Bauer Memory at Emory Lab

We at the Bauer Memory Development Lab are pleased to send the annual newsletter to our participating families. With this newsletter, we express our appreciation to the families who have volunteered for our studies. All of us at the Bauer Lab – Dr. Patricia Bauer (Bauer Lab director), Adna, Alena, Ana Maria, Jessica, Jillian, Jimmy, Lucy, and Natalie – sincerely thank you for joining us in our efforts to learn about memory! Thank you for your continued involvement with Emory's Child Studies Center!

One thing we in the Bauer Lab have learned is that each and every year brings new and exciting developments. This past year is no exception. This year we have seen the start of many new studies on the development of memory processes, as well as the completion of other studies. Included in the next pages are summaries of these projects.

In addition to the very productive work being conducted in the lab, we have also had many new members recently. Julia Wilson will be our newest graduate student, having graduated from Kenyon College in May. We have also welcomed Jackie Ellison into our fold. Her background is in the study of language, and she brings a fresh perspective to our developmental research. Two new lab coordinators have begun this past semester in the lab – Katie Lee who graduated from the University of Georgia in 2017 and Blaire Porter who graduated this past May from Trinity College. And last but not least, Hilary Miller has joined the lab as a post-doctoral fellow, having received her PhD from the University of Wisconsin.

As we welcome these new members, some of our older members will be experiencing their own changes. Post-doctoral fellow Alena will be opening a research lab at Clark University. Lab coordinator Adna will be moving into a new position at Johns Hopkins University. And post-doctoral fellow Natalie will be welcoming a new baby into her family! And as always, we celebrated the graduation of several of our undergraduate student research assistants this past May and their transitions to various jobs and graduate school programs.

Other updates on the lab (including pictures from professional conferences our researchers have attended to share their work with the scientific community) can be found on page 8.

We are excited to welcome our new members, to wish our older members the very best in their new paths, and to share our work with you!

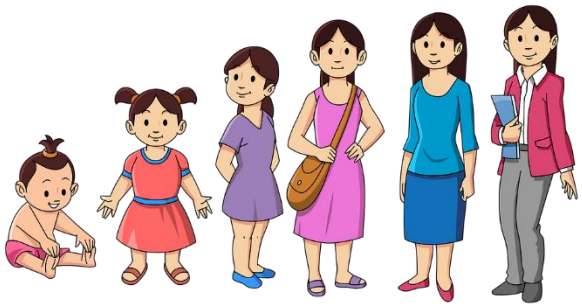
INSIDE ISSUE 8

For more information about projects, findings, or ways to contribute to our research, you can visit the Bauer Lab website or call (404-712-8330) and email us (memoryatemory @emory.edu)!

DEVELOPMENT OF LEARNING AND MEMORY
In Infants and Preschoolers

How We Study Development

Much of the research in our lab investigates the different skills and processes that affect memory and specifically, learning. One of our big questions is how memory changes across development: how do children learn and use new information? How do children represent an event in their memory and understanding of self? How do they incorporate other factors such as spatial location and emotion into their memory? And lastly, how do the memory processes, skills, and strategies of children develop into those of adults? As a result of our interest in development, we at the Bauer Lab work with participants from a wide age range, all the way from infancy to adulthood.



Development from Infancy to Adulthood

Our Eye-Tracking Room

Throughout the years, the Bauer Lab has used a variety of methods to collect data to answer our questions on the development of memory. This includes behavioral, event related potentials (ERP), and eye-tracking methods. Presently, we utilize eye-tracking technology in a number of our studies to examine how the littlest and the youngest of our participants understand the world around them (and be able to compare them to our older participants).

The eye-tracker we use in our lab is a self-contained, external monitor. It may look like a typical computer monitor, but it has two infrared cameras that measure reflections from the pupil and cornea. Based on these reflections, the eye-tracker automatically calculates where the participant is looking on its screen. With this data, the eye-tracker can also include information on the size of the pupil at the time of looking and how long participants look at a specific point on the screen. These variables can show us where participants are focusing their attention and how much effort they are using during a task. Because of its capabilities, eye-tracking is an ideal technology to use with participants who have not yet developed the ability to communicate with experimenters using language.

Read on to learn about two of our studies that utilize eye-tracking with younger participants!

How Children Develop New Skills and Reasoning

Infants

In this study, Adna and Jillian are studying the development of spatial cognition and its relation to memory in 6- to 12-month-old infants.

In particular, we are interested in how infants learn to reason about and predict the motion of moving objects and the crucial role of visual memory in their ability to reason about the world. During the study, infants see rotating objects and various static shapes (similar to the red shapes to the right of this paragraph), and we measure how long infants look at the objects using our eye tracker. As was touched on above, utilizing eye-tracking technology allows us to quantify infants' attention to different aspects of the shapes. Data collected thus far suggest that infants are able to process different types of spatial information and that they do so in a similar manner to the way that adults process spatial information.

We are continuing to recruit infants aged 6 to 12 months to participate in this study and for other studies in the Child Study Center, so we hope to see you back in the lab soon! We also welcome any new families who want to participate in our study! Interested parents may reach out to our lab or the Child Study Center at Emory University (contact information available at the bottom of the page and on page 9).

Jillian

Adna

Preschoolers

Jillian

In another study with four-year-olds, Jillian is studying the development of spatial reasoning abilities during the preschool years and how these abilities relate to young children's growing understanding of math concepts, like numbers and basic addition.

During the study, we first show four-year-olds videos of objects and shapes that move in predictable and unpredictable ways (once again, similar to the red shapes to the left of this paragraph). We record their eye movements while they do this task using our eye-tracker, which allows us to then examine where they look at the moving shapes to see whether children can predict the shapes' expected motion. In addition, we have the children complete different tasks that measure their memory, math skills, and vocabulary. This allows us to examine how children's spatial reasoning abilities (as measured using the task on the eye-tracker) relate to these various skills.

We are continuing to recruit four-year-olds to participate in this study over the coming months. New families are also welcome to reach out to our lab or the Child Study Center and ask to participate in this study (contact information available at the bottom of this page and on page 9).

Once data collection is complete, we will have an update for you on the study results. We are excited to see what they are!

How Children Form a Knowledge Base

As was mentioned on our first page, we are interested in the development of memory, especially as it pertains to adding new information to our knowledge base. Much of the research in the lab investigates the different skills and processes that affect how children learn, use, and remember new information—skills that are especially important in a school setting.

In particular, we at the Bauer Lab are interested in how children combine information learned across different times and contexts and then generate new understanding, a skill which is critical to building this knowledge base across one's lifespan. This is known in our lab as **knowledge integration.** It is an ability that undergoes many changes in the early years of life. As a result, one of the goals of this research is to better understand how this skill develops over the school-age years, as well as to investigate the ways in which we can promote and facilitate its development.

This line of work began in 2009, and since then, we have conducted a great deal of research on how children combine new facts through picture stories (see the next image for an example of a researcher using picture stories in a study), single sentence facts, and games.

As an example of what a knowledge integration study, children would come into the lab and meet with a researcher who would read them a pair of picture stories. In this pair of stories, children will see the images that appear in the border to this page below. The first story presents children with the first image: a hummingbird learns a fact about flowers, primarily that a corolla is the name for the bunch of flower petals on a flower. Then, after a short break, we read

Researcher Using a Picture Book during a Study

them the second story, which includes the second two images and ultimately teaches children a second fact about flowers, such that flower petals are used to make perfume. At the end of the session, we ask the children to **self-derive** new information. This requires children to put the two facts together to create a third, "new" fact (i.e., the corolla is used to make perfume) that they are then able to say in response to our prompting question (i.e., what is the corolla used for?).

In the first several studies using this design, we found that children as young as 4 years old can combine these learned facts (although children this young tend to struggle more than older children and require more hints and feedback). We in the Bauer Lab are continuing to build our understanding of how children **self derive** new knowledge through **knowledge integration.** Read on for descriptions of the studies we have recently conducted on knowledge integration and what we have learned so far about this skill and its development in childhood!

How Can We Support Young Children?

Recognizing Relatedness

Ana Maria

As was discussed above, children as young as four engage in the productive process of self-derivation, albeit at a lower rate than older children. This might be related to preschoolers' difficulty in recognizing the relatedness between information and therefore not binding them together in memory. In this study, Ana Maria is looking to boost self-derivation performance in 4-year olds by improving their recognition of how different pieces of information are related.

For this study, 4-year-old children read story pairs, with each story in a pair containing an unknown fact about a specific topic. As with our previous "corolla" example, the facts within a story pair are related and can be used to derive novel knowledge. After the stories, 4-year-olds are then asked about the facts they learned in the story (e.g. "what is a bunch of flower petals called?" and "what are flower petals used to make?"), before being given the self-derivation question (e.g. "what are corollas used to make?"). We hope that asking 4-year-olds for the individual facts from the stories will lead them to recognize the relation between the facts, which would allow them to link the facts in memory and self-derive successfully.

We are currently collecting data. If you know of any 4-year-olds who would like to participate in this study, please contact Emory's Child Study Center. Thank you to all our families who participated in the study so far! We look forward to sharing our results with you.

Using Prior Knowledge

Adna

In another variation on our self-derivation work, Adna gave 4-year-olds the chance to learn facts at home prior to being asked to combine new information in the lab. We mailed stories home to families and asked parents to read stories to their children before the lab visit. All stories were related to the information children later learned in the lab, allowing us to test how new information is integrated into prior knowledge and the pre-existing knowledge base.

For example, children learned the first "corolla" fact at home ("a corolla is a bunch of flower petals"). In the lab, we first asked them to remember this fact, hoping to (similar to Ana Maria's study) encourage them to have the information in mind. Then children read stories in the lab, where they heard that first fact again but also learned the second "corolla" fact ("flower petals are used to make perfume"). All children showed remarkable memory for the at-home stories and were able to productively link information learned from parents at home with knowledge learned in other learning situations. Moreover children derived new knowledge at a higher rate than in previous studies, suggesting that 4-year-olds benefit both from being reminded of the at-home stories in the beginning and from having prior knowledge prior to their lab visit. Further analyses are being conducted to examine the relationship between self derivation and prior knowledge. Thank you to all of the families who participated!

School Aged Children Face New Challenges in Self-derivation

As already described, our lab is very interested in how children build a knowledge base throughout their lives. This involves understanding how the process of self-derivation occurs organically in everyday settings such as the classroom, where children are required to learn new information presented through different formats, by different teachers, and sometimes across different languages. How do children navigate these varied circumstances and expectations?

Across Different Media

Jillian

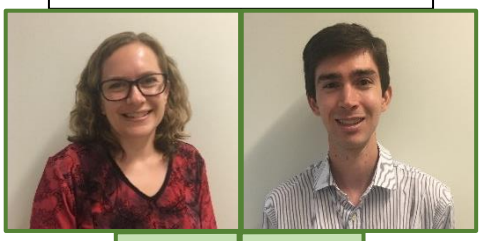
The focus of this study is to understand how children combine information learned from different types of source material (graphics vs text) to build their knowledge bases.

Jillian asked 7- to 9-year-olds to view graphics (similar to those found in their school textbooks) and to read sentences that related to those graphics. Then children were asked to combine facts within the graphics with facts contained in the sentences to create new knowledge about academic concepts.

The findings of the study suggest that children are better able to combine two facts that are presented in the same medium (e.g., in text) than two facts presented through different media (e.g., in a graphic and in text).

Data collection for this project has just wrapped up, so we would like to thank our participants and their families for their help in making this project possible!

Across Different Languages



Alena Jimmy

Dual-language education is an education model that provides instruction in two different languages. Because the model has excellent academic outcomes for students while simultaneously teaching a second language, it has become increasingly prominent across the country.

Alena and Jimmy are interested in how children build a knowledge base when instruction is delivered in multiple languages. This year, we returned to North Carolina to work with a group of children in grades 2-5 learning in a Spanish/English program. Now that data collection for this year finished, we are learning how important language proficiency and also the presence of pictures as contextual support is in comprehension and integration of learned facts.

We thank the families who have participated, and we are excited to see the implications study will have for instruction in dual-language programs!

How Older Children Integrate and Self-Derive


Alena


Jessica

We know from our previous research that children differ in their ability to generate new knowledge through self-derivation based on age. Given the results from the studies in pages 2-6, Alena and Jessica have asked questions about how older children (age 10) differ from their younger counterparts on our knowledge integration task.

Performance on a More Challenging Version

Health topics, such as dental hygiene and exercise, are important for children to learn as they develop into adolescents and young adults. Moreover, information on these subjects are likely to appear in various places and in many formats. The study by Jillian described in the previous page suggests that learning across different media is already more challenging. How then do older children fare when they must integrate new knowledge across different media on these generally more challenging topics?

To investigate this question, we showed groups of 10-year-olds videos and pamphlets on health related topics. We later asked them to generate new knowledge from the facts they had read.

Data collection is ongoing for this study, but we are excited to see how kids learn across the different sources and welcome any families who might want to participate in this study (contact information for our lab is available at the bottom of the page and for Emory's Child Study Center on page 9)!

Awareness of Performance and Strategies Used

Remembering the source of your knowledge is sometimes as important as the knowledge itself. For example, remembering that a teacher taught you about the "corolla" facts may signal that the information is important, as it could appear on a test later.

In order to test children's memory for the source of their knowledge, 10-year-olds came into the lab, read a list of facts, and later were asked to generate new knowledge from these facts. We then asked them questions about the knowledge they had generated.

More specifically, we asked them to describe what they thought they did with the facts they learned in order to generate new knowledge. We think that if children know how they put facts together to gain new knowledge and can recognize when they are the source of their own new knowledge, then they may generate more knowledge overall.

Data collection is ongoing for this study. We look forward to sharing the results once data collection is complete!

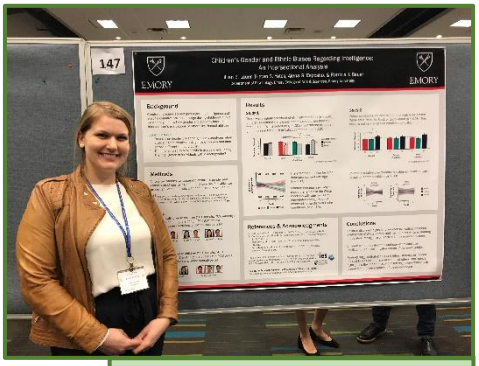
Thanking Our Undergraduate Research Assistants!

Our lab is fortunate to have such hard-working and reliable research assistants who provide support for our work at almost every stage: creating stimuli, conducting sessions, entering data, etc. So we at the Bauer Lab want to say thank you again to all of these dedicated research assistants! And a special congratulations to our graduating students: honors students Tristan, Eukyung, and Adriana, as well as Andrea, Ana, Annabess, Caroline, and Nick.

Adriana Mendez	Ariana Torres	Michelle Yi
Andrea Ochoa	Carolina Korey	Natalia Garzon
Amber Wilson	Elizabeth Bryant	Nick Alvarez
Amy Ma	Eukyung Yhang	Sama Radwan
Ana Ioachimescu	Kaveri Sheth	Tristan Yates
Ana Maria Blasini	Kelly Doyle	Tulasi Kadiyala
Annabess Ehrhardt	Maria Rendon	Veronica Vazquez

Presenting Our Work

Dr. Bauer giving a talk at the Swiss Graduate School for Cognition, Learning, and Memory Summer School Weggis, Switzerland



Jillian presenting a poster at the Society for Personality and Social Psychology Atlanta, Georgia

We at the Bauer Lab thank you again for taking part in our research! As we are interested in how memory processes develop from childhood to adulthood, the lab also does studies with adult participants (undergraduate students attending Emory University), but a large portion of our research is focused on working with our child participants. Our efforts would not be possible without such enthusiastic support and participation from the Atlanta community. We greatly appreciate all of the families who have volunteered their time with us, and we hope to see you for another study again soon!

Additionally, as our lab is always busy and recruiting for several studies at a time, we always welcome new families who would like to be included in the Emory Child Study Center database. If you have any friends, family, or coworkers who also have children in the 6 month to 10 year age range, we would love to have new families participate as well!

Parents interested in learning more about a specific study may contact the Bauer Lab at the phone number or email included below:

36 Eagle Row
Atlanta, GA 30322
(404) 712-8318
memoryatemory@emory.edu
https://scholarblogs.emory.edu/bauerlab/

Parents may also visit the Emory Child Study Center's website and include their information in our database of volunteer families. Please see the link below. A QR code is also included.

Child Study Center, Emory University
(404) 727-7432
childstudies@emory.edu
www.psychology.emory.edu/childstudycenter