are first introduced to two puppets. They get to play with each of them individually. Next, a series of events unfold in front of them. One puppet creates an intricate drawing and leaves it unattended. Then, the other puppet ruins the drawing, either intentionally or accidentally. The drawing's owner returns to blame the guilty puppet.

This particular study is running through the end of Spring 2017, and we are excited to learn more about how children's responses might differ depending on the blamed puppet's intentions. - *Lab for Early Social Cognition*



## “Mind-reading” during social interaction

A crucial part of social interaction is being able to imagine what others might be thinking. This ability, called mentalizing, is often considered to be one of the key difficulties in autism, and it may be altered in other disorders such as social anxiety. Previous studies have identified several brain regions involved in mentalizing, but most of these used non-interactive tasks such as reasoning about fictional characters or photographs of faces. Recent evidence suggests there is something fundamentally different about engaging in a live interaction as opposed to merely observing others, and this difference may be apparent at the neural level.

To explore this possibility, we developed a new paradigm in which children chat with a peer while inside an MRI scanner, allowing us to measure the brain activity that underlies mentalizing within a live social interaction. During the chat, the children are asked to make inferences based on what they know about their peer’s beliefs, desires, and feelings. Half the time, the children ‘chat’ with a computer program instead of the peer, providing an offline basis of comparison for the interactive portion. We are currently conducting this study with typically developing children aged 8-12 and hope to extend it in the near future to children with autism. - Developmental Social Cognitive Neuroscience Lab

## Brain Scans and Movie Watching in Early Childhood

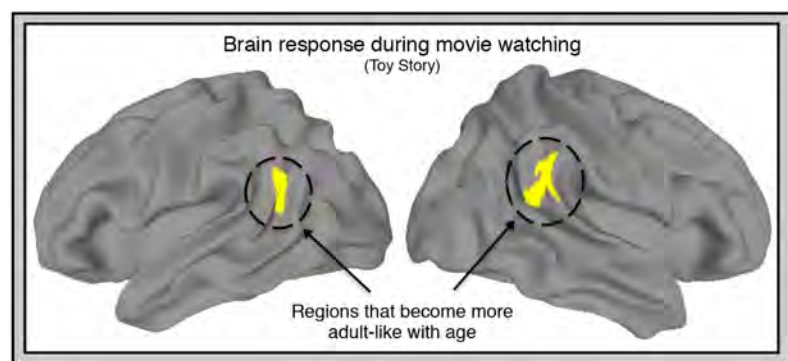
As many parents know, children change so much from within a few short years. Children remember more events with more detail, develop greater self-control, and are better at “theory of mind,” the ability to take another person’s perspective and think about other people’s thoughts or feelings.

While previous research highlighted how these abilities develop, we know less about the underlying changes in the brain at this age. This lack of knowledge is likely due the difficulty in collecting brain scans in young children- any movement from the child and the brain scans become blurry and hard to analyze.

However, recent work has shown that presenting children with a movie to watch during a brain scan can significantly minimize motion. In addition, while most research studies use simple pictures or words on the screen to study brain activity, watching a movie is more similar to how our brain processes information in the real world. It involves paying attention to both visual and auditory information at the same time (like faces and words).

At the **Developmental Social Cognitive Neuroscience lab**, we developed a study to understand how the brain’s response to these complex and dynamic events changes with age. Using, We collected functional magnetic resonance imaging (fMRI), we collected brain scans from both 4- and 6-year old children and adults, as they watched a clip from the movie *Toy Story*.

We found a significant relationship between children’s age (in months) and how much their brain response looked like that of an adult within the brain region known as the temporo-parietal junction (TPJ) on both sides of the brain (below). Previous work shows this region is important for thinking about the thoughts of other people in older children and adults, an ability that develops significantly during early childhood. This more adult-like brain activity in the TPJ might be related to those changes and future studies will directly relate these changes in the brain to children’s improvements in perspective-taking. - Developmental Social Cognitive Neuroscience Lab



## News from Psychology!

Welcome **Sydney Maniscolo**, the new lab manager for the Developmental Social Cognitive Neuroscience Lab • Welcome to the new lab managers for the Neurocognitive Development Lab, **Lisa Cox** and **Shane Wise** • Welcome **Morgan Botdorf**, the new graduate student in the Neurocognitive Development Lab • In the Fall of 2016, **Sarah Blankenship**, a graduate student in the Neurocognitive Development Lab, successfully defended her dissertation.



### Verb learning in children

In order to learn new verbs, children need to figure out what events in the world they refer to. The context of the sentence can be helpful: even if you don't know what *take* means, you know that "she took the truck from him" must at least refer to an event with a girl, a boy, and a truck. This kind of evidence can help children focus on relevant events. But to determine how children match new verbs to events they see in the world, we need to know whether they see those events the same way as adults.

If adults see a girl taking a truck from a boy, they view the girl, the boy, and the truck as the three participants in that event. To see if 9- to 12-month-olds view this event in the same way, we first show them a video of a girl picking up a toy truck, with a boy sitting nearby but not participating in the event.

As children become familiar with the event, their attention drops. Then, we measure whether their attention is recaptured by making a small change in the video: either the girl starts taking the truck from the boy or the girl picks up the truck in a different way.



If children are more surprised by the first type of change, this would suggest that they consider the boy a participant in the "taking" event though he wasn't a participant in the "picking up" event, just as adults do. *-Project on Children's Language Learning*

### What's the meaning of too?

Sometimes, what we say depends on what information is shared among the people in a conversation. The sentence "I ate peanut butter for breakfast too" can be used only if it is taken for granted that someone else also ate peanut butter for breakfast. This study explores whether children have learned this subtle aspect of the meaning of *too*.

Two researchers played a game with a child. One researcher hid a toy in one of three boxes. The other researcher was on the child's team and tried to help the child find the toy by giving a clue. This researcher might peek in the

# Linguistics

Research in the Linguistics Department focuses on the human capacity for language. To study this, researchers are looking at children's language development and the mental processes that support it.

red box and ask a question like, "Is the green box empty, too?" The use of "too" implies that the red box is also empty. If children understand this property of "too", we expect them to look in the third box.

We find that 4-year-olds are better at finding the toys based on these clues than 3-year-olds are, but we don't yet know why. Is it because the younger children don't understand *too*, or because the game is too complex for them to follow? Future work aims to figure out what develops between 3 and 4 and what role experience with the language plays in shaping children's understanding.



An example set up of the game

- *Project on Children's Language Learning*

## How do children learn new nouns?

This study investigates how 19-to-21-month-old children learn the meanings of new words based on the sentences those words occur in. We show children videos of a girl using a toy to affect another toy, like using a cloth to wipe a camera.



We describe these scenes with sentences that have a made-up noun, like “tig.” Then, we show the two objects and ask children to find the tig. By tracking where they look, we can see which object they think is the tig.



Which is the tig?

In previous studies, we’ve found that children interpret the made-up word differently depending on the structure of the sentence it occurs in. In a sentence like “She’s wiping with the tig,” adults understand that the tig is the cloth, but 19-month-olds often think that it refers to the camera. We think that children are predicting that the object being wiped will come right after the word *wipe* in the sentence. Children don’t make this mistake

when we satisfy this prediction and mention the object being wiped, (e.g., “She’s wiping *that thing* with the tig”). We’re trying to find out if children this age can understand sentences like “What is she wiping with the tig?”

If children understand this question like an adult would, they might notice that we are asking about the thing being wiped, and therefore that the tig is the thing being used to wipe. This will help us understand both whether children can learn new nouns in these types of questions, and whether they understand these questions in the same way that adults do. - Project on Children’s Language Learning

### Ambiguous sentences and how questions may clarify

A sentence can communicate more than it appears to say. For example, in (1) the speaker asks “what Smurfette cleaned” even though that question is not fully explicit.

(1) *Smurfette cleaned something. Can you tell me what?*

This kind of implicit meaning can help us understand other parts of how sentences are put together. Notice the ambiguity of (2).

(2) *Smurfette moved the bunny that cleaned the log with a paintbrush.*

This sentence can mean either that Smurfette used the paintbrush to move the bunny that cleaned the log, or it can mean the bunny used the paintbrush to clean the log. However, when I ask a very similar question, this ambiguity seems to disappear

(3) *What did Smurfette move the bunny that cleaned the log with?*

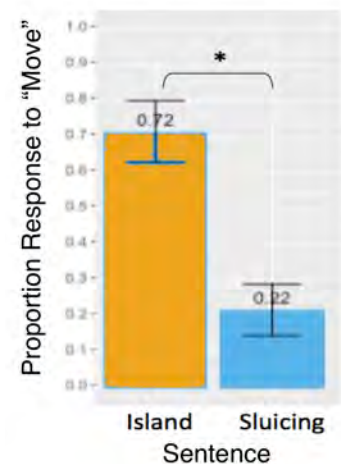
Now the question can only be about what Smurfette used to move the bunny. It can’t be about what the

bunny used to clean the log. Why? Is it just because that second meaning is a weird thing to ask? We can use elided questions to probe this.

(4) *Smurfette moved the bunny that cleaned the log with something. Can you tell me what?*

Here, the question seems to retain the ambiguity of the statement. So, the fact that (4) is ambiguous in a way that (3) is not tells us that the problem with (3) can’t be that the meaning of the question is too weird. Instead, it must be something about its form.

In this study, we asked whether even 4-year-old children distinguish (3) from (4). And they do. Looking at the graph below, we can see that when we ask (3), children gave an answer about what Smurfette used to move the bunny 72% of the time. But when we asked (4), they only gave that answer 22% of the time. This shows that the question about the cleaning is at the front of their minds, but they know that (3) just isn’t a good way to ask it.



- Project on Children’s Language Learning

Interested in participating in fun and interesting studies like the ones you read about here?

Visit our website at [childstudies.umd.edu](http://childstudies.umd.edu) to sign up on our confidential family list!

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Spring 2017

# Infant & Child Studies

## At the University of Maryland



Thank you for your participation!

Our research would not be possible without families like you!

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