INFANT AND CHILD COGNITION LAB

WELCOME TO OUR 2021 NEWSLETTER!

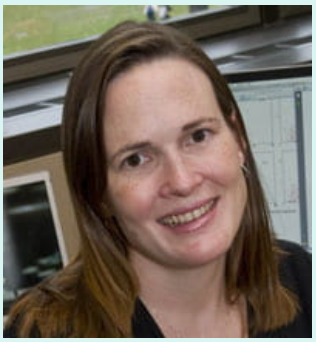
We have been running lots of exciting studies with infants, children, and adults investigating developing number concepts and how these concepts may be related to other topics such as sharing behaviors, confidence, anxiety, gesture use, and more! This year, we have moved all of our studies to be run online over Zoom. This allows us to reach children all over the country!

A BIG THANK YOU to everyone who has participated in our studies! These important questions could not be addressed without the many incredible families who volunteer their time to participate. We hope you find the information in this newsletter interesting and we look forward to working with you again in the future!

If you are interested in learning more about us, you can check out our website at www.cordeslab.org or contact us at bccognition@bc.edu. We'd love to hear from you!

THANK YOU FOR READING AND WE HOPE TO SEE YOU SOON!

OUR LAB TEAM



DR. SARA CORDES - PRINCIPAL INVESTIGATOR

Dr. Cordes is a Professor of Psychology at Boston College. Research in her lab centers on the development of quantity concepts and social influences of math learning.

STACEE SANTOS - POSTDOC

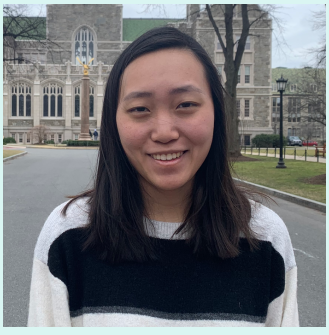
Stacee is interested in how reduced access to sound and language influences cognitive development. Her current research explores the development of different numerical concepts with deaf and hard of hearing children.

LINDSEY HILDEBRAND - GRADUATE STUDENT

Lindsey is a third year graduate student in the lab. Her work investigates how children and adults think about math and spatial abilities, with a focus on the emergence, consequences, and mitigation of gender stereotypes about these domains,

LESENIA FISH - LAB COORDINATOR

Lesenia graduated from the University of Wisconsin – Madison with a BS in Psychology and Neurobiology in 2018. She is interested in topics in social psychology.



ALYSON WONG - LAB COORDINATOR

Alyson graduated from Boston College with a BA in Psychology in 2020. She is broadly interested in social development.

THE IMPACT OF MATH AND SPATIAL LABELS ON PERFORMANCE

There is a large gap between the number of men and women that participate and succeed in advanced STEM settings, such that women are underrepresented. Notably, though there is little evidence to suggest differences in math and spatial abilities across genders, many studies have found that females report significantly higher math and spatial anxiety than males.

Given the importance of math and spatial skills and attitudes for STEM, in this study, we asked how early these gender differences in math and spatial attitudes emerge, and whether these anxieties impact children's performance on tasks. In particular, we were interested in whether explicitly labeling a task as a "math" or "spatial" game would impact how well children performed the task.

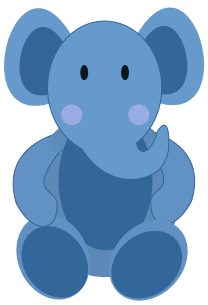
First through fourth grade students completed a computer game and were told that the task was a math game, a spatial game, or simply a "new game". Then, children were given measures of math and spatial self-concept and anxiety. We found that beginning as early as first grade, girls already indicated more math and spatial anxiety and less positive views of their math and spatial skills than boys did. Additionally, these attitudes were strongly related, suggesting that math and spatial attitudes are intertwined early in childhood. Lastly, children performed worse when they were told that the game was a math game, suggesting that their attitudes about math may interfere with their performance; however, their performance was not affected when the game was labeled as a spatial game.

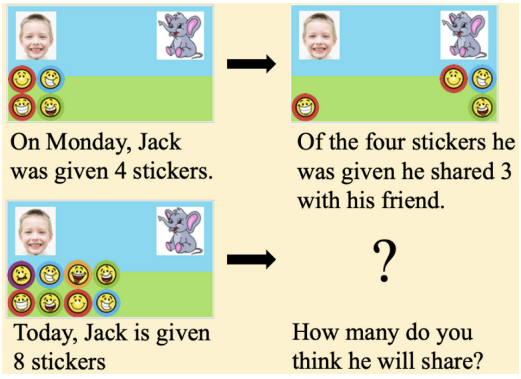
Findings for this study indicate that gender differences in math and spatial attitudes are early emerging but that they may have different consequences for performance. Our future studies will use results from this work to design interventions aimed at fostering girls' attitudes and interest in STEM.

THE ROLE OF GENDER IN CHILDREN'S SHARING EXPECTATIONS

Past research has demonstrated that children have an overwhelming preference for equality when it comes to sharing, such that children would rather get nothing than get fewer resources (e.g. candy) than another child. However, by four-years-old, children also show strong in-group biases based on gender and will evaluate a member of their own gender more positively than a member of another gender Thus, we wondered what children would do when faced with concerns for equality AND group-based preferences.

In this study, children heard stories about another child who shared some of their stickers with a friend. Child are told stories about both boys and girls who either shared most of their stickers (generously), or less than half of their stickers (selfishly). Then children were asked to predict how many stickers they expected the protagonist to share in the future, as well as rate how nice they think the protagonist is and how much they would want to be friends with the protagonist. Finally, children completed a gender stereotype questionnaire that assessed their stereotypes about boys' and girls' sharing behaviors.

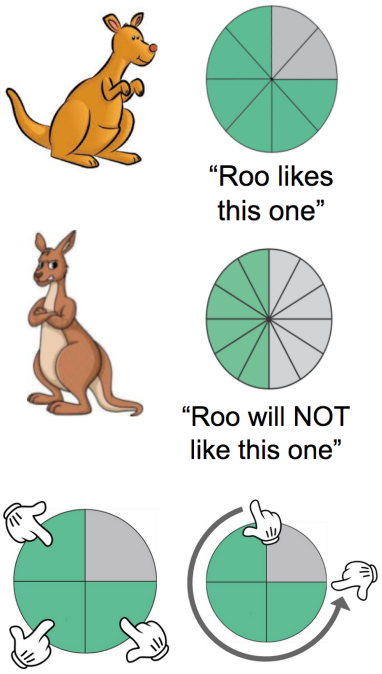




Though we still have more work to do, early findings suggesting that while both boys and girls demonstrated preferences for children of their own gender, girls demonstrated weaker in-group biases than boys at least in this context. For example, girls indicated a higher desire to play with both genders than did boys, and girls' ratings of niceness decreased with age, suggesting they became sensitive to others' selfish behavior and disliked this quality in others. Boys, on the other hand, rated other boys as nice, regardless of whether they engaged in selfish behaviors. These results highlight the conflict between concerns for fairness and in-group biases in young children and gender differences for these processes.

CAN TEACHING USING GESTURES HELP KIDS LEARN FRACTIONS?

Children often struggle with fractions. They tend to show a “whole number bias”, and treat the numerator and denominator in a fraction as separate numbers rather than recognizing the proportional relationship between the two (e.g. children will say 5/10 is bigger than 3/4 because “5” and “10” are larger than “3” and “4”). Previous research has found several ways to help children overcome this bias, such as visually presenting fractions in ways that highlight proportional information. In this work, we explored whether gestures may also facilitate attention to proportional information.



In our study, 5-7 year old children were taught to identify shapes depicting the proportions 3/4 and 6/8 by a character “Roo”, who likes shapes with “just the right amount of color and just the right amount with no color” (i.e. shapes that represent 3/4 or 6/8). When introducing the shapes, the experimenter performed either a single continuous dragging gesture (to emphasize proportional information), multiple discrete pointing gestures to each unit within the shape (to highlight numerical information), or no gesture. Children then completed (1) a proportional matching game asking them to identify which of two shapes matched a target shape and (2) a gesturing task in which they used physical gestures to show how much color Roo likes.

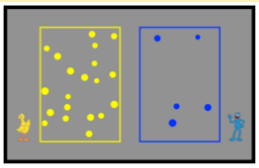
Our results found that in the gesturing task, children themselves were more likely to use the same type of gestures they saw when learning the fractions, which was strongly related to their performance in the matching game. Particularly, when one shape matched the target shape on proportion (but not number) and the other shape only on number (thus not a proportional match), children who used continuous gestures were better at correctly identifying proportional matches than children who used discrete gestures. This suggests that children’s own gestures can provide insight into their proportional knowledge, and may suggest that instructing children to use these specific gestures can influence their understanding of proportions.

LANGUAGE EXPERIENCE PROMOTES THE DEVELOPMENT OF NUMERICAL CONCEPTS

Research has shown a link between the development of numerical concepts and language. However, the role language plays in numerical development is unclear. Here, we examine counting, number discrimination, and vocabulary abilities in children in which access to fluent language is limited early in development – deaf and hard of hearing (DHH) preschoolers born to hearing parents using spoken language.

In our study, 3– to 6-year-old DHH children and same aged hearing peers completed tasks to assess their numerical abilities. Children completed tasks to assess their understanding of the number words, and their nonsymbolic numerical abilities – that is, their ability to tell which of two sets had a greater number of items. Parents also filled out surveys measuring the child's vocabulary abilities and the amount of time the child has had access to fluent language.

Panamath



"Who has **more** dots?"

Measure of how good children are at estimating and comparing large numbers without counting (computer)

Give-N

"Can you put ____ ducks in the pond?"

Measures a child's counting abilities and number knowledge

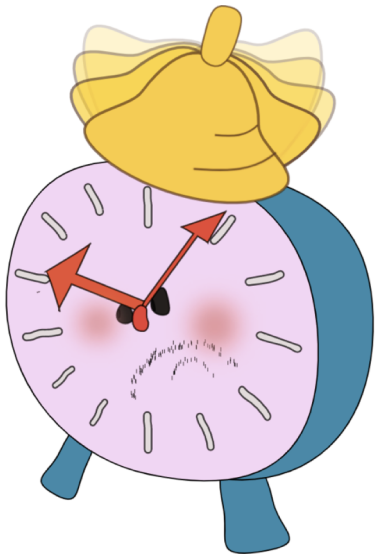
Our results revealed that DHH children showed lower proficiency in counting, numerical discrimination, and vocabulary relative to hearing peers. However, when analyses took into account the amount of time the DHH children had had access to auditory amplification (e.g., hearing aids, cochlear implants), only group differences in vocabulary remained. That is, numerical abilities seem to be strongly predicted by access to fluent language. These findings indicate that language exposure is an important catalyst for numerical development.

What's next? We are exploring whether DHH children's spontaneous attention to quantities in their environment is impacted by reduced language access. This could help explain the lag we see in the development of numerical concepts in DHH children. We aim to pinpoint areas that need attention to address disparities in math abilities we see with these children.

HOW DOES TIME PRESSURE AND ANXIETIES IMPACT MATH PERFORMANCE?

Time pressures or constraints are common in everyday life. For example, parents have a limited time to complete household tasks, students must complete tests and assignments during class, and generally everyone has to factor in and schedule all the activities they would like to complete in a day. Can such time constraints cause stress or anxiety? Can this stress or anxiety impact performance when completing tasks? Prior research has indicated that time constraints may negatively impact performance accuracy in the short term, yet it is unclear whether this may depend on your attitude towards the task being performed.

In this study, we investigated the relationships between short term time constraints, performance, and trait anxieties in a math context. We had adult participants (college students) complete a math task in which we either emphasized the amount of time they had to complete the task or not. After completing the math task, participants completed a survey about their general anxiety and their anxiety specific to time-pressures.



We found that an interesting interaction between gender and anxiety, such that emphasizing time constraints led to improved performance accuracy among females with low math anxiety and among males with high math anxiety. Together, these findings suggest that time constraints interact with gender and anxiety to impact performance. Future work is investigating why anxiety works in opposing fashions for males and females in these time constraint contexts.

CHECK OUT WHAT ELSE OUR LAB HAS BEEN DOING!

LAB MANAGER, LESENIA, PRESENTING HER POSTER

PRE-PANDEMIC BRUNCH WITH OUR 2020 SENIORS

WEEKLY LAB MEETINGS!

A BIG THANK YOU TO EVERYONE WHO MAKES OUR RESEARCH POSSIBLE!

ABCD Allston/Brighton Head Start

Acton Discovery Museum

Boston Children's Museum

Riverside Children's Center

Rec Place Afterschool, Inc.

Wellan Montessori School

And all the wonderful families who participated in our studies!