Infant & Child Studies

@ The University of Maryland

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Contact Us

childstudies@umd.edu
(301) 405-6302

1401 Marie Mount Hall, UMCP
College Park, MD 20742

childstudies.umd.edu

UMD Infant and Child Studies

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 always welcome new families!

The Infant & Child Studies offices always welcome new families to participate in research. Spread the word to friends and colleagues!

Hearing and Speech

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

Listening in noise: Trouble hearing, or trouble paying attention?

The input children receive is a critical factor in their language development, but much of the language they hear occurs in noisy or multi-talker environments. Research suggests that children are also affected by background noise much more than are adults. However, we don't know *why* children have more trouble listening in noise. One possible reason is that noise can degrade the quality of the target signal (e.g., by making portions of it inaudible), which children may find more difficult due to their more limited language experience. Another possible reason is that noise can serve as a source of distraction, and therefore affect children more strongly because their attentional skills are still developing.

Several of our current studies seek to distinguish the effects of degradation of the signal from the effects of distraction, and identify which one plays the greater role in children's difficulties. In these studies, children participate in two tasks: one in which they listen to speech that is presented with different kinds of noise, and another that assesses their ability to ignore distractions while they play with toys. Later, we'll examine how their performance on these two tasks relates. These studies will help us understand how noise affects children's speech processing, and impact how we think about noise in children's learning environments. *–Language Development Lab*

The impact of concussion on children's language

Each year nearly half a million children go to the hospital with a head injury. Children and teens have a higher risk for severe brain injuries than adults, and often require a longer recovery. Even concussions, a relatively minor form of brain injury, can result in many difficulties, commonly including trouble naming objects or people that are perceived correctly (severe "tip-of-the-tongue" experiences). Although children with concussions often stop experiencing physical symptoms within 7-10 days, little is known about how long the injury continues to impact children's language, which can affect their education and social growth.

In this study, we asked children and teens who had recently experienced a concussion and healthy children of the same ages to name a series of pictures as fast as they could. Each picture was presented for less than a second and the next picture appeared very quickly, so the task required attention and quick thinking. We wanted to know if the children recovering from a recent injury would name images correctly as often as healthy children (e.g., see a picture of a cat and know to say "cat"), but more importantly, we wanted to see how much longer the recovering children would take to say the correct name. With mild injuries like concussion, we found that recovering children and healthy children were not different in how often they named pictures correctly. However, after an injury, children did take longer to say the correct name.

Most children with concussions are expected to recover within 7-10 days. After that, they often return to their normal school schedule and recreational activities. However, when we examined how many days the recovering children needed in order to name objects as quickly as the healthy children, we found that they needed around 20 days after the injury to return to the same speed as healthy children. This is well beyond the amount of time most people think it takes to

Continued

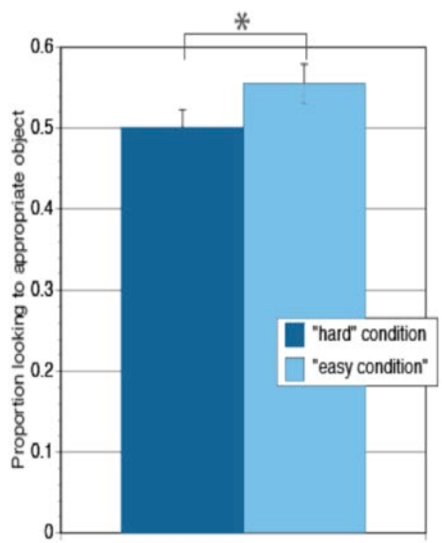
recover! These results suggest that slowed thinking of language could give a child difficulty even after they return to participating in school and sports. *-Language Development Lab*

Adjusting for foreign accents

No two people produce sounds in exactly the same way. How do children adjust to differences between speakers and recognize when they're saying the same word? A recent study in our office has examined how well toddlers can learn words when they hear them from speakers with different accents.

Foreign accents can seem more or less strong depending on the word the speaker is saying. For example, Spanish has fewer vowel sounds than English: just the ones in *feet*, *met*, *palm*, *goat*, and *goose*. When speakers who have a Spanish accent say an English word and the sounds in that word are also in Spanish, like *met*, they sound more similar to a native English speaker. When they say a word like *fit*, which has a vowel sound that Spanish doesn't have, the speaker will produce it more like one that *is* in Spanish – so *fit* ends up sounding a lot like *feet*! For children learning new words and trying to generalize their knowledge across speakers, this means there are "easy cases" like *met* where the accented speaker sounds more similar to a native speaker, and "hard cases" like *fit* where they can sound very different.

Children aged 31-33 months participated in a study in which they were taught four words for unfamiliar objects by a speaker with a Spanish accent: *mef* and *shoon* (easy cases), and *fim* and *nutch* (hard cases). Afterwards, they were shown two objects, and a native English speaker told them to look at one of them, using a word they had just learned from the Spanish accented speaker. We found that for the easy cases, where the two speakers sounded more similar, children looked toward the correct object. But for the hard cases, children looked at both objects equally, indicating that they didn't recognize that the two speakers were saying the same word. Soon, our office will investigate what factors can help children generalize between speakers, even when the words they say sound very different!

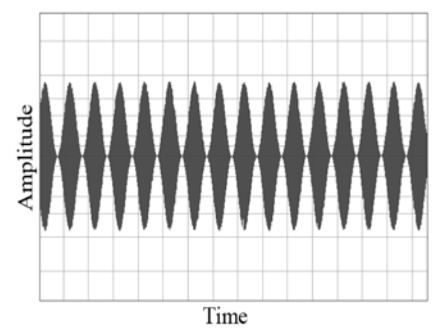


* Indicates significant difference

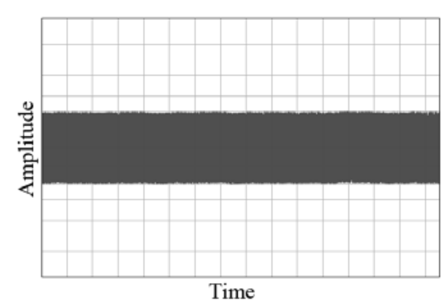
-Language Development Lab

"Amping up" the difficulty?

Almost all of the speech we hear occurs with some kind of background noise: traffic, other conversations, television, music, heaters, fans, and more. But what kinds of noise are most difficult to listen through? Surprisingly, the answer to this question is different for young children and adults! Adults have less difficulty listening to speech when the noise varies in amplitude, having points where it is louder or softer, like another person talking in the background or a beeping noise. Adults can take advantage of the times when the background noise is softer, and use the speech they hear at these points to predict or fill in what the speaker is saying when the noise is louder. In contrast, infants have *more* trouble with noise that varies in amplitude than they do with noise that's more constant. The changes in volume might grab their attention and distract them, and with less language experience, they are less able to "listen through the gaps" and make predictions like adults do. In our office, we're currently testing toddlers in their ability to listen to speech in constant and varying noise, to try to find out when this developmental change happens and children start to show the same pattern as adults!



Noise with varying amplitude



Noise with constant amplitude

-Language Development Lab

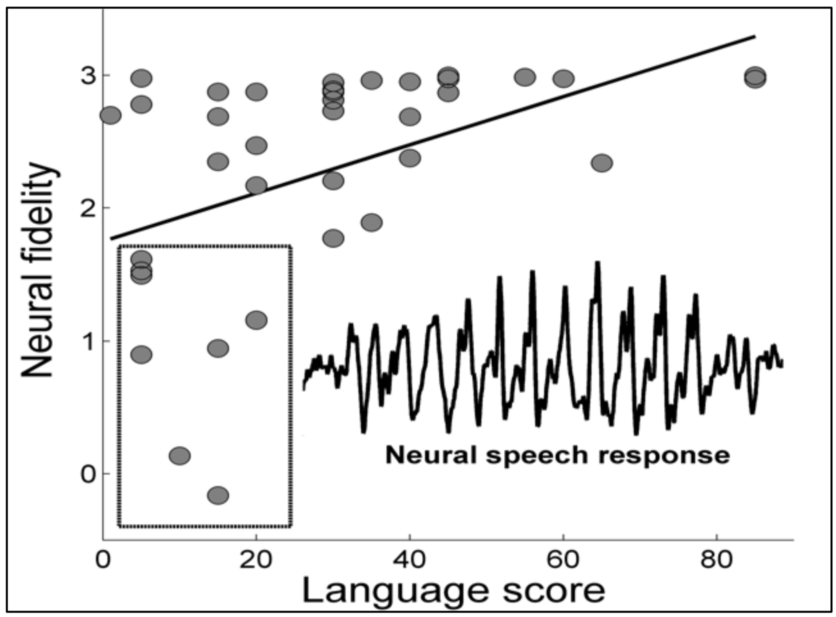
Infant brain responses predict language development

For parents of children with language disorders, getting a diagnosis can be a long and frustrating journey. Children must fall well behind their peers before a diagnosis of language disorder is possible. When children fall behind in language, it can be hard to catch up. Early diagnosis and early intervention lead to the best outcomes for children with language disorders. We know that language learning begins in the womb. What if we could predict a child's language development in infancy, months before he or she will learn to speak? New advances in brain imaging technology may hold the key to doing just that.

Here at the Hearing Brain Lab, led by Dr. Samira Anderson, we conducted a study to differentiate between infants with good or poor brain responses to speech in order to predict later language development. We recruited infants and played speech syllables into their ears while recording their brain's responses using electrodes placed on their heads. We later sent a language questionnaire to each of the infants at the age of 18 months. This questionnaire estimates language development from the number words the baby can say.

We analyzed the brainwaves of the infants when listening to the speech syllables. The brainwaves of infants with better language development more closely mirrored the soundwaves being played into their ears than their peers with poorer language development. The figure below plots language scores and neural (brainwave) fidelity.

The babies with low neural fidelity also have low language scores. This pattern can be seen as early as 3 months of age, almost a full year before language concerns typically arise. We hope to be able to continue this research so that we can make predictions about individuals' language development. If successful, we can flag individual infants for early language intervention, thus improving their ultimate language development outcomes. *–Hearing Brain Lab*



Announcements from Hearing and Speech

- Kimmie Wilson graduated with a master's degree in Speech-Language Pathology in Spring 2015 and is currently working in Montgomery County.
- Caroline Kettl, Catie Penny, Catherine Wilson, and Allie Urbanus graduated in Spring 2015 after working in the Language Development Lab as undergraduate research assistants. They are now all pursuing master's degrees in Speech-Language Pathology: Allie at the University of Wisconsin-Madison, and Caroline, Catie, and Catherine at UMD. Caroline and Catie have continued their work in the lab as graduate assistants!
- The Language Development Lab's work on background noise and its effect on children's ability to learn language was featured in an ABC News article in February 2016.

Human Development

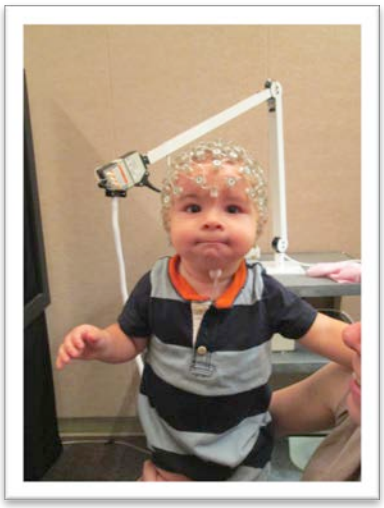
The core mission of the Human Development department is to advance our knowledge on the growing human across varying levels. This can range from an individual's genetic make up to the overarching society.

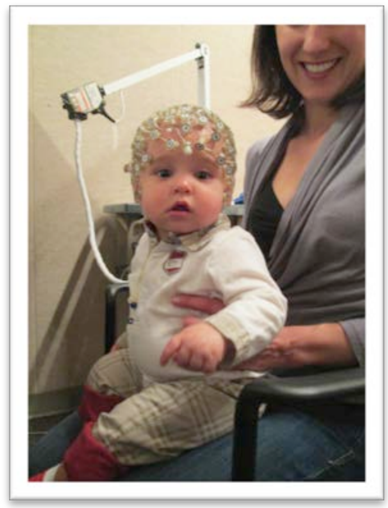
Infant action and communication

How do infants understand and interpret others' actions? Current theory suggests that understanding actions depends on both cognitive development within the child, and the experiences the child has interacting with others, and that these may also help lay the foundation for developing language skills.

At the Child Development Lab, we are interested in learning more about how children's action understanding is related to their experience as well as their developing language abilities.

To do this, we observe infants interacting with both an experimenter and their parents during a structured play time, and we also measure infants' brain activity during interactions using electroencephalogram (EEG), which is non-invasive and infant-friendly. We are currently recruiting infants aged 10- to 12-months to participate in this study. *–Child Development Lab*





Study Participation Opportunity!

The Child Development Lab at the University of Maryland is starting a new study to examine infant temperament and brain development! We are recruiting **two-month-old infants** to participate in up to four visit sessions (two at the University of Maryland and two at the National Institutes of Health in Bethesda, MD) before the infant's 14-month birthday.

Compensation is provided for your time and participation for each session. Visits will include observational and behavioral assessments, functional magnetic resonance imaging (fMRI), and the completion of questionnaires. Please contact Brittany DeVries at infantstudy@umd.edu for more information or give us a call at 301-405-2835.

Welcome Dr. Lucas Butler!

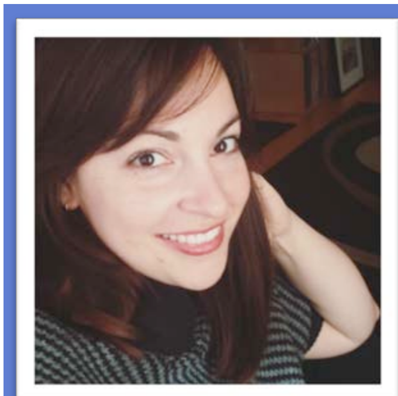
Dr. Butler received his Ph.D. in Psychology from Stanford University. His research focuses on how early cognitive development is shaped by overarching social contexts.

Providing guidance to support parent-child math talk

Previous research has shown that parents who engage in talk about numbers with their children can promote their preschoolers' early math knowledge, helping them be prepared for entering kindergarten. Everyday activities and play provide great opportunities for parent-child math talk. However, it is also possible that direct teaching activities where math learning is the main focus would be more effective for engaging in math talk and promoting children's learning.

To examine this, we asked parents and their 4- and 5-year-olds to Engage in one of three activities in our office for 15 minutes. Families were asked to use a set of toy wooden foods, which were divided into pieces and held together with Velcro so they could be pulled apart and put back together. The families were asked to use the toy foods in one of three contexts: how they would typically play at home, in a playful math learning context with a storybook, or a direct math learning context with a worksheet. In both learning contexts, parents were given additional materials that included questions related to learning fractions (e.g., dividing food equally for several friends). The interactions were analyzed for the amount of number-related talk that both parents and children used.

We observed that parents and children in both learning contexts engaged in more frequent and diverse talk about numbers compared to parents and children in the play-as-usual context. This suggests that activities such as storybooks where math concepts are clearly highlighted may help some parents find ways to talk about math that they may not recognize during their typical play with preschoolers. Providing such guidance to parents may enable them to engage their children in more frequent, higher quality number talk that contributes to early math learning. *–Early Childhood Interaction Lab*



Student Spotlight!
Sarah Eason

Doctoral student Sarah Eason successfully defended her dissertation this past September. Her research examined how social contexts relate to children's early math learning. She is now a post-doctoral fellow at the University of Chicago!

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

Downtown Silver Spring · Washington Parent's Montgomery County Camp & Summer Fun Expo · We ♥ GradTerps! · Bowie Town Center Simon Malls · The Mall at Prince Georges · Wee-Sale Children's Consignment Sale · Owen Brown Community Association

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.

Does sentence structure matter?

Adults have specific expectations about how sentences of their language should describe events in the world around them. For example, imagine a scene where a girl hits a tower of toys with her hand, and it topples over. We'd expect a sentence describing this scene to mention both the girl and the tower of toys, because they seem like important participants in the event. A sentence like "She toppled the tower" or "She toppled it" would conform to our expectations, but a sentence like "She played" would be somewhat strange, because it doesn't mention the tower at all. In this study, we want to see whether 19- to 21-month-old children have similar expectations about how sentences should describe the scenes they see. Will children also expect a sentence about the toppling scene to mention both the girl and the tower of toys?

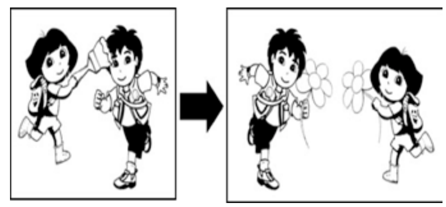
To investigate this question, we use a method that measures how much children are surprised to hear sentences describing a scene. First, we show children a video of a girl toppling a tower of toys until they become very used to it, leading to a drop in attention.

Then, we play a sentence with a made-up verb that either mentions both the girl and the tower, or only mentions the girl but not the tower. We measure whether children recover attention when they hear this sentence, which shows us whether they are surprised to hear it. We're still in the process of collecting data, but we've preliminarily found that children are not surprised to hear a sentence like "She blicked it," which has the structure of a sentence like "She toppled it"—it mentions both the girl and the tower. However, children are surprised to hear a sentence like "She blicked," which has the structure of a sentence like "She played"—it doesn't mention the tower. Even though children don't know all of the words in these sentences, they pay attention to the sentence structure, and are more surprised to hear one type of structure than another. These results tell us that children at this age have similar expectations as adults do about how people use sentences with specific structure to describe events in the world.

-Project on Children's Language Learning

How do children understand sentences when parts are missing?

As adults, when we hear a sentence like *"Dora painted Diego before picking the blue flower"* we know that the one who picked the blue flower was Dora, not Diego, even though the subject of "*picking the blue flower"* is not pronounced. However, previous studies have reported that as late as their 6th birthday, children have a different intuition: that this sentence can mean that either Dora or Diego picked the blue flower.



To investigate why children understand this type of sentence differently than adults do, we set up a coloring game that lets 4-5 year old children show us who picked the blue flower by coloring the pictures. In this game, children color in different items on an iPad (for example, Diego's flower or Dora's flower), based on a sentence that the researcher said out loud. With a sentence like *"Dora painted Diego before picking the blue flower,"* we found that children consistently (83% of the time) colored Dora's flower blue, not Diego's. This suggests that previously, when children said that it could be either Diego or Dora, the activity that was used might have been too difficult for children at this age, while the coloring activity made things easier so that children were more able to focus on the sentence.

Currently, we are exploring whether the mistakes that children made are related to parts of their brain development aside from language (for example working memory, which may be needed to understand sentences like these), and whether even younger children have the same understanding of these sentences as the 4-5 year olds. *-Project on Children's Language Learning*

What counts? Number word learning in different languages

Counting might seem easy, but learning what number words mean takes children a long time. They first memorize a count list, and then slowly learn the exact meanings of cardinals *one* through *four* one by one, before they ultimately realize that the last number counted corresponds to the quantity of things. This tiered pattern seems to be universal: studies show that children go through these stages regardless of the language they speak.

But cardinals (*one, two, three)* are just one kind of number word. What about ordinals like *first, second, third?* We can make most ordinals by adding *–th* to a cardinal, which may help children understand their meaning: while nothing about the word *four* reveals that it refers to exactly four things, *fourth* is clearly related to *four.* That makes the meaning of most ordinals transparent, though this rule does not apply to the irregular ordinals *first, second, third,* or *fifth.*

We can find out if (in)transparency affects how children learn these number words by asking children to play a packing game. A puppet is packing for a trip and all of his things are getting in line to jump into his suitcase. Because not everything will fit, the child gets to help the puppet choose the right things to pack, like the *third piggybank* or *four hats.* This shows us what cardinals and ordinals they understand.

This is Moe the Monkey getting ready for his trip.

The third piggybank gets to come. Can you find the third piggybank and pack it

Moe going to play in Holland.

We can also compare these findings to how children learn ordinals in other languages, like Dutch. Dutch has more transparent ordinals than English; translated literally, the list starts *first, twoth, third, fourth, fiveth, sixth.* We learned that Dutch children start by learning *first,* and then go on to *twoth* and *fourth,* skipping *third*! Some children know higher ordinals like *ninth* before they comprehend *third*, and many Dutch children say *threeth*. That suggests they use a linguistic rule like the one above to figure out what ordinals mean: linguistic knowledge seems to influence the pattern of ordinal learning. English-speaking children receive less clear evidence for such a rule, does that mean they learn ordinals differently? This cross-linguistic comparison will teach us something about the effects of (in)transparency in understanding ordinal concepts. *-Project on Children's Language Learning*

Learning novel nouns

Depending on the sentence used to describe an event, it's easy to get multiple interpretations for a new word, even if you're watching the same event. For instance, imagine a scenario where a woman is using a special cloth to smudge a toy. If you hear this event described as "She's smudging with the plumbis", then you will think *the plumbis* is what the special cloth is called. However, if you hear the event described as "She's smudging the plumbis", then you will think *the plumbis* is what the toy is called, not the cloth. Importantly, even if you just heard the first sentence, and didn't see anything, you would still be able to figure out what *the plumbis* meant. It must be an object used to smudge something. Likewise, if you just heard the second sentence without any visual cues, you would think that *the plumbis* was something that was getting smudged. Previous research has shown that children listen to how words are used in sentences and apply this information to learn about what new words mean from a very young age. In this study, we're interested in whether children between 16 and 17 months-old can use sentences like this to learn the meanings of new nouns.

We created new words, like *plumbis*, so that we could make sure children had never heard them before. Then we showed children the videos of two objects interacting with different sentence description. They either heard sentences like "She's smudging with the plumbis" or "She's smudging the plumbis." Then, we presented both objects on different sides of the screen. When asked to find the plumbis, children look toward whichever object they think *the plumbis* is, based on sentences they heard. The goal is to see whether children at this age can understand and then use these kinds of sentences to learn new words. *-Project on Children's Language Learning*

Psychology

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

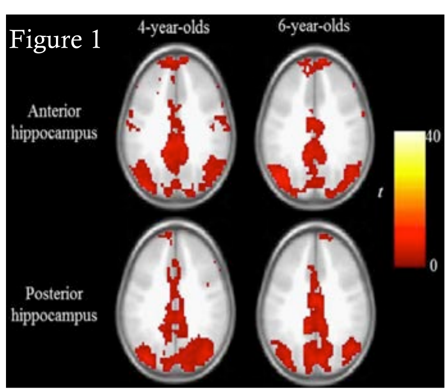
Episodic memory in the growing brain

Children's ability to remember contextual details about an event (where it happened or the order of activities) relies on a network of brain regions. Our lab wanted to see how changes in this brain network would be associated with episodic memory in early childhood. To study children's memory for details, we asked 4- and 6-year-olds to interact with toys in two different rooms (see Figure 1). In addition, for each toy children learn a novel action associated with the toy (they either put it on their head, beat it like a drum, or hug it). Later we show children some of the same old toys as well as some new toys. If they say they have seen the toy before we ask 1) which room it belonged in and 2) which action we performed with it. We also asked kids to participate in a functional brain scan to see which brain regions would be related to their memory for contextual details.

Both groups of children did well at remembering which toys they played with AND the details that went with the toys. We also found

that both groups of children had a similar brain network (see Figure 1). However, when we compared how brain region function related to their memory for contextual details, differences appeared between the two age groups. We found that 6-year-olds' episodic memory was related to activity in regions *within* this brain network, while 4-year-olds' episodic memory was related to activity in regions *outside* this brain network.

Figure 1



This suggests that younger children may rely more on regions "outside" the memory network to complete episodic memory tasks and as children develop, their brains transition to relying on the mature hippocampal memory network to better remember contextual details.

Our lab is currently conducting a large scale NIH-funded study with children aged 4- to 8 years to further investigate these memory-brain relationships in early childhood. *–Neurocognitive Development Lab*

Preschoolers' ability to pay attention to a third party's social intentions

Young children are often enthusiastic to help other people. Previous research has shown that by the second year of life, children are consistent in helping others achieve physically based goals, like picking up a dropped object. In addition to physical goals, people often express socially based goals, such as getting the attention of another person. So how do children behave when they see that somebody needs help with a

Continued

social goal? To study children's willingness to help in a socially based task, we had 3-year-old children participate in a play session with two researchers. At one point, a researcher (The Caller) needed help with a physical task: picking up a dropped pen. At another point, the same researcher needed help with a social goal: getting the attention of the other researcher (The Player). The presentation of the social goal occurred twice in a randomized order: once with The Player unable to hear The Caller's attempt to gain attention and once with The Player explicitly telling The Caller that she was busy before attempts to gain attention. The responses and behaviors of the children were recorded in each scenario.

Results show that children were significantly more likely to help in the scenario with the physical task (i.e. the dropped pen). Between the two social goal scenarios, children helped less often when The Player had previously indicated that she was busy. This indicates that children were hesitant to inform The Player when The Caller's social goal conflicted with The Player's preferences. Moreover, it was shown that personality traits, such as shyness, had an influence on children's willingness to help. From a parent-report measure (EAS) looking at shyness, children having higher shyness scores were less likely to help in both social helping scenarios.

Overall, this study shows that 3-year-old children can be good helpers and are aware of others' social intentions when evaluating a situation. This is particularly evident if they recognized that helping one person's goal would violate the wishes of another. *–Lab for Early Social Cognition*

Rewards in social interactions

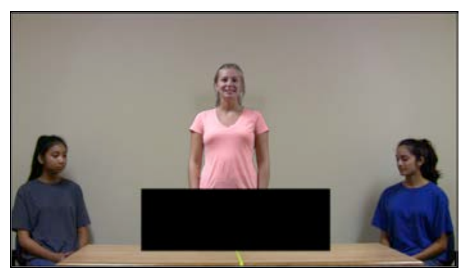
Throughout the lifespan, humans are motivated to interact with each other. What makes social interaction so rewarding for children? One explanation is that the brain's reward system is sensitive to social interaction. In this study, we examined the brain responses of children aged 8-12 while they engaged in an interaction with a peer. Children answered questions about their own likes and hobbies (e.g., "I like soccer") and then learned if the peer agreed (e.g., "Me too"). For some questions, children were 'chatting' with a computer program instead of a person. For those questions, children still answered, but only saw whether or not their answer was the same as a randomly generated answer (e.g., "Matched").

We found that the brain's reward system was more engaged when sharing with a peer than with the computer program. Further, other brain regions involved in social processing were also more active when sharing with the peer. Neural response to the peer was larger in older children, indicating that children's brains may become more sensitive to peer interaction as they enter adolescence. Discovering how the brain supports social interaction has implications for disorders like autism, where social motivation may be atypical. We are excited to extend this project to even more children over the coming months! *–Developmental Social Cognitive Neuroscience Lab*

Helping expectations in friends

Children gather information from social interactions and use it to predict how people will act in the future. Our lab wanted to explore how children use information from interactions to figure out if two people are friends. We also wanted to know if children use this information to predict if one person will help another. To answer these questions, we asked 2 ½- to 3-year-olds to watch a series of videos on an eye-tracker (a screen with a small camera that tracks the child's eye movements).

Children were introduced to a protagonist as she played with her toys. Then, they met two other characters. One character interacted with the protagonist in a friendly way (by sharing her snack or playing with blocks together) and another character played or ate on her own. Then, all three of the characters were presented on the screen (photo below). The protagonist fell behind a desk, and children heard a series of escalating prompts that indicated that she needed help. During this time, our eye-tracker monitored where children were looking.



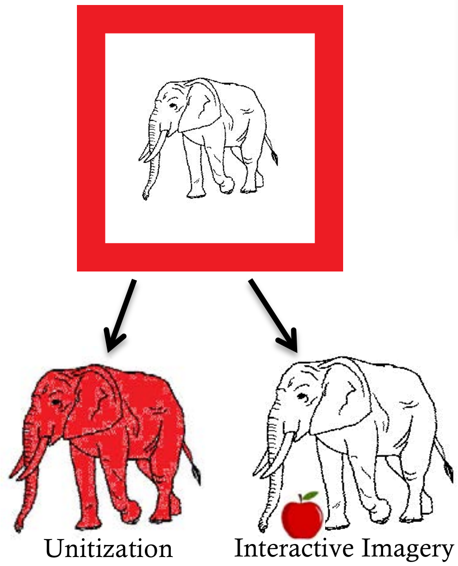
When the protagonist explicitly asked for help, children looked longer and more often at the friendly character than the character who played alone. This suggests that children expect the friend to help more often when the protagonist is in need, rather than another person.

Our lab is currently exploring how other types of relationships could influence children's helping expectations. *–Lab for Early Social Cognition*

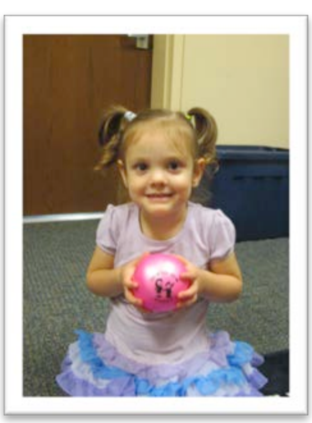
Memorization strategies in middle childhood

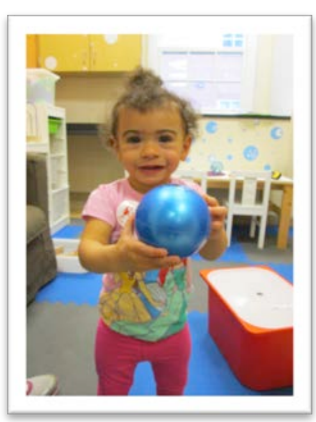
Children younger than 8 years of age are notoriously bad at remembering multiple pieces of information that go together, for example the route they would take to get from their house to the bus stop. This is called memory binding. In our office we are trying to determine if we can improve memory binding skills in young children. One way we are doing this is by teaching them visualization strategies. Visualization strategies involve forming a mental image of what you hope to remember.

In a recent study, we presented 6- & 8-year old children with pictures surrounded by colored borders (e.g., an elephant surrounded by the color red). Children were told their job was to remember what color went with each picture. We then taught children one of three strategies. One group of children learned a unitization strategy where they visualized the picture in the color of the border (e.g., a red elephant). One group was taught an interactive imagery strategy where they were told to visualize the picture interacting with another item the color of the border (e.g., an elephant eating a red apple). The final group of children were a taught a separate imagery strategy where they were told to visualize both the picture and another item the color of the border (e.g., an elephant and a red apple), but nothing to integrate the picture and the color.



We found that both the unitization and interactive imagery strategies boosted memory performance compared to the separate imagery strategy. In fact, children who used the separate imagery strategy remembered only half of what the other children remembered! These findings suggest that when children are trying to remember relations between multiple pieces of information, they will benefit most from strategies that integrates the pieces of information together. – *Neurocogntive Development Lab*





Announcements from Psychology

-Welcome to Kelsey Canada! She is a new graduate student in Dr. Tracy Riggins' Neurocognitive Development Lab.

-Welcome to Liat Hotz, Undergraduate Lab Coordinator, and Ruth Ludlum, Lab Manager, in the Developmental Social Cognitive Neuroscience Lab.

-Welcome to Marissa Clark! She is a full time Research Assistant in the Neurocognitive Development Lab.

-The Developmental Social Cognitive Neuroscience Lab's Manager, Kayla Velnoskey, has entered into Yale's doctoral program in Cognitive Psychology.

-Kate Rice, a graduate student in the Developmental Social Cognitive Neuroscience Lab, has accepted a faculty position at the University of Texas starting Fall 2016.

-Liz Mulligan, the Lab Manager in the Neurocognitive Development Lab, will be attending Stony Brook's Clinical Psychology doctoral program in Fall 2016.

-The Lab Manager in the Lab for Early Social Cognition, Emma Larson, will be attending LSU's School Psychology doctoral program in Fall 2016.

-Congratulations to Dr. Tracy Riggins on the birth of her baby boy, Cole.

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Spring 2016

Infant & Child Studies

At the University of Maryland

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Contact Information

Email: childstudies@umd.edu

Phone: (301) 405-6302

Website: childstudies.umd.edu

Address: Infant & Child Studies

1401 Marie Mount Hall, UMCP

College Park, MD 20742

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