Bauer Memory at Emory Lab Newsletter 2016

Each year we at the Bauer lab send out this update to keep the families that have participated in our studies informed about the work that has been started and accomplished in our lab. It's also another chance to express our appreciation to all of you who have participated for joining in our efforts!

This year there have been many starting and ongoing projects, as well as new transitions to report with our lab members. All of us here: Dr. Patricia Bauer (*Memory at Emory lab* director), Adna, Alena, Alexis, Allison, Anaïs, Aoxiang, Jessica, Jillian, Laura, Marina, Nicole, Rebekah, Ruth, Sumayah, and Xiaomei, thank you for your support of our work. We greatly appreciate your patience, enthusiasm, and continued involvement with the Child Studies Center at Emory University.

The newsletter includes summaries of the projects that have been in progress this year. Our lab has been studying the development of memory and the processes that help us to build a knowledge base. We have continued the work on knowledge integration through stories and games with both *behavioral* and *eye-tracking* methods of data collection.

This work has been conducted with preschool and school-aged children. In addition, the brain imaging *ERP* (event-related potentials) technique has been used to examine emotional memory in children and adolescents. On page 7 you will find lab updates and professional conferences where our researchers have shared their work with the scientific community. Please also see "Publications" on our website for some examples of the lab's published works!

Every year also brings changes to the makeup of our lab, and 2016 is no exception. Nicole now can officially write "Ph.D." after her name, and Jessica and Aoxiang can add "M.A."! Marina moved to Michigan in June to take a position as a Research Associate Data Analyst and to spend more time with her new grandson, Sage. Natalie joined the lab to keep everything running smoothly. Rebekah started a school counseling program at the University of West Georgia. Jillian, a doctoral student, joined our lab and has been working on learning and emotion projects. The lab also received funding to continue a longitudinal education project started by Alena. We have also had a visiting scholar from China, Xiaomei, who is working on education projects.

Laura served as a lab coordinator over the spring and will be starting a clinical psychology program in the fall at Arizona State University. Alexis also came in as a lab coordinator in June after graduating from Florida State University and majoring in Psychology and Criminology. Sumayah, another new lab coordinator, received her master's in Public Health from Emory before joining the lab. In addition, we have had many undergraduate research assistants graduate this year. Congratulations to Abby, Aileen, Jennifer, Christine, and Laura, as well as Allison and Adna, who pursued honors projects while they were in the lab. Welcome to all the new members, and we wish all the best to those who are moving on.

For more information about our projects, findings, or ways to contribute to our research, you can visit our website, call us at 404-712-8330, or e-mail us at memoryatemory@emory.edu!

Inside this issue:

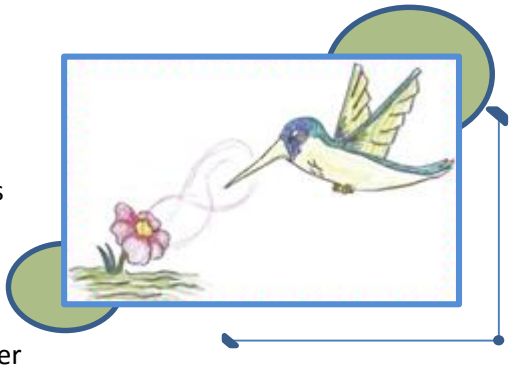
Forming a Knowledge Base

Much of the research in our lab investigates 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, and undergoes many changes in the early years of life.As such, one of the goals of this research is to better understand how this skill develops over the school-age years, as well as how to promote its development.

This line of work began in 2009 using picture books to teach children new facts. For example, in one story children may learn a fact about flowers (e.g., a corolla is a bunch of flower petals). Then, after a short break, we read them a story that includes a second fact about flowers (e.g., 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. Read on for descriptions of studies that aim to explain what factors contribute to this skill, and how different learning situations affect knowledge integration.

Generating Our Own Knowledge vs. Being Taught



A very important topic in education is identifying the best methods to help children learn. The Bauer Lab decided to investigate this subject by varying the way that children were exposed to new information. Specifically, we asked whether children learn new information better when it is taught or when they have the opportunity to generate the knowledge on their own.

Five-year old children were read short stories in the lab and their memory for the stories was tested at the end of the session as well as one week later. In one version of the stories, the passage contained two pieces of related information that could be combined to create a new piece of information. In the other version of the stories, the new information was directly stated in the passage so that children did not have to generate the new fact on their own. An example scenario would be that in a story a child would hear that "a corolla is a bunch of flower petals" and in another story, s/he would be explicitly taught that "corollas are used to make perfume." In the other scenario, the child is given the two pieces of related information "a corolla is a bunch of flower petals" and "flower petals are used to make perfume." The child must combine the two pieces of related information to arrive at the target fact "corollas are used to make perfume."

There was not a difference in performance when children were read stories where they were explicitly told the new fact or when children generated the new fact by combining the two pieces of related information. This is a surprising finding since we expected memory to be worse for facts that were explicitly stated to the child rather than when children generated the facts themselves.

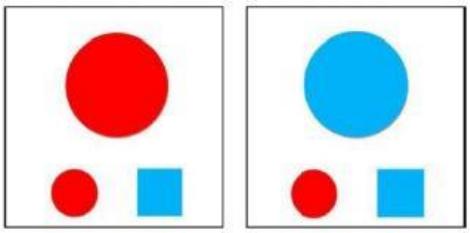
The Importance of Learning at Home

In another variation on our knowledge integration work, we gave 4-year-olds the chance to learn some facts at home prior to being asked to combine new information in the laboratory. We mailed stories home to the families and asked parents to read the stories to their children several times before their visit. All of the stories were related to the information they later learned in the laboratory, allowing us to test how new information is integrated into the pre-existing knowledge base. For instance, some children learned a fact about flowers at home (e.g., a corolla is a bunch of flower petals). Then, in the laboratory, they learned a second fact about flowers (e.g., flower petals are used to make perfume).

All children did great—they showed very good memory for the stories read at home! Moreover, similar to earlier studies, children combined newly and previously learned information two thirds of the time.

This research has taught us that, compared to when they learn all the facts in the laboratory, children productively link information learned from parents at home with knowledge learned in other learning situations. Thus, the act of reading to your children may promote knowledge extension in a more formal setting, irrespective of the specific content. In an effort to further understand what improves learning and memory, future research will continue to examine the factors that support knowledge development in younger and older children.

What Makes Us Good at Generating Our Own Knowledge?



One measure of controlled attention

In our study of how children acquire knowledge, we are also interested in what processes are necessary for children to learn from texts and be able to combine individual pieces of information into new knowledge. This line of study will help us promote the development of skills necessary for academic performance. This past year we have continued to examine what cognitive skills support the ability to combine new factual information.

We are examining reading ability, long term visual and auditory memory, controlled attention, and reasoning skills to see how they relate to performance on learning tasks. We are also comparing lab performance with children of the same age completing similar tasks in the school setting to see how our lab results translate to learning in schools. In this study, children came into the lab on 2 occasions a week apart. Children read individual facts separated by vocabulary, memory, and attention tasks. They were then asked about the information from the facts they read and knowledge extension questions that required putting information from more than one fact together. Children then completed with a reasoning task and a memory task.

This is a follow-up to a study conducted last year in which 4-, 6-, and 8-year-old children were read stories with related information. We found that vocabulary was an important factor in children's ability to extend knowledge. Data collection is has just been completed with 8- and 10-year olds.
We look forward to the results!

Combining Information from Graphics and Text

In their classrooms, children are presented with new information in many different ways, from textbooks and reading assignments to lectures and in-class demonstrations. The focus of this study is to understand how children combine new information across such different media to build new knowledge. In the lab, we ask 8-year-olds to review pictures like those found in their science and social studies textbooks and to read sentences related to those pictures. Then, children are asked to combine facts learned from the pictures with facts found in the sentences to create new knowledge about academic concepts.

For example, a child may be shown a picture of some animals and asked to name the tallest one (i.e., giraffe). Later, the child is told that "The tallest animal in the world has a purple tongue." By combining those pieces of information, the child can learn that "Giraffes have purple tongues."

We think that children's ability to combine information across pictures and word passages may benefit their academic achievement, particularly in science and math subjects. Data collection for this project has just begun, so we hope to see you in the lab soon!

Learning across Two Languages

Elsa, Laura W., Esther, Daniel, Jillian, Alena, Ruth, Laura M., Adriana, Aileen

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, from a different person, or from different materials. 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. This model of education is increasing across Georgia and at a national level. We are interested in how children build a knowledge base when instruction is through multiple languages.

This past year, we went to two dual-language schools. Locally, we worked with children learning Spanish, French, and Mandarin at the GLOBE Academy. In addition, we traveled to North Carolina to work with a group of children in a Spanish/English program. We also had several children from the surrounding area come to the Child Study Center and listen to stories in English, Spanish, or in one of each language. Between stories, children completed vocabulary measures in English and Spanish. We are excited to investigate how children are able to put together facts and information that is related from across different languages!

Eye-tracking Technology

The eye-tracker we use in our lab is a self-contained, external monitor. 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. The eye-tracker has been used in studies of emotion, reading, memory, and knowledge integration. Read on for studies using this method of data collection!

Where Did I Learn That?

Remembering the source of your knowledge is sometimes as important as the knowledge itself. For example, remembering that your 3rd grade teacher taught you about butterflies may help you remember other details about that topic. In order to test children's memory for the source of their knowledge, 8-year-olds came into the lab for two sessions.

Examples of answer choice pictures

In the first session, we read them stories and asked them to generate new knowledge from the facts they had read. When children came back one week later, we asked them questions about the knowledge they had generated. Most importantly, we asked them, "How do you know that?" and presented them with pictures representing each of the stories they had heard the previous visit as answer choices. We think that if children know where their knowledge comes from, they may remember it better. We are also investigating this question using eye tracking. Another group of 8-year-olds came to the lab and read stories themselves.

We think that eye tracking will show that children use more cognitive effort to understand information that they can generate themselves after learning two related facts. We are currently processing the data collection for these studies and we look forward to sharing the results.

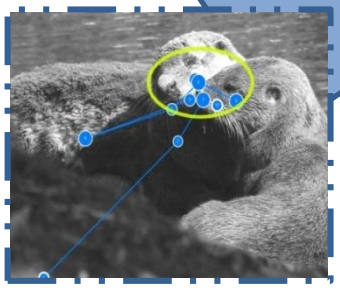
Looking while Listening and Learning

Another variation on our knowledge-integration line of research used eye-tracking to try to understand how children learn through hearing different sets of related facts.

Previous eye-tracking research has shown that the amount of time looking at something and changes in pupil size are linked to the amount of effort needed to understand information.

Five-year-olds came into the lab for a single session and listened to groups of facts. We wanted to compare whether the amount of effort to understand the information was different between two types of fact sets. In one type, they might hear that "Centaurus is a galaxy," "Galaxies are made of stars," and "Centaurus is made of stars." This last fact they learn is explicitly teaching the link between the first two facts.

In another type of fact set, children might still learn that "Centaurus is a galaxy" and "Centaurus is made of stars," but *instead* of learning "Galaxies are made of stars" as the second fact they would hear "*There are three types of galaxies*." This time the third fact, "Centaurus is made of stars," is new information rather than the combination of the first two facts they heard. After hearing some of each type of fact set, children were asked questions about what they had heard, as well as some language questions.



An example of how the eye-tracker can detect fixations by the eye

We think that children might process the information in the third fact differently depending on how much overlap it has with the first two facts. Data collection for this project is ongoing.

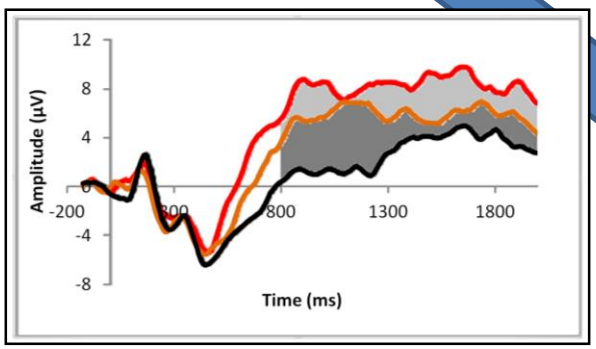
Remembering Emotional Pictures

Adults often have better memory for emotional experiences, such as weddings and car accidents. This "emotional memory enhancement" effect appears in both behavioral and brain responses. It has important effects on both *what* is remembered (e.g., a fun birthday party versus what was for dinner last Tuesday) and *how* those memories are experienced (e.g., in detail versus vaguely). In an ongoing series of studies, we are studying the 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 versus neutral experiences, and whether that activity relates to behavioral responses.

A child wearing an ERP cap

In a prior study we 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 (positive and negative) than for neutral scenes. Though children remembered the scenes very well, 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 perceive scenes as more or less emotional than they normally would. For example, a picture of a car falling off a cliff typically evokes a negative response.



An example of an ERP wave form
Orange- Negative reappraisal
Red- Negative Matching
Black- Neutral

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. The results from this study indicate that emotion enhances memory in 5- to 8-year-olds. Importantly, this study was the first to show that manipulating emotion responses affects later memory in children. This finding demonstrates that emotion impacts memory even in school-age children.

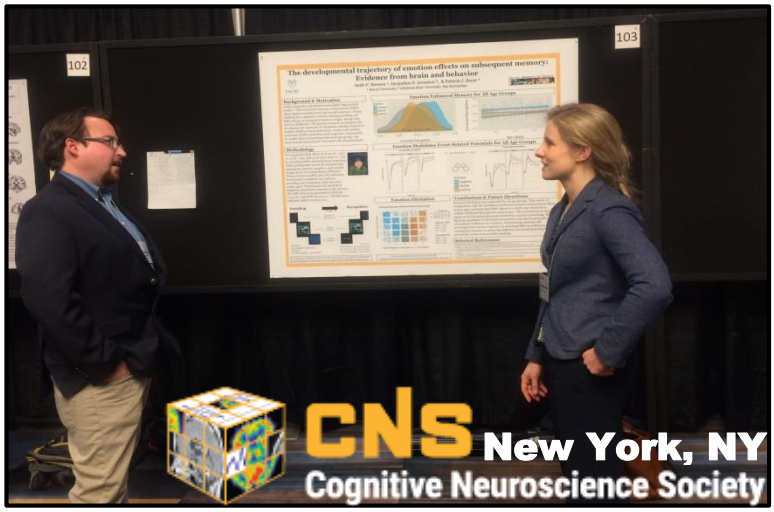
In the current study, children between 8- and 16-years-old and adults between 18- and 30-years old are asked to look at emotional scenes while wearing ERP caps so that we can record their brain activity. Data collection is now complete for 8- to 22-year-olds. Across this age range, participants remembered negative and positive scenes better than neutral scenes. This emotional memory enhancement effect is strong and consistent at all ages. Preliminary analysis of the ERP data shows that the brain response to emotional versus neutral scenes is also similar from middle childhood to early adulthood.

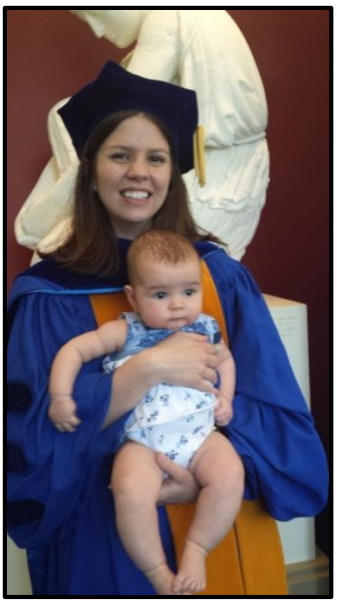
Altogether, these findings suggest that emotion effects on memory are stable and strong from middle childhood to early adulthood. We are eager to look next at individual differences in how much better memory is for emotional relative to neutral scenes, in order to learn more about why some people's memories are more or less sensitive to emotional information.

We thank all of our participants for contributing to this exciting and ongoing research!

Bauer Lab News and Professional Conferences

Many in our lab have attended professional conferences during the year to learn from and share with others in the scientific community. Here are some updates on our lab members, too!





This year, Natalie obtained her doctorate and also had a little girl, Edi. Welcome to the Bauer Lab family!

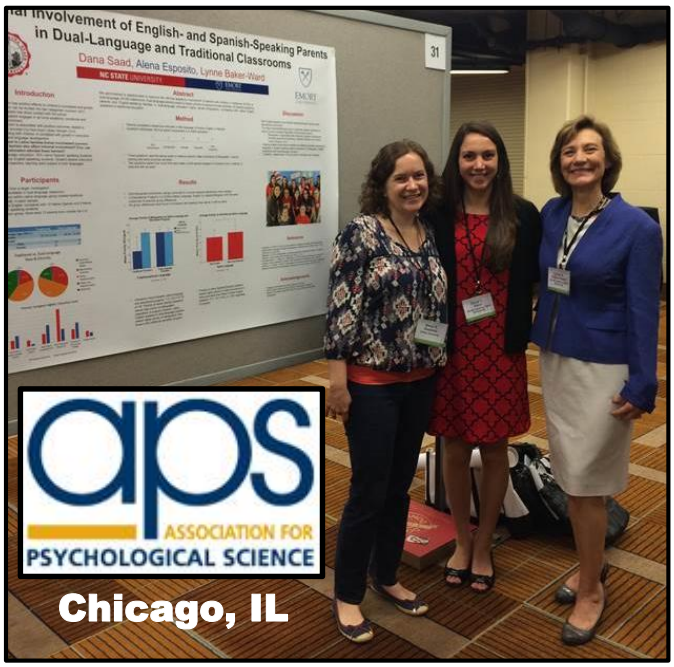
Cognitive Development Society
Columbus, OH

ICIS
INTERNATIONAL CONGRESS OF INFANT STUDIES
2016 Conference

New Orleans, LA

Comparative Cognition Society

Melbourne, FL



Thank You to Our Undergraduate Research Assistants!

We are fortunate to have had many undergraduate research assistants helping us with all aspects of our research. They provided enormous support in all aspects of our research, from scheduling participants and running testing sessions to transcribing and coding, among many other lab activities! Congratulations to our honors project students Adna and Allison, as well as Jennifer, Aileen, Abby, Christine, and Laura W. on their graduation!

Allison Carr	**Esther Lu**	**Elsa Pantoja Garcia**
Matthew Cialdella	**Adriana Mendez**	**Aileen Rivell**
Daniel Cruz	**Margo Menkes**	**Abby Rufer**
Adna Jaganjac	**Laura Morales-Riley**	**Christine So**
Jennifer Lee	**Oby Nwamu**	**Laura Winstone**

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

We at the Bauer Lab thank you again for taking part in our research! Our efforts would not be possible without such willing and enthusiastic community participation. We hope you join us again for another study in the future!

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http://www.psychology.emory.edu/cognition/bauer/lab/index.html