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Spring 2016 Newsletter

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What has the BU Developing Minds Lab been up to?

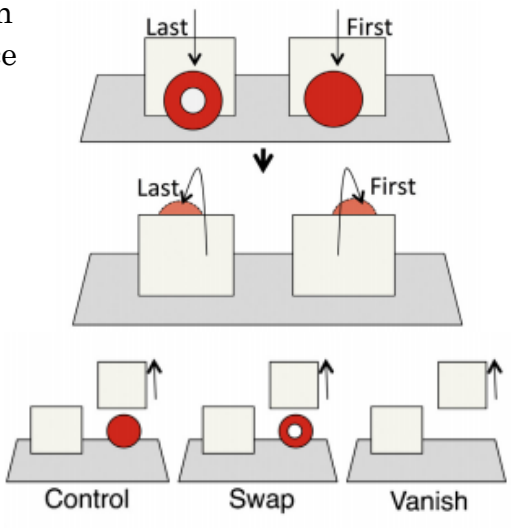
It has been a wonderfully busy spring! With your help, we have continued to explore how infants and children think, and have discovered some pretty interesting findings. Take a look inside and see what we have learned. We couldn't have done it without you!

* Developing Minds Lab * Boston University *

What do 6-month-old infants remember about objects that are hidden from view?

How does the topology of an object affect infant's memories?

Infants have been shown to be highly sensitive to topology, that is, whether an object is open or closed. For instance, babies know that only open objects (like a cup) can contain other objects. In our lab, we studied infants' abilities to *remember* whether an object is open or closed once the object is hidden from view. We showed 6-month-old infants an open and a closed disk which were then hidden behind two screens. We then revealed one of the objects to have either changed topology, stayed the same, or disappeared. We found that infants noticed when one of the objects changed topology, but did not remember *anything* about the other object, suggesting that infants' memory for topology is limited. These findings were recently published in the journal *Cognitive Development*.



What do infants remember about the features of humanlike and non-humanlike objects?

Using a similar procedure to our topology study, we hid humanlike faces and non-humanlike balls behind two screens one at a time, and then revealed the objects to have either changed or stayed the same. We then measured infants' looking times to see if they noticed when objects changed "magically" behind the screens.

We found that infants remember the category the object came from, but have a harder time remembering what the object looks like. For example, when the object changed from a doll to a ball, babies noticed. However, when the object changed from a ball to a different ball, or a doll to a different doll, babies did not notice. These results suggest that what babies remember about these hidden objects is their category, and not necessarily their appearance!

What do these findings suggest about infants' memory abilities?

Generally speaking, infants have trouble remembering the features of two hidden objects at once! However, infants are more likely to remember big-picture information about objects, like whether it was humanlike or not, or whether it continues to exist. Overall, the big takeaway is that even when babies don't remember *what an object looks like* they may still remember *what an object is!*

What are children's limits to understanding other people's mental states?

Young children between 5 and 7 years of age do not have a clear understanding of what the mind is. In fact, they are likely to say that they have no idea at all what the mind is. However, older children, between 8 and 10 years of age, show a more clear understanding of what the mind is, what it does, and whether it is part of the body. Likewise, for younger children, the idea of different "mental states" is confusing, whereas older children are able to name and count different mental states when presented with a story about mental states.

How can toddlers create meaningful groups of objects to help remember more?

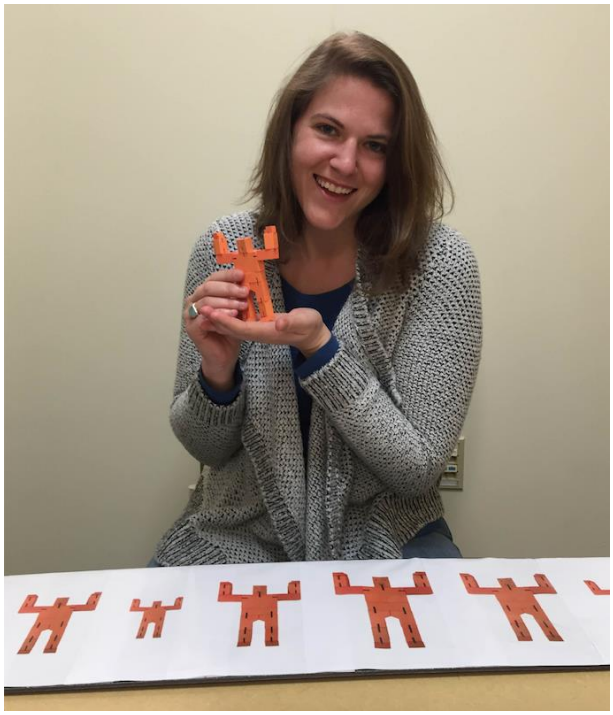
For the past year or so, the DML has been studying how labels and functions of objects affect toddler's developing memory abilities. Are toddlers able to group objects together using these labels and functions to remember more than they usually can? We show two-year-olds groups of two and three blocks, and then give each group both a label (i.e. "blick" or "two") and a function (such as causing a toy to spin). Then, we hide one of the groups of blocks in a box, and see if children search for the correct number of blocks after hearing just the label. So far, we have found that even before children are able to count, they can successfully remember specific numbers of objects when the group of objects is given a new, meaningful label.

How does subjective value of an object influence how people perceive that object?

Previous research suggests that people may perceive important or "high value" objects as being larger than "low value" objects. For example, a study conducted in 1947 demonstrated that when children from both low-income and high-income neighborhoods were asked about the size of a coin, the children from low-income neighborhoods perceived the coin as larger (theoretically because the low-income children placed a higher value on the coin). Although this study took place many decades ago, it has not yet been replicated! This spring, we attempted to replicate these findings, both with children, and with adults.

Will children remember a "favorite" toy as being larger than an unfavorable toy?

In our lab, we present 4- to 6-year-old children with a toy, and then explain (in 4 or 5 sentences) how it is either a favorite toy, a least favorite toy, or a neutral toy in the lab. Critically, the toy is identical in all conditions; only the prompt changes! We then remove the toy from view and do a quick coloring task. After the toy has been hidden for about one minute, we ask children to pick the "real size" of the toy from a display of subtly differently sized images of the toy. We are curious if children who were exposed to the "high value" toy will remember it as larger than children who were exposed to the "low value" toy. This study is brand new to our lab, so there are currently no results to report, but we'll see soon!



How do demographic factors influence adults' physical perception of money?

We have been collecting data with adults throughout the greater Boston area on how factors such as sex, age, cash use frequency, and income affect how people remember the size of dollar bills. On a tablet, we simply collected demographic information, and then asked adults to resize a rectangle to make it the size of a U.S. one dollar bill, and to resize a circle to make it the size of a quarter. Data collection remains ongoing, but so far, we have found the following results:

1. On average, participants underestimate the size of both the dollar and the quarter
2. Women underestimate the size of the dollar bill more than men, and this difference increases with age
3. We found no significant effect of household income or cash use frequency, which differs from the 1947 finding with children. Stay tuned for more results!

Museum of Science

DML at the Museum of Science!

Living Laboratory
Developed at the Museum of Science, Boston

Current research shows that children may develop the ability to learn algebra much earlier than they are taught in school! Through the living laboratory at the Museum of Science, we are exploring 4- to 6- year olds' abilities to "solve for x" when problems don't have numbers and letters, but instead are presented as fun games with groups of objects and a "magic cup" that acts as the x variable. This spring, we asked the following questions:

1. **Can children solve for hidden variables?** When problems are presented with objects and magic cups instead of numbers, children can!
2. **Can children add with two different variables at once?** We have found that children estimate values of hidden quantities so successfully, that they are able to perform two variable addition.
3. **Can children balance equations?** Though children can successfully distinguish between two variables, they seem to have trouble manipulating these variables to make two separate quantities equivalent.

Research in progress!

Our current study explores how these "magic cup" hidden variables might help children solve math problems with real numbers. We have seen that children understand the fundamental concepts of algebra, but can they apply these concepts to actual, written numbers? Thanks to the help of many museum visitors, we will find out soon!

How do we learn the names of new objects?

Previous research has shown that we often use gestures to describe new objects and ideas before we use words. This is true for children who are just learning to speak, as well as older children and adults learning about new things. This study, conducted by senior Raychel Gordon in the Hall of Human Life, explores whether the way you are taught about new objects influences how well you remember them. Specifically, we are exploring the effects of meaningful and random gestures or verbal labels.

Data collection remains ongoing, but so far, we are finding that children and adults alike remember objects most easily when the objects are taught with a meaningful gesture.

Thank You!

We are so grateful for all of the families who participated in our research throughout the year. You have helped us learn so much about children's cognitive development, and we hope you had fun along the way!

We always love meeting new families, and are thankful to anyone who helps. You can learn more about our lab and our research at our website: bu.edu/cdl/developing-minds-lab, or on our Facebook page: facebook.com/DevelopingMindsLabBU/

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