Bauer Memory at Emory Lab

We at the Bauer Memory Development Lab like to send out a yearly newsletter to update our participating families and keep them informed about the work we have done. We also take the opportunity to express our appreciation to the families who have volunteered their time to participate in our studies. All of us at the Bauer Lab – Dr. Patricia Bauer (Bauer Lab director), Adna, Alena, Anaïs, Jessica, Jillian, Natalie, Nicole, and Ruth – thank all of you for joining us in our efforts to learn about memory! Thank you for your continued involvement with Emory's Child Studies Center!

This past year has indeed been a busy one for the Bauer Lab. It has seen the start of many new projects and the end of some older projects. As was mentioned above, we are interested in the development of memory, especially as it pertains to knowledge integration and building a knowledge base. We have conducted research on knowledge integration through stories, single sentence facts, and games, and we have used behavioral, event related potentials (ERP), and eye-tracking methods to collect data to answer our questions. The work we do on the development of memory processes spans a large age range: we have had studies with 6-month-old participants and other studies with 30-year-old participants. Please read on to pages 2-6 where you will find summaries of ongoing projects from the past year!

Every year brings such changes. This past year, we have had three new members join in our lab! Ana Maria Hoffmann graduated from the University of San Francisco in 2016 and has now started in our lab as our newest graduate student. Jimmy Daly and Lucy Cronin-Golomb both graduated this past May, from Stanford University and Tufts University respectively, and they have begun with us this semester as lab coordinators. As for our older members, Nicole has accepted a post-doctoral position at University of Texas in Austin. Previous lab coordinator Ruth has started a master's program at North Carolina State University. And senior graduate student Anaïs has defended her dissertation and will soon begin a post-doctoral position at the Grady Trauma Project. In addition, we have proudly seen many of our undergraduate student research assistants graduate this past May!

Other updates on the lab (news and pictures from professional conferences our researchers have attended to share their work with the scientific community) can be found on page 7. 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!

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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)!

How Children Form a Knowledge Base Through In-Lab Story Reading

Much of the research in our 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.

The ability to combine information learned across different times and contexts to generate new understanding is critical to building a knowledge base across the lifespan. But 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 using picture books to teach children new facts.

Researcher Using Picture Book during Study

For example, in a pair of stories, children may see the images that appear in the border to this page below. One 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 them a story that includes the second two images, ultimately teaching them a second fact about flowers, such that flower petals are used to make perfume. At the end of the session, we then ask them to put the two facts together to create a third, "new" fact (e.g., the corolla is used to make perfume).

In the first several studies using this design, we found that children as young as 4 years old can combine these learned facts.

We have conducted these studies using eye-tracking technology. 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 to calculate where the participant is looking on the screen as well as the size of the pupil. This can show us where participants are putting their attention and how much effort they are using during a task.

Our Eye-Tracking Room

Read on for descriptions of both eye-tracking and behavioral studies that aim to explain what factors contribute to knowledge integration and how different learning situations affect this skill.

Choosing Relevant Information amongst Distractors

Remembering the source of your knowledge is sometimes as important as remembering the knowledge itself. For example, remembering that your teacher taught you about butterflies may signal that the information is important and should be remembered for future reference. Awareness of source becomes especially important in a learning context where children are exposed to many different facts and expected to make connections between them. Because of this, we explored the role of awareness for source when picking relevant information from a pool of knowledge about a given topic.

For this study, 8-year-old children heard sets of stories in the lab about different topics (for example, 4 different stories about flower petals and 4 other stories about galaxies). After hearing a set of stories, they looked at a picture from each of the stories, all on the same screen. While they looked at the pictures, we asked them a question to see if they self-derived new knowledge from the stories (for instance, "What are corollas used to make?"). Later in the session, we had the children point to which stories they used to answer that question. Successful self-derivation required children to pick the necessary facts from amongst information that was broadly connected to the topic of corollas for example but not helpful in answering our question. And we found that children could engage in this productive process of self-deriving new knowledge even when they were given potentially distracting information. We also found that high scores on self-derivation related to high scores of awareness for the source of the information (i.e., pointing to the correct stories).

Thank you to all our families who participated in this study!

Ruth

Remembering the Source of Relevant Information

Jessica

Supported by the above study, we think that if children know where their knowledge comes from, they may remember the knowledge better. To further test this, we conducted a follow-up study where we ask children more questions about why they chose the stories they did.

Once again, 8-year-olds came into the lab and read stories (such as those in our corolla example) on an eye-tracker. We later asked them to generate new knowledge from the facts they had read and followed this up with questions about the knowledge they had generated. Most importantly, we asked them "How do you know that?" and presented them with pictures of the main characters from each of the stories they had previously heard. Children were able to choose between saying that they learned that knowledge from one or more stories, that they had generated the knowledge after figuring it out themselves, or that they had always had this knowledge.

We are examining both behavioral data (what the child explicitly says) and eye-tracking data (how long the child spends looking at each answer choice). We also think that eye tracking will show that children use more cognitive effort to understand information that they can generate themselves after learning the two related facts from the paired story set. This may also be linked to better memory for the source of knowledge. Data collection just wrapped up for this study and we look forward to sharing the results once they are processed!

Building a Knowledge Base across Different Settings

Across Different Mediums

Children learn information not only at different times but also in many different ways, from textbooks and reading assignments to lectures and in-class demonstrations. The focus of this study was to understand how children combine new information across different media to build new knowledge.

We asked 7- to 9-year-olds to view graphics similar to those found in their science and social studies textbooks and to read sentences that related to those graphics. Then they were asked to combine facts learned from the graphics with information contained in the sentences, to create new knowledge about academic concepts.

For example, children were shown a graphic of animals ordered by their average heights and then asked to name the tallest animal (i.e., giraffe). Later children were told that "The tallest animal in the world has a purple tongue." By combining those two pieces of information, the child could learn that "Giraffes have purple tongues."

Example Graphic

Findings for the study suggest that children *are* able to combine two facts presented in different media (e.g., in a graphic and in text), but they do *better* when the facts are presented in the same medium (e.g., in sentence format). Data collection has just wrapped up, so thank you to our participants and their families for making this project possible!

In Classrooms, Across Languages

As already described, our lab is very interested in how children build a knowledge base. This involves remembering information and adding new information that is learned under different circumstances – such as at a different time or from a different person. Dual-language education is an education model that provides content instruction through two different languages. This model of education has excellent academic outcomes as well as the benefit of learning a second language and is becoming increasingly common both across Georgia and at a national level.

With the increasing use of this model of education, we are particularly interested in how children build a knowledge base when instruction is through multiple languages. This past year, we returned to two dual-language schools. Locally, we worked with 2nd grade children learning Spanish and Mandarin at the GLOBE Academy. In addition, we traveled to North Carolina to work with a group of children in grades 2-5 learning in a Spanish/English program.

We are excited to investigate how children are able to put together facts and information that is related from across different languages and the implications this will have for instruction in dual-language programs.

MEMORY INVOLVED IN
Emotional Images and Events

Remembering Emotional Images

Anaïs

Child Wearing ERP Cap

Adults often have better memory for emotional experiences (weddings, car accidents, etc.) in both behavioral and brain responses. This "emotional memory enhancement" influences what is remembered (a fun birthday party versus last Tuesday's routine dinner) and how the memories are experienced (in detail versus vaguely). In a series of studies, we examined whether emotion effects on memory are consistent from middle childhood through early adulthood or if they change during this period of development.

Using a brain imaging technique called event-related potentials (ERP), we can see if there are unique patterns of brain activity for emotional (positive & negative) versus neutral experiences and whether that activity relates to behavioral responses. Previously we have used ERP to examine brain activity while 5- to 8-year-old children viewed emotional scenes for the first time and then again during a later memory task. Children had larger brain responses for emotional scenes than for neutral scenes (see below for example of what this data might look like). However, their memory was equivalent for emotional and neutral scenes. This suggests to us that the "emotion effect" emerges earlier in the brain than in behavior.

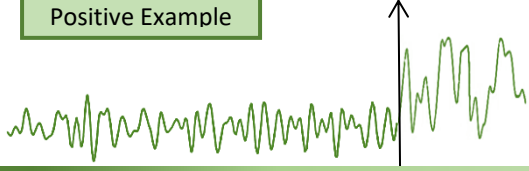
In a different study, we examined how modifying the emotionality of a scene impacts memory. We used a technique called reappraisal to prompt participants to evaluate scenes as more or less emotional than they normally would. For example, a picture of a car falling off a cliff evokes a negative response. However, when accompanied by the explanation that it is a picture of a stunt car in an action movie, the image is reappraised as less negative.

This study's results indicate that emotion enhances memory in 5- to 8-year-olds. It was the first to show that manipulating emotion responses affects later memory even in school-age children.

In the most recent study, children between 8- and 16-years-old and adults between 18- and 30-years old looked at emotional scenes while wearing ERP caps to record their brain activity. Across this age range, we observed a strong and consistent emotional memory enhancement effect: participants at all ages remembered emotional scenes better than neutral scenes. Analysis of the data also shows that the brain response to emotional versus neutral scenes is similar from middle childhood to early adulthood.

Altogether, these findings suggest that emotion effects on memory are stable and strong from middle childhood to early adulthood. We are currently submitting these findings for publication in scientific journals. Next, we are eager to examine individual differences in how much better memory is for emotional relative to neutral scenes, in order to learn why some people's memories are more or less sensitive to emotional information. We thank all of our participants for contributing to this exciting research!

Positive Example



Neutral Example

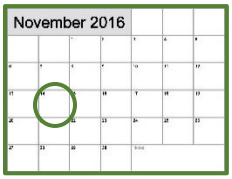
Remembering Emotional Events

Adna

How we recall personal emotional events is important for both understanding the world around us and learning about ourselves. However, little is known about consistency of emotional memories. That is to say, when you talk about a time that you felt peaceful, sad, angry, or joyful—do you always talk about that memory in the same way? We used an online survey to ask pre-teens, teens, and adults to tell us about events they experienced in their lives during which they felt these emotions. Participants also titled each memory after writing it. Then, six weeks later, participants were given the memory titles (to serve as cues) and asked to retell these same stories. We are currently examining whether participants told the same stories at both times and comparing details given at both times (including who was there, where the event was, what happened as well as what emotions are mentioned and how the event is evaluated). We are also interested in seeing whether there are age differences in consistency of memories. Finally, we plan to examine whether different types of emotional memories are more consistently recalled than others. Thank you to all of the families who participated!

Natalie

"Describe a memory from a time when you felt happy, excited, or joyful."



"Previously, you wrote about a memory entitled [TITLE]. Please write about this memory again."

MEMORY INVOLVED IN Spatial Rotation

Performing Spatial Rotation

This year we have conducted two studies investigating the development of spatial cognition in infants between the ages of 5 and 12 months. Both studies have been focused on understanding how infants reason about and predict the motion of rotating objects. During these studies, infants are presented with rotating objects and various static shapes, and we measure how long infants look at the differing objects using our eye tracker, which allows us to quantify infants' attention towards different types of rotational motion and static shapes. Data collected thus far suggest that infants process different types of spatial information in a similar manner to the way that adults process spatial information. We are continuing to recruit infants aged 5 to 10 months to participate in these studies throughout the upcoming year, so we hope to see you in the lab soon!

Jillian

Adna

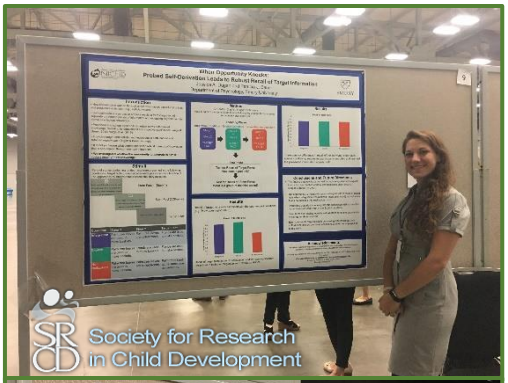
Thanking Our Undergraduate Research Assistants!

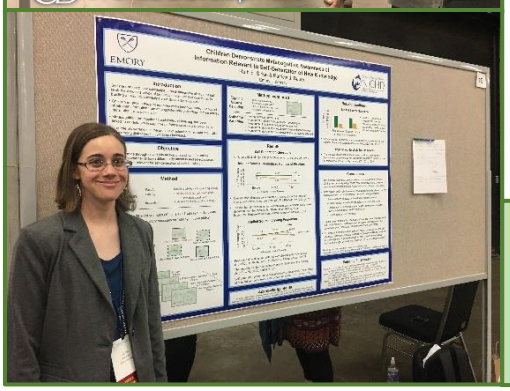
We are always fortunate to have so many dedicated and hard-working research assistants helping us in the lab! Undergraduate research assistants are vital in that they help in almost every stage of conducting our studies. They take part in creating stimuli, recruiting participants, conducting sessions, and entering data, just as a small example of some of the ways our research assistants provide support for our work.

Thank you again to all of our research assistants! And congratulations to this past year's graduating students: honors student Margo, scheduler Oby, as well as Gabriella, Elsa, Daniel, Matt, and Jhenelle.

Oby Nwamu	Matt Cialdella	Kaveri Sheth	Veronica Vazquez
Margo Menkes	Nicolas Furci	Paula Quezada	Eukyung Yhang
Elsa Pantoja	Carolina Korey	Sama Radwan	Reilly Allison
Daniel Cruz	Adriana Mendez	Tristan Yates	Tru Powell
Jhenelle Elder	Andrea Lozano	Hannah Billings	Lily-Michelle Arthur
Gabriella Lains			Annabess Ehrhardt

Presenting Our Work





Jessica and Ruth Presenting at SRCD in Austin, TX

Dr. Anaïs Stenson After Her Dissertation Defense!

We at the Bauer Lab thank you again for taking part in our research! Our efforts would not be possible without such enthusiastic community participation. We hope to see you for another study again soon!

child study center
EMORY UNIVERSITY

Do you know any families who might be interested in participating in child development studies at the Emory Child Study Center? Please visit the Child Study Center website at:

www.psychology.emory.edu/childstudycenter

or Call/Email:

404-727-7432/childstudies@emory.edu