2025 NEWSLETTER

INFANT AND CHILD COGNITION LAB

It has been a busy year running studies with children and adults! We have continued running our studies over Zoom, in the lab, and off-site. We are looking forward to continuing this, as well as bringing families back to the lab in-person!

We would like to sincerely thank all of our study participants who have helped us to answer questions about children's abilities to keep track of number, space, and time, and also how children think and feel about math and other cognitive abilities. Our work is not possible without the families, schools, museums, and daycare centers who partner with us. We hope this newsletter allows you to further learn about the important work that you contribute to and we look forward to continuing to work with you!

OUR LAB TEAM

Dr. Sara Cordes | Principal Investigator

Dr. Sara Cordes is a Professor and Associate Chair in the Department of Psychology & Neuroscience at Boston College and the Principal Investigator of the Infant and Child Cognition Laboratory (the ICCL). Research in her lab centers on understanding how infants, children, and adults keep track of basic quantities (ie., time, number, and amount), how these quantity representations may be impacted by social, linguistic, or contextual factors, and how these representations relate to later mathematics achievement.

Stacee Santos | Post-Doctoral Fellow

Stacee's research explores the intersection of language and cognition, with a focus on how language experience shapes cognitive development. Her work has highlighted the role of language experience in the emergence of early numerical concepts in Deaf and Hard of Hearing children and continues to investigate how language access influences how children develop. Currently, she is examining the relation between language and executive function, particularly the impact of language deprivation on EF development.

Isabelle Boni | Post-Doctoral Fellow

Isabelle is interested in various branches of mathematical cognition including verbal and non-verbal representations of number, arithmetic, geometry, and understanding of abstract concepts such as infinity. Her research involves developmental, cross-cultural, and comparative approaches.

Taylor Stone | Graduate Student

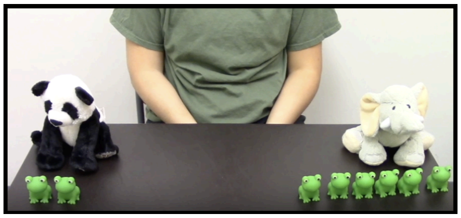
Taylor is broadly interested in children's social and numerical cognition. Her research explores how early math skills, such as counting, shape children's ideas about fairness and sharing. She is also interested in how children reason about confidence and competence across varying academic domains. Through this work she aims to better understand how early experiences with number and social expectations can influence children's academic motivation and self-concept in different learning environments.

Carolina Alvarez | Graduate Student

Carolina conducts research on numerical cognition across the lifespan, with the goal of shedding light on why certain individuals struggle with abstract numerical concepts. She is working on projects that aim to contribute to the development of interventions that can facilitate math learning in children, determine whether individual differences in the way individuals process numbers is associated with math performance, and identify external factors that are predictive of math difficulties.

How does counting shape children's ideas about fairness?

When children share, they don't just care about what is being shared - they also pay attention to ***how*** items are shared. In a recent study, we explored how young children (ages 2.5-5) evaluate people who distribute resources fairly or unfairly. We were especially interested in whether the use of counting affects how children judge fairness. Children watched short videos where two people shared toys between two stuffed animals. Importantly, one of the people counted while sharing, while the other one did not.

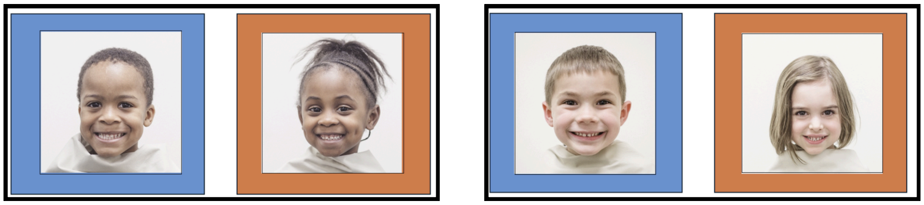


We found that only children who had already mastered counting considered the person who counted as a "better sharer". That is, proficient counters understood counting was a means to promote fairness. However, younger children who had not yet mastered counting did not show this preference, suggesting that only after children master the count procedure do they understand the intent of counting. These findings highlight how early math skills are connected to social development while helping us to better understand how children develop ideas about fairness.

How do children view confidence in math and reading?

Confidence and competence are both important for academic success. In this ongoing study, we're investigating how children (grades 2-5) view how confident and competent children of different genders are in the domains of math and reading and how these beliefs change with age. Children were shown images of boys and girls and asked who they thought would be more confident in their abilities or more capable in math and reading. They also answered questions about their own abilities. So far, we find that children across all grades believe that girls are more confident in reading. Moreover, older children (4th-5th graders) are more likely to think that boys are more confident in math. When it comes to how children view their own abilities, younger students tend to think they're better at reading, while older students increasingly say they're better at math.

These early findings suggest that academic stereotypes might become stronger as children get older, especially, in math. Interestingly, this seems to be happening a bit later than what other studies have found, hinting that children's beliefs about school subjects may be changing over time. We're continuing to collect data to better understand these trends and how to better support children in the classroom encourage all around confidence in all learners.



An example of the stimuli shown to child participants during this study.

ManyNumbers

From an early age, children are able to compare the sizes of small groups of objects. Even without language, infants and toddlers can tell the difference between 2 and 3 toys, and distinguish between 4 toys and 12 toys. Surprisingly, however, studies show toddlers fail at comparing small groups to large groups: 1 toy compared to 4 toys, for instance. This may indicate the presence of two separate – and initially incompatible - systems of numerical representation: the Object Tracking System for small sets, and the Approximate Number System for large sets.

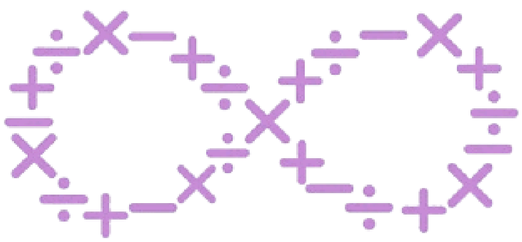
However, research supporting these ideas comes from a limited number of labs and children. In our ManyNumbers Small Sets project, an exciting new international study, we will work with researchers across several labs to understand when and how toddlers develop the ability to compare small and large sets, and whether language skills might be relevant to this ability. This study will test a substantially larger number of participants than prior studies, estimated at over 350 children (from 14-36 months old). Apart from leading this project, we will be assisting as a participating site for another ManyNumbers project exploring how children learn number words, which will include children between 30 and 71 months old.

For more information, see www.manynumbers.org.

How do children learn about infinity?

The rise and fall of the sun, the night sky, fractal patterns in nature: these are examples of natural phenomena that appear to extend indefinitely. Numerical infinity is similarly unending, but it is an abstract concept that is not directly observable. While we have a familiarity with natural phenomena, do we have a natural intuition about numerical infinity? Or must it be formally taught?

Previously, researchers have asked 4–6-year-olds in the US questions like, “If I keep counting, will I ever get to the end of numbers, or do numbers go on forever?” Overall, children’s answers suggested a limited understanding of numbers’ endlessness, though the survey’s wording may have underestimated participants’ knowledge.



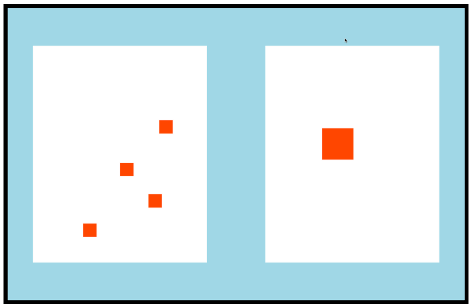
In our first study, we surveyed a new sample of US children using a modified task, finding more children than previously estimated showed an understanding of endlessness. Still, because these children live in a culture emphasizing formal mathematics, it is difficult to disentangle what they might have been taught from what they might independently intuit.

In our second study, we surveyed Tsimane’ adults, a population living in the Amazon who were raised when formal schooling was less prevalent in their region, and so had minimal classroom exposure. In this population, a large proportion—more than US children—appeared to understand endlessness.

Overall, our findings suggest infinity-related concepts such as numerical endlessness can be acquired with minimal formal schooling, suggesting endlessness may be more intuitive than previously thought.

Does language experience promote spontaneous focus on numerical information?

In this study, we explored the impact of early language experience on a child's tendency to spontaneously focus on numerical information (SFON) in the environment, a skill found important for the development of math abilities. In a large sample of 3-6-year old English speaking Deaf and Hard of Hearing (DHH) preschoolers and hearing peers, we provided the first investigation of SFON in DHH children. Although DHH children fall behind their peers in math abilities, interestingly, we found no group differences in children's SFON, suggesting that the paying attention to numerical information is not as tied to language input as suggested by prior work. While the DHH children in this study underperformed on the numerical assessments when compared to their hearing peers, we show that language experience—the cumulative amount of time a child has had auditory access to language—accounts for differences in early numerical abilities between English-speaking DHH and hearing children. Importantly this suggests that it is exposure to language – likely the quality and quantity of numerical input provided by caregivers – that helps foster these early numerical abilities, but not SFON.



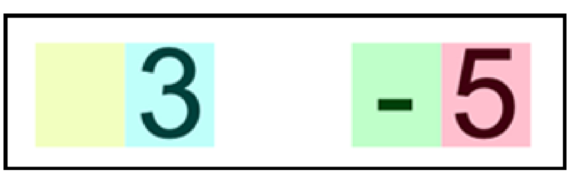
An example of the stimuli shown to child participants during this study.

How might a social context affect negative number processing?

Both children and adults struggle with negative number understanding. Positive numbers are taught first in school and are encountered more often in daily life, unlike negative numbers which are not even introduced until around fourth grade.

Previous research has shown that framing math problems in a social context can lead to better performance in math tasks. In our study, we explored whether framing a numerical board game using a social context to teach children about negative numbers would lead to better learning of the concepts. Before and after the children played the board game, they completed an arithmetic assessment containing both positive and negative numbers and a number line task.

In another study with adults, we investigated if there is an association between negative number processing and math performance. We showed two numbers on a computer screen and asked participants to select the numerically larger number. After that, we asked them to complete a math assessment containing arithmetic and algebra questions. Next, we will be running a similar study with children and compare their performance to the performance of adult participants.



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THANK YOU

We would like to express our sincere gratitude to everyone who makes our research possible!

Acton Children's Museum

Arlington Children's Center

Aruna's Place

Boston Museum of Science

Clinton Path Preschool

Cottage Montessori School

Ladybug Family Daycare

Rec Place Afterschool, Inc.

and all of the wonderful families who participated in our studies.

Infant & Child Cognition Lab