Wesleyan University

COGNITIVE DEVELOPMENT LABORATORY

Spring 2010 Newsletter

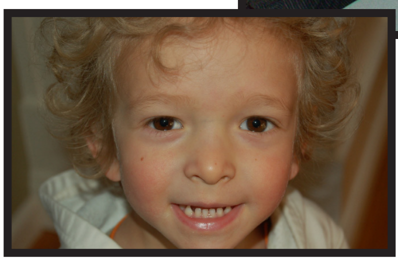
Hello from Wesleyan's Cognitive Development Lab!

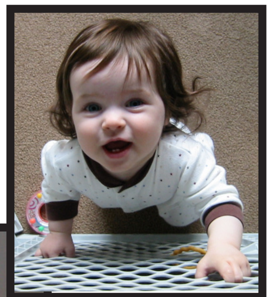
Here are the latest updates and research findings from our labs. Thanks to everyone who has participated in our studies and who has helped to make our work possible!

About Us:

We study how children think and learn about the world - about language, numbers, objects, space, and people.

We design games to gain insight into children's thinking and how it changes throughout development.





The Yellow Lab

This lab is directed by Dr. Hilary Barth and is located on the 2nd floor of Judd Hall.

The Blue Lab

This lab is directed by Dr. Anna Shusterman and is located on the 4th floor of Judd Hall.

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Our Research:

Quantities & Basic Math

How do children learn and reason about numbers?

We study the perceptual and cognitive development of quantitative thinking and reasoning in children (in preschool and elementary school) and adults. We're interested in finding out how intuitive ideas about numbers and quantities change throughout life and how children connect school-based math with early-developing intuitions. This may lead to improvements in childhood education and adult numeracy.

Individuals & Groups

How do children decide whom they should trust, learn from, or choose as a friend?

In order to navigate the world, children need to learn a great deal about interacting with social partners. Important social skills, like sharing, friendship and trust, develop through the early childhood years. These skills may influence how young children acquire knowledge about the world around them as well as how they interact with their own social groups and with members of other social groups.

Space & Navigation

How do children orient themselves in space?

We are curious about how children explore and remember their physical environment, and how they acquire language to talk about things like directions. Words like "left" and "right" are difficult for children to learn before they are about five years old and we want to better understand this challange. We also look at the effects of learning these words on spatial reasoning and navigation. Do they affect how we think about our environment?

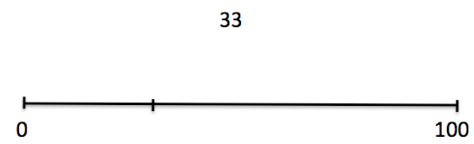
Counting & Number Words

How do children move beyond rote counting?

Most children learn to count sometime between their second and third birthdays. For young children, counting to ten is sort of like reciting the ABC's -- just a list of words that we say in order. How do children come to understand that the order is important -- for example, that numbers later in the list are for bigger quantities? In many of our studies, we investigate how children begin to construct a meaningful number system. What insights do they need to achieve in order to first understand number words? How does learning these words affect their mathematical reasoning?

This Year's Yellow Lab Studies

number line game



In this ongoing project, children were presented with a horizontal number line on a piece of paper, marked with numbers only at the two ends (for example, "0" and "100"; the exact numbers depended on the age of the participating child). Children were shown a number (for example, "33") and were asked to draw a mark on the line where that number should go. Each child did this for many numbers. Not surprisingly, younger children are less accurate than older children at the number line game. But we can find out some surprising things about developmental changes in the way children think about numbers from their performance in these games. We can learn about the implicit rules that children use when mapping numbers onto space, and we can understand how children connect Arabic numerals with their proper numerical magnitudes. We can also use this game to learn about children's proportional reasoning, which is especially important for formal, school-based mathematical thinking. We are currently in the middle of a large series of studies using the number line game and other related tasks.

t-shirt game

The T-Shirt Game is part of a line of research that investigates how preschool children decide to learn from others (or not). In this study, we were interested in finding out whether children were more likely to trust a member of their own group (even if they had been wrong in the past) instead of a member of a different group (even if they had been right in the past). We asked children to join a made-up group by wearing a colored T-shirt. This way, we know that the children do not have preconceived ideas about the group members – which would not be true if we used racial or ethnic groups. For example, a child wore a blue T-shirt and we drew his or her attention to being a member of the Blue group. Then the child watched a live action video in which an actor wearing a blue T-shirt labeled a familiar object incorrectly, while an actor wearing a red T-shirt labeled it correctly. Finally, a novel object was presented and each actor labeled it with a different made-up word. Although preschoolers usually choose to learn from people who were previously accurate, in this case they didn't! When the previously accurate person was a member of the other group, not the child's own group, four-year-old children did not choose to trust the previously accurate actor.

size comparison game

How do children compare sizes of individual shapes, sets of things, and other kinds of sizes they can't look at directly (like the size of "6" compared to the size of "10")? In the size comparison game, we are investigating how kids think about sizes. Children see a piece of paper (or computer screen) with a line on it and two items drawn over the line (for example, a big and small circle, or a tall and short rectangle). We then ask children to draw a mark to help the two circles share the line, so that both the big and small circle get just enough space. We are interested in measuring the way children assess sizes both alone and relative to each other. We are also looking at how children's responses to simple size judgments like these relate to other kinds of intuitive math abilities. Right now we are still collecting data, and also creating some fun versions of the game for younger children.

puppet sharing game

How do kids think about social groups and how is this affected by their experience with groups? A series of studies, in which kids play the Puppet Sharing Game, is helping us to answer these questions. In one version of this study, kids tended to like puppets from their group, regardless of how much those puppets shared with others. They also liked puppets from the other group when those puppets shared a lot. However, when puppets from the other group didn't share well, children were quick to develop negative attitudes about that group. But, when given a chance to share stickers with puppets, they were equally likely to share with puppets from their own group or the other group.

In an expansion of this study, we give children a chance to ask puppets from their group or the other group to share with them. Although this study is still in progress, it appears that kids are more likely to ask puppets from their own group to share, because they expect their own group to share more with them.

Because culture has an important impact on child development, we expanded this study with a population in the Faroe Islands (located in the north Atlantic). When children played the same game in this society, the simple act of being assigned to a group was enough to affect their liking of the puppets. Whether they viewed puppets from each group sharing a lot or a little with others, their liking of the own group increased and their liking of the other group decreased. This may be due to the isolated nature of Faroese society, where children have few opportunities to engage with children from other backgrounds.

Together, these studies demonstrate that kids are very sensitive to negative information about individuals from other groups. However, children frequently have positive attitudes about both groups and are eager to share with others.

sticker estimation game

In the Sticker Estimation Game, each child is asked to quickly guess how many stickers or pictures are on a card. The card contains too many things to count fast, so it is a guessing game, not a counting game. We've used this game in the past to explore children's sense of how number words should match up with sets. Now, we are using it to look at how this ability relates to other aspects of intuitive mathematical thinking, like proportional reasoning and number line estimation. We are currently in the middle of a large series of studies using the sticker estimation game and other related tasks.

animated naming game

In this continuing series of studies, we are interested in finding out how children decide to trust what they hear from others. We know based on previous research that preschoolers choose to learn new information from speakers who were previously accurate, and reject new information from speakers who were inaccurate. We are interested in finding out if children's trust in an accurate speaker is very specific, or if children are also willing to trust other members of an accurate speaker's group (even without any specific knowledge of the accuracy of those other group members). We first showed children two animated characters: one labeled a familiar object correctly and the other labeled it incorrectly. We then introduced two new animated characters: one of them looked more like the reliable speaker and the other looked more like the unreliable speaker. Then a picture of a novel object (an unfamiliar shape) appeared, and each new character labeled it with a novel, made-up name. Even though these two new characters had no history of accuracy or inaccuracy, preschoolers thought the new character who resembled the previously reliable speaker was more likely to be correct. These results imply that children's trust in what other people say might not be person-specific: it could spread to other members of the same group. However, our newest studies suggest that four-year-olds do not choose to learn novel words from new members of the accurate speaker's group. So there appear to be limits to the way in which children generalize their trust to group members; ongoing studies will tell us more!

This Year's Blue Lab Studies

objects & sets game

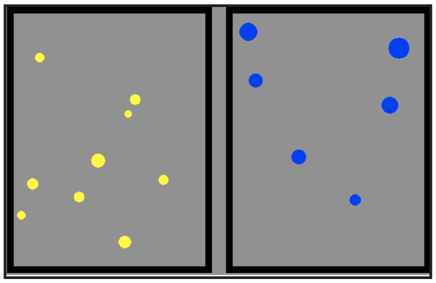
In this game, we tested the idea that young children mistakenly think that number words refer to particular objects (e.g., this truck is the "five"), instead of sets (e.g., there are five trucks here). For example, we laid out five objects on a spinning plate and asked children to count them. Then we turned the plate a half-turn and asked the children to count again. We reasoned that if children thought that number words are like labels that stick to objects, they would now count in the reverse direction, starting with the same object as "one" that they had before. We used a series of other simple questions too. To our surprise, even young children knew that number words referred to sets, as long as they had reached the two-knower stage (see "Try it at home" on the first page). This study shows us that children figure out a lot about number word meanings long before they fully understand how counting works.

teaching counting to children

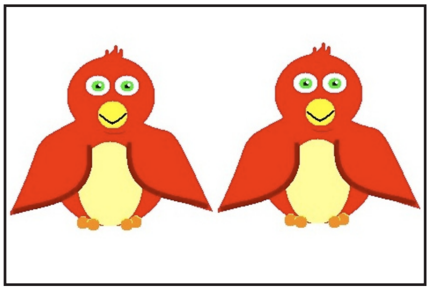
In this study, we worked with a few children who were on the cusp of figuring out how counting works (at the three-knower stage), but not quite there yet. We trained these children with the same exercise five times over the course of a few weeks. We showed them pictures of objects and told them how many there were. For example, we would describe pictures to children as having "four balloons" or "seven horses." We only used sets of "four," "seven," and "ten." After five intensive training sessions, all of the children had learned "four" but none of the three could correctly identify sets of "seven" or "ten." This training confirms that the higher numbers are particularly hard to learn, and we are creating further studies to discover how to help children eventually understand how counting works for all numbers.

developmental changes in number knowledge

In this study, we have been testing children's verbal and non-verbal number knowledge every month. We play our regular verbal number games, like Give-a-Number, which tells us about children's language for number concepts. We also test their non-verbal number acuity – the smallest ratio between quantities that children can perceive as different. For example, without counting, you would be able to tell the difference between 2 and 4 dots, but not 57 and 59 dots. Children see side-by-side displays and are asked to choose which of two sides has more dots. Current research suggests that young children's number acuity may be predictive of future math success. We have been tracking a group of about 50 preschoolers every month to see whether changes in verbal number knowledge are accompanied by changes in non-verbal number acuity. Crucially, we have observed changes in both kinds of abilities during our six-month observation period. We will spend the summer analyzing these data to better understand the relationship between growth in children's knowledge of number language and their number acuity.



learning about "two"



Children know a lot about numbers before they can even speak. Infants can't count, but they compare rough quantities of objects and keep track of exactly three objects at a time! In a new study, we are exploring whether children as young as one year old understand the word "two." Although most studies suggest that children do not really understand the word "two" until they are about three years old, a few reports suggest that much younger children do, in fact, use this word correctly. We are using a "looking time" study to see what children between 12 and 30 months old know about the word two. The children sit on their parent's lap in front of two computer monitors. Children see two objects (like dogs, birds, or stars) on one screen and three objects on the other. Then they hear a voice say something like, "Look, baby, look! Two birds! Two!" We record the child's face and measure whether they look longer at the screen that matches what they hear. So far, we have not found evidence that very young children clearly understand "two." We are following up some interesting leads with a new design for this experiment.

red & blue game

The Red and Blue Game explored how group membership affects children's judgments of other people's actions. Children were placed into one of two groups: the Red or Blue group. These are called "minimal groups" because the only thing connecting children to their group members is a red or blue T-shirt. Children watched videos of people from their group and from the other group doing good and bad things, such as helping someone who fell or messing up someone else's puzzle. They pressed a key as soon as they knew whether the action was good or bad. We found that minimal group membership, in combination with some stories about competition between the two groups, seemed to be enough for kids to start forming biases: they responded faster when their own group performed good actions than when the other group did. This suggests that they expected their own group to do good, but not bad, actions.

navigation game

Many of our studies investigate how young children think about their physical environment, and how language helps them think about abstract concepts like spatial direction. We are specifically interested in how children's knowledge of "left" and "right" affects how they think about and navigate the world around them. These spatial words are difficult for children to learn before they are about five years old. Our current study looks at how children think about their environment when they navigate a large square room with one red landmark wall and involves a treasure hunt game in which children must find and win hidden stickers. We found that even three-year-old children were very good at remembering that the sticker was hidden at the red wall (or at the opposite side). However, it took several more years for children to start remembering more complex relationships between the landmark and the sticker (like left of the red wall). Furthermore, children who knew the words left and right were better able to remember these more complex spatial relationships.

This Year’s Blue Lab Studies

space-time metaphor game

On a day-to-day basis, we use spatial words to talk about time. For example, we say “I moved the meeting *forward*” or “That was a *long* time ago.” Some psychologists believe that we have a conceptual “space-time metaphor” and that we use spatial concepts to think about abstract ideas like time. Do children spontaneously make the connection between related concepts about space and time (like long stick and long meeting)? We are addressing these questions by teaching children a made-up word and seeing if they can use this new word to talk about both space and time. For example, we teach children the word “blicket” to describe a long (but not a short) pencil, and then ask them to play a buzzer “blicket.” Or, we teach them that a long buzzer press was “blicket” and ask them to choose the “blicket” pencil. So far, we’ve found that five-year-old children can spontaneously use the new word to talk about length in both space and time, and we’re currently testing even younger children. Stay tuned!

number development in deaf children

In a major new project, we have been exploring the development of number concepts in children with hearing impairments who use hearing aids or cochlear implants. While these children are learning English, their language development is getting off to a later start than their hearing peers. We are interested in understanding how differences in language development affect their ability to learn number concepts. Amazingly, we have been finding that most of the children go through exactly the same milestones as their hearing peers, with very few differences! Of course, they tend to achieve these milestones at a slightly older age, depending on when they first heard spoken language in their environment. We are grateful to the Clarke School for Hearing and Speech in Northampton, MA, for their partnership in this study.

spatial language in ecuadorian kichwa

In English, we often use words like “left” and “right” to describe spatial relationships between small objects. For example, we may say, “the cup is to the left of the saucer.” Not all languages are like English however – in some languages, speakers may to say something like “the cup is east of the saucer.” In a recent project that grew out of a student’s study abroad experience, we found that indigenous people in Ecuador who speak Kichwa (a dialect of Quechua) tend to use spatial terms that are based on the sun (sunrise, sunset) and the mountainside in the Andes range where they live (uphill, downhill). These correspond to east, west, north, and south. This represents a major discovery about an important indigenous language. Through further work with this community, we hope to learn more about how language, thought, culture, and geography interact in shaping human behavior.

News & Updates:

Congratulations to our graduates!

Liza Bourchtein will be working at a schizophrenia research lab at the National Institutes of Health in DC.

Barry Finder, who just completed his Master's in the lab, is moving to Austin, TX.

Dominic Gibson is the new lab coordinator at the Lab for Child Development at Johns Hopkins University.

Amanda Herrera will start a PhD program in cognitive psychology at Northwestern after a year of travel.

Gwynne Hunter will be attending UC Berkeley School of Law.

Kyle MacDonald is the new lab coordinator at the Center for Infant Studies at Stanford.

Anna Patton, visiting student from CCSU, is going on to do a Master's in psychology at St. Joseph's.

Emma Zoloth and Laura Nuzzi will both be doing research at the Judge Baker Children's Center in Boston.

Hilary Barth, director of the Yellow Lab, got some very exciting news this year! Not only was she was awarded a National Science Foundation CAREER grant, but she also became a new mom!

Mariah Schug, the lab's post-doctoral fellow, will be a visiting professor in the Wesleyan Department of Psychology.

Emily Slusser will join our labs in July as our new post-doctoral fellow. She is coming from UC Irvine to work on National Science Foundation funded mathematical cognition projects.

Our current lab coordinator Sarah Edelman will be starting her studies in mental health counseling at NYU this fall. Both labs are excited to welcome new lab coordinators, Talia Berkowitz (Barnard '10) and Jenn Garcia (Wesleyan '10)!

We have started a major project that looks at number acquisition in children who are deaf or hearing impaired. We are grateful for the partnership of The Clarke School for Speech and Hearing in Northampton, MA in this endeavor.

We are also pleased to be launching a new partnership with Macdonough Elementary School in Middletown. As part of this partnership, student volunteers will assist teachers in Macdonough kindergarten classrooms with math lessons.

Try it at Home!

In many of the Blue Lab studies, we use a task called "Give-a-Number" with 3-5 year old children to see which milestones in number comprehension they have reached. This task is fun for children and you can do it at home!

Get a dish filled with at least 10 identical objects. Line the objects up and have your child count them.
If your child did not count to 10, he or she may just be starting to learn about counting. You can try the game below and track your child's progress over the months (and even years).

Place the items in a pile. For each trial, ask your child to place the specified number of items in the dish.
Remember to empty the dish between trials.
Trial 1: 1 item, Trial 2: 2 items, Trial 3: 3 items, Trial 4: 4 items, Trial 5: 5 items, Trial 6: 7 items, Trial 7: 6 items.
(Optional: You can let your child count and adjust the number of objects if they make a mistake. Then move on to the next trial.)

Every time your child places the correct number of objects, continue to the next trial. Every time he or she gets it wrong, go back one trial. See if you can find the highest number that your child usually answers correctly. This is your child's "knower-level." If your child can do this for each number you ask for, he or she understands how counting works and is called a "counting-principle knower" or "CP-knower."

Getting in Touch:

We're always looking for families to come play in our labs, and for schools and daycares who are interested in our research. Our studies are brief, fun for kids, and informative for parents and educators.

Please contact us if your family is interested in participating. You can share your contact information by phone or on our website. We'll call to let you know when we have a study for your child's age group.

THANK YOU!

Our research projects depend on you - local families, schools, and daycare centers. We appreciate your generous support!

From:

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