A Note from Dr. Cordes:

Welcome to our 2016 newsletter - we are excited to tell you about some of the projects going on in the lab! We have been running lots of exciting studies with infants, children and adults looking at our developing knowledge of number and other quantities.

If you’ve come into our lab before, we owe you a BIG THANK YOU! These important questions could not be addressed without the many families who volunteer their time to participate. We hope you find the information in this newsletter interesting and bring your child in for another study!

If you haven’t come in before but are interested in learning more about us, see our contact information at the end of this newsletter. We’d love to hear from you!

Thank you for reading, and we hope to see you again soon!

Best Wishes,
Sara Cordes, Ph.D.
Associate Professor
Boston College
Our Lab Team

Sara Cordes – Principal Investigator

Dr. Cordes joined the faculty at Boston College in 2009 where she is the Principal Investigator of the Infant and Child Cognition Laboratory. Research in her lab centers on the development of quantity concepts. You can find more detailed information about Dr. Cordes on her personal page.

Raychel Gordon – Lab Manager

Raychel graduated from Boston University in May 2016 with a BA in Psychology and minors in Linguistics and Deaf Studies. Her research interests range from language acquisition and development, to behavioral neuroscience. In particular, she is interested in word learning, gesture, and conceptual development.

Nadia Chernyak – Post-Doctoral Researcher

Nadia received her Ph.D. in Developmental Psychology from Cornell University in 2014. Her research has focused on moral cognition and prosocial behavior, and has examined questions such as: How does morality become conceptualized as a unique choice (vs. an obligation)? How do our ideas about choice vary across cultures and development? How and why does choice motivate young children's prosocial behavior? She is also interested in how children's emerging understanding of number interacts with their knowledge of fairness and their own abilities to share fairly. More information about Nadia’s research is available on her personal page.

Stacee Santos – Post-Doctoral Researcher

Stacee is interested in how the limited access to sound and language influences cognitive development. Her research investigates different numerical concepts with deaf and hard of hearing children. These studies explore how children with hearing loss discriminate between different amounts, recognize shapes, understand quantities, space, and proportion. Stacee received her Ph.D. from Boston College in 2008 where her research focused on the cognitive benefits of physical activity and complex motor learning.
Our Lab Team Continued

Michelle Hurst – Graduate Student

Michelle graduated from McMaster University in Ontario, Canada with a BSc in Mathematics and a minor in Psychology. She is interested in math education and the development of cognitive factors associated with learning and understanding math. In particular, Michelle is interested in how children and adults think about and learn fractions, the transition from arithmetic to algebra and how early math ability relates to later math achievement. More information about Michelle's research is available on her personal page.

Karina Hamamouche – Graduate Student

Originally from Indiana, Karina received her BA in Psychology and French from Butler University in 2014. She is interested in how preschoolers learn and understand number. Further, Karina is interested in how these abilities in young children relate to later math skills.

Sophie Savelkouls – Graduate Student

Sophie graduated from Tufts University with a BSc in Psychology and Child Development in May 2014. Her background includes working with preschool children to improve their school readiness by implementing a STEM curriculum. Sophie is interested in infants' conceptual development. Primarily she is interested in how infants understand number and the role that language can play in numerical discrimination.
Can infants tell the difference between small quantities?

We know that infants are quite good at discriminating large quantities, and they get better at this with age. So for example, while 7 month olds already can tell the difference between 8 and 16 dots (a 1:2 ratio), it is not until 9 months of age that they can tell the difference between 8 and 12 dots (a 2:3 ratio). However, we know less about infants’ abilities to discriminate small quantities. Can infants also tell the difference between 1 and 2 items or 2 and 3 items? Our lab investigated whether infants are just as good at discriminating small quantities as they are at discriminating large quantities, and whether it follows the same developmental pattern.

In one study, we showed 7 month old infants displays of 2 dots over and over again, until they stopped finding these displays interesting to look at. We then showed them displays of 1 dot to see whether they noticed that the number of dots had changed. A second group of infants was also first shown displays of 2 dots over and over again, but after they got bored, we showed them a display of 3 dots. Interestingly, we found that while 7 month olds were able to tell the difference between 2 and 3 dots, they could not tell the difference between 1 and 2 dots! We are currently investigating these surprising findings to try and explain why 7 month olds fail to tell the difference between 1 and 3 dots.
Understanding “Same” and “Different”

The ability to make relational comparisons between two objects (e.g. A is equal to B, C is bigger than D) is one of the key features of human thought, critical for learning about the world. The most basic type of relational comparison that infants have to learn is that of same and different. Without being able to perceive sameness, infants would have a very hard time making sense of the world around them. The question that we are interested in answering is when and how infants learn this very basic but abstract concept.

In one of our studies, we show 11 month old infants displays of 5 symbols, where each symbol in the display is completely different in terms of shape and color. At first infants find these displays very interesting to look at - but after a while, they get bored and look away. We then show them more displays of 5 symbols - but this time, all 5 symbols in the display are exactly the same. Do infants notice that all 5 symbols are now the same? We are still in the process of collecting data, but preliminary results suggest that infants do have a very basic understanding of same and different at this age!
How do emotions impact children’s counting abilities?

Our daily lives are filled with emotional experiences. For example, how many seconds do we have to cross the street before a car zooms past? While past research has shown that children and adults’ performance on an estimation task is affected by the presence of emotions, it is unclear how emotions impact children’s precise counting abilities. In this study, children are asked to count the number of faces presented on flashcards. Importantly, some of these faces are happy, while others have a neutral expression.

We are finding that children who still learning the count procedure count more accurately when they count happy faces compared to the neutral ones. However, children who have mastered basic counting are unaffected by the emotional faces. We believe that the happy faces heighten the child’s attention, thus improving their counting accuracy.
Does our approximate sense of time relate to our math abilities?

Did you know that our reading and math abilities are closely linked? Did you know that our ability to keep track of very short durations of time is related to our reading abilities? In this study, we are exploring how our sense of time may be related to both our formal reading and math abilities.

Children and adults complete different reading tasks in which they are asked to read lists of real words and made-up words as fast as they can. Then they complete a timing task in which two animals play an instrument for a certain amount of time and they are asked to decide which animal played for longer. Finally, children and adults complete an arithmetic task. Data collection is still ongoing; however, we expect to see distinct patterns in how performance on the timing task may relate to performance on the reading and arithmetic tasks.
Fractions, Decimals, and Numbers

Students often find fractions to be a very hard concept to learn. One of the difficulties is learning the similarities and differences between Fractions, Decimals, and Whole Numbers. For example, sometimes kids think of fractions and decimals as being completely different numbers, believing that there are only fractions between two other fractions and only decimals between two other decimals. For whole numbers, children often have difficulty understanding how they relate to fractions and decimals since fraction and decimal notation is made of whole numbers. In this study, we looked at how children think about rational number magnitude in these different notations and whether their ability to do this kind of task with fractions and decimals predicted how well they would do on a pre-algebra test.

We asked 4th -7th graders to decide which of two numbers was bigger when the numbers were both fractions (e.g., ¾ vs ½), both decimals (e.g., 0.75 vs. 0.5), both whole numbers (e.g., 50 vs 74), one fraction and one decimal (e.g., ¾ vs 0.5), one fraction and one whole number (e.g., 5/4 vs 2), or one decimal and one whole number (e.g., 2 vs 3.75). After this activity, children did a short set of pre-algebra questions and some fraction and decimal arithmetic questions.

Preliminary results suggest that children do show evidence of understanding the relationships between magnitudes presented as fractions, decimals, and whole numbers. But, it is still easier for them when the numbers are decimals or whole numbers and harder when they are fractions. Also, how well children did on the fraction and decimal arithmetic and comparison tasks predicted how well they did on the pre-algebra questions! The results of this study can tell us about how children think about fractions and decimals and that these earlier skills are important for other areas of math learning as well.
Touch and Estimation

Previous research suggests that people’s sense of touch is related to how they estimate numbers of items. In this study, we are investigating whether changing the patterns of different amounts of items people see influences how adults perceive amounts of items that they touch. Some adults estimated only items of dots they saw on a screen. Others estimated items of dots on a screen, then put their hand in a box and estimated the number of raised dots they felt. During the study, the patterns of these dots changed - the sets of dots either increased or decreased in quantity, and their sizes also changed.

Preliminary results from this study indicate that by changing the numbers of dots people estimate, we can influence how they estimate items using touch. For example, if the numbers of dots on the screen are smaller, then people tend to underestimate the amount of items they touched. We see a similar pattern when people see larger numbers of dots. This study gives us some interesting new insights into our senses and how they help us think about numbers!
Does number help children be fair?

Young children are tasked with very quickly learning many social norms - how to be kind and polite, how to respect those around them, and how to share with others. One important social norm that governs their worlds is fairness, or the idea that children should share their toys and resources with others. Yet, we know strikingly little about how this important ability develops and how we can better encourage it in young children. Here we look at how children’s understanding of number relates to their abilities to be fair. In one study, we asked 2-5-year-olds to share some dinosaur toys between two puppets. We also looked at their number knowledge by having them perform a counting task. Children who had a better understanding of number were also better at sharing the toys equally. In a second study, we asked a different group of children to share stickers between themselves and a puppet who was feeling sad. Again, children who had a better grasp of number were more likely to be equal sharers. These results could not be explained by age alone. Our results suggest that understanding number is an important requirement for better sharing behavior, and that teaching children about numbers might also help with their social abilities such as sharing and fairness.
Thank you to everyone who makes our research possible!

The After School Club
Angier After School Program
Aruna’s Place
Boston Children’s Museum
Charlestown Nursery School
Clinton Path Preschool
Day-After-Day After School, Inc.
Empow Studios
Family ACCESS of Newton
First Path Daycare Center
Les Petits Nursery School
Meeting House Child Care Center
Museum of Science, Boston
Newton Montessori School
Plowshares Education Development Center
The Rainbow Nursery School at Mount Alvernia Academy
Rec Place Afterschool, Inc.
Riverside Children’s Center
Saint Columbkille Partnership School
Swift Waters After School
... many more!

...and to all of our wonderful families!