Bauer Memory at Emory Lab

Newsletter 2020

We at the Bauer Memory Development Lab are pleased to send the annual newsletter to our participating families. With this letter, we express our appreciation to the families who have volunteered their time for our studies, as well as update you about our research. All of us at the Bauer Lab sincerely thank you for joining us in our efforts to learn about memory and development! Your continued involvement in the Emory Child Study Center is greatly appreciated.

In the following pages you will find updates and descriptions of some of the studies in which you and your children may have participated. We also include other updates and pictures of our lab members in action!

In addition to the productive work being done in the lab, many members have celebrated accomplishments this year. Our principle investigator of the lab, Dr. Patricia Bauer, has become Editor-in-chief of the prestigious journal, *Psychological Science*. She was also awarded an honorary degree by Aarhus University in Aarhus, Denmark for her research in autobiographical memory. Lucy earned her Master's Degree in April 2020. Lab Coordinators Blaire and Katie will be starting graduate school in the fall- Blaire at the University of Texas, Austin and Katie at the Rollins School of Public Health at Emory! Jessica earned her Ph.D. and became a Postdoctoral Fellow in the lab!

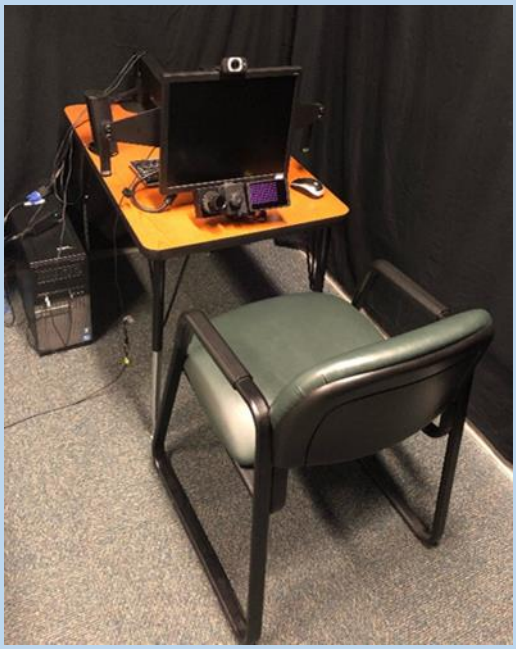
We also celebrated the graduation of many of our undergraduate students this past May. We are excited to share our updates with you and see what this next year brings!

For more information about projects, findings, or ways to contribute, you can visit our website or call us at (404)-712-8330 and email us at memory2@emory.edu

Dr. Patricia Bauer, Ph.D.
Lab Director

Our Research

Much of the research in our lab investigates different skills and processes that affect how children learn, remember and use new information. These skills are particularly important to study because the ability to combine information to generate new understanding is critical to building a knowledge base. As such, one of the goals of our research is to better understand how these skills develop and change over time.



Eye-tracking Technology

Many of our studies use an eye tracker! It uses infrared light to measure reflections from the pupil and cornea to calculate where the participant is looking on a screen. We use the eye-tracker to show us where a participant is focusing their attention and how much effort they are using during a task. This is important because it gives us insight to internal cognitive processes that may help explain human behavior. As researchers, we are investigating the clues provided to us through techniques such as this to understand when these developmental changes are occurring!

Forming 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, remember, and use 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 understandings, a skill that is critical to building this knowledge base across one's lifespan. Our lab calls this process **knowledge integration.** 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 gained a great deal of information about how children combine new facts through pictures, stories, single sentence facts, and games.

Knowledge Integration Example:

Children come into the lab and meet with a researcher who presents the child with a series of facts (either learned from a PowerPoint or learned from reading a story).

For example, a child might learn that a corolla is the name for the bunch of flower petals on a flower. Then, after a short break, the child might learn that flower petals are used to make perfume. At the end of the session, we ask the child a series of questions (i.e. What is the corolla used for?). In order to answer these "integration" questions, one must put the two related facts together to create (or self-derive) a third, "new" fact (i.e., the corolla is used to make perfume).

Integration in Children

Overall, we have discovered children as young as 4 years old can learn facts and combine information to self-derive new knowledge. This skill vastly differs across age groups. The following studies aim to help us understand the development of this skill.

Some children may have participated in a study that is funded by the National Institutes of Health. Children in this study are 8, 10, and 12 year olds and they met with Blaire, Claire, Melanie or Katie either in person or via an online platform. During this study, children learn facts and see some images that represented those facts. Later in the session, the children are asked some questions about what they might have learned. In this study, we are interested in teasing apart the learning (self-derivation) process to answer questions like WHEN children put two pieces of information together- is it when they learn the second related fact? Or is it when they are asked a question that requires them to remember both facts? Answers to these questions will help us better understand (and possibly help facilitate) how children learn and form a knowledge base. Having 8, 10, and 12 year olds participate in this study over time will allow us to better understand cognitive changes that occur across development.






In another project, Lucy, Blaire and Hilary asked kids and adults to learn from a presentation on an eye-tracker. We showed them pictures that represented individual facts that could be integrated together to generate novel information. For example, at one time point a participant might learn “The heart is the only muscle that never tires.” At another time point they then learn, “The only muscle that never tires is powered by electricity.” They are then asked, “What is the heart powered by?”. To successfully answer the question, participants must combine information across the two facts (answer: The heart is powered by electricity). For this project, we were particularly interested in *reactivation* of information during learning. That is, do participants remember information from the first fact when they learn the second related fact? If so, does that help them successfully answer the test questions? We found that, in both child and adult samples, participants who reactivated, or remembered, information from the first fact after learning the second were more likely to answer test questions correctly.

Learning Tools/Memory Tools

Our lab is interested in how we learn, what we do with that learned information, and what helps us learn. As children, there are different methods of facilitating learning. As adults, we can benefit from finding memory tools that continue to help this process. The following studies show how different forms of testing can be a learning tool.

In a project ongoing from last year, Julia observed what factors might influence how children (ages 7-9) and adults (ages 18-22 years old) put together information they have learned across different time periods within one session, to generate new information. Specifically, she examined if prompting the participant to integrate the facts would help this process of combining pieces of information. We found that both children and adults combine information across episodes and self-derive novel facts without being specifically prompted to do so. However, **prompting** led to higher levels of self-derived facts, suggesting that providing prompts to integrate the facts supports learning across episodes and self-deriving new information.

Julia's second project was an investigation of how different forms of **testing** affect how we remember *and further extend* learned knowledge. In two samples of adults (age 18-22 years and 18-25 years), she taught participants separate facts that could be put together to generate new knowledge on that topic. We then either asked them to **recall** these pieces of new information they learned, or **integrate** them to see if they did combine those pieces of information and generate new knowledge themselves. After varying delays, we asked them to further integrate new information with the information they had already learned. We then asked them to recall all the facts that they had been taught. Results are forthcoming, but so far our data suggests that being able to integrate the facts and generate new knowledge during session 1 helps participants remember the learned information better, in comparison to when they are just asked to recall the facts during session 1. These findings will help us understand the best ways to learn and remember new information.

Julia plans to incorporate a brain imaging technique known as ERP in her research. ERP is a technique for recording electrical activity produced by the brain - "brain waves." Electrodes are placed on the scalp with the use of a cap as seen in this image. ERP stands for "event-related potentials", meaning we can look at the brain's response to particular events of our interest!

Learning Tools/Memory Tools

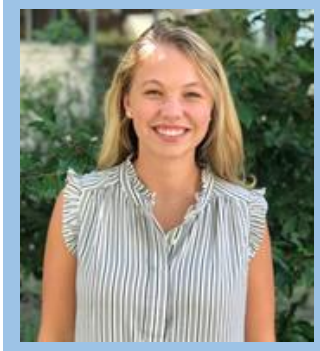
As we continue to find different forms of testing that contribute to our learned knowledge, we can also look into the importance of knowing where our knowledge comes from.

Lucy is very interested in memory tools that can improve overall learning outcomes. In one of her studies, she used **pre-testing**, or asking test questions before learning, to improve learning ad performance across various formats (picture and text). Interestingly, pre-testing only helped performance on questions that were asked about information learned across text + graphic formats. We think this is likely due to attention. It might be that photographs are especially helpful when you know what to pay attention to! A pre-test can help direct attention to supporting and relevant details in the photograph. Lucy is also planning to incorporate new eye tracking technology into this research, to understand where her participants direct their attention!

Remembering the source of your knowledge is sometimes as important as the knowledge itself. For example, remembering that your teacher taught you about butterflies may signal that the information is important. In order to test children's memory for the source of their knowledge, Jessica and Claire had 8-year-olds come into the lab and read stories on an eye-tracker. They later asked them to generate new knowledge from the facts they had read.

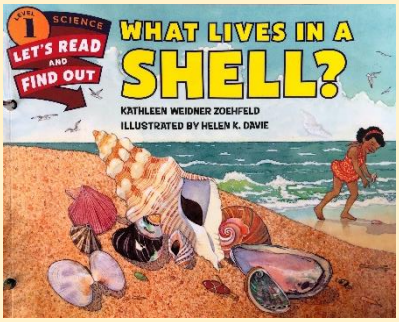
We then asked some questions about the knowledge they had generated. Most importantly, we asked them, "How do you know that?" and presented them with pictures representing each of the stories they had heard during the previous visit as answer choices. **We think that if children know where their knowledge comes from, they may remember it better.**

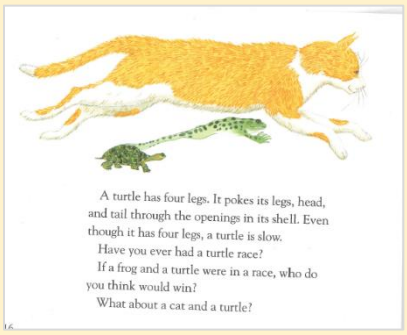
We think that eye tracking will show that children use more cognitive effort to understand information that they can generate themselves after learning two related facts. This may also be linked to better memory for the source of knowledge. Data collection is almost complete for this study and we look forward to sharing the results once they are processed!

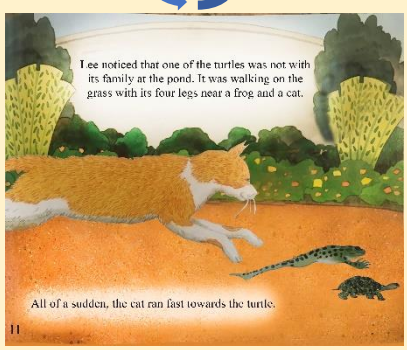


Learning from Storybooks

Our lab is specifically interested in how children learn more about the world around them. Children's interactions with their parents play a major role. The following study explores how children learn science knowledge from storybooks they may read at home with their parents.







Hilary, Lucy, and Melanie are looking at how 4- and 5-year-old children learn science information from book reading with their caregivers. In this work, we have caregivers read books to their children about animal topics, such as why animals have shells (for protection!) and why animals need to be fast (to catch food!). We then ask the children questions about the books to see what kinds of information they remembered. This work helps us understand how children learn from science books and how caregiver interactions influence learning. In our first study, we used non-fiction children's books. We found that books that support learning through giving examples and providing details of facts help children learn more information. Additionally, questions present in the book help to engage children, which also enhanced their learning. We are currently extending this work to see whether children learn the same type of science information when the book is presented with a story, as a narration. To do this, we adapted the non-fiction books caregivers read to their children and added narrative elements, such as a fictional character. (See some examples of these changes to the left!) We are interested to see if adding narrative elements enhances children's memory of the same science facts, or if it distracts the child away from the science facts. Data collection is currently ongoing. Since COVID-19 interrupted in-person data collection, we will have both in-person and online sessions to compare and present! We hope to use this work in the future to enhance early science learning in the home. We thank families who participated and look forward to sharing our findings.

Integration in the "Wild"

It is important to study how the process of integrating two pieces of information happens outside of the laboratory. The following studies investigate integration in sessions that imitate out-of-classroom learning and learning across medias.



Learning often requires combining information across different types of media. For example, a teacher may include diagrams to supplement readings, a museum exhibit may include a 3D artifact as well as an instructional video, or you might find yourself in a doctor's office holding an informational pamphlet meant to supplement the doctor's orders.

In this study, Lucy asked Emory undergraduates to learn a bunch of information about art history. To successfully answer her test questions, participants had to integrate information across two separate yet related learning episodes. Sometimes these learning episodes were text-only passages and other times they were text passages paired with supporting photographs. We did not know if it would be easier or harder to learn from text and photographs as opposed to just text. We thought maybe the photograph would be distracting (split-attention effects). On the other hand we thought perhaps the photograph would help with task engagement (increased enrichment). Preliminary data shows lower overall performance on this task compared to previous Bauer lab integration work (single sentence learning episodes).This makes sense because she asked them to learn a lot of information at once! Preliminary analyses suggest that participants are more successful on test questions when they are able to learn from photographs as well as text. We need a larger sample size to solidify this finding, but it is cool to see the data trending this way!

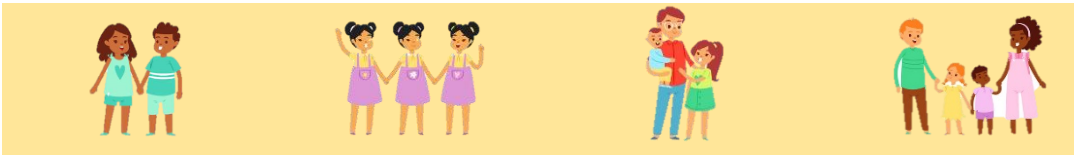
In another study, Lucy asked Emory undergraduates to learn across contexts and formats. They learned some information through text passages in the lab and some from text and exhibits in the Michael C. Carlos museum. Preliminary data analyses suggest that participants are most successful on test questions when they learn information from text and exhibits! Neat!

Much of Lucy's stimuli came from exhibits at the Carlos Museum on Emory's Campus!

Autobiographical Memories in Sibling Relationships

This year, our lab was lucky to work with a visiting scholar from Turkey, Demet! Demet's research aims to understand memory of experiences, specifically regarding sibling relationships.

Lab members and their siblings!



Demet studies autobiographical memory, which can be understood as recollections of past events that have happened to us in a specific time and place, leaving emotional or personal significance in our lives.

Autobiographical memories are important in our lives because we constantly use these memories to understand ourselves, to compare the person who we used to be and who we are now, to socially bond with others and even to plan our futures! Even though autobiographical memories center ourselves as the main actors, we do not live an isolated life. Whatever happens to us, most of the time it happens with others, be it within our families, among our friends or colleagues. Therefore, we include other people into our autobiographical stories. Demet's current study mainly focuses on siblings, and memories including siblings because siblings are our lifelong partners. They are one of our family members who we relate to like friends. We may use this relationship to understand ourselves. Our siblings may become one of many reference points to position ourselves in life.

To understand this, in our first study, we interviewed a group of college students from Turkey and the USA about their relationships with their siblings. Overall we found that siblings have close relationships, they experienced changes in their sibling relationship qualities mostly from negative to positive, and these changes happened mostly during adolescence or adulthood years. There were many external factors triggering a change or a transformation in sibling relationships or in themselves. Some of these factors were family problems, health issues or death. Still, they also reported growing up, maturing, or leaving for college as the main reasons for the change that they experienced. In our second and main study, we asked another group of young adults to write about a personally significant memory, and two more memories that include their sibling and their family members. Although this study is still in progress, we expect to see some differences across memory types and the gender of the self and/or the sibling. We would like to continue our research with more students participating from different backgrounds to compare and see some differences or similarities across cultures.

Our Online Transition

COVID-19 may have added an unexpected twist to our in-person lab experience, but that did not stop us from collecting data. We have explored various new ways to transition to remote work, and because of you- we are busier than ever!

Graduate student, Lucy Cronin-Golomb, defended her Masters thesis over Zoom. Congratulations Lucy!

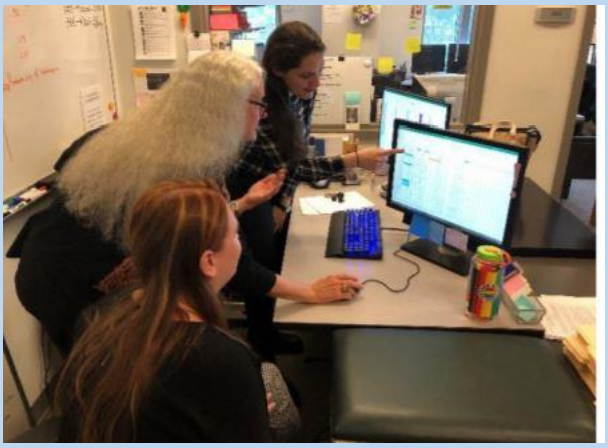
Every lab member has been adapting to this new online work environment, even Bear! For our storybook study, we asked 4-5 year olds to tell their friend Bear everything they remember about the books they had just read. Now, we are Zooming parents and children while they read the same books from their own homes and then have them tell virtual Bear everything they remember!

One of our lab's research assistants, Alissa Miller, has graduated Emory's Class of 2020 and joined us as our newest staff member this year! She began her position as Lab Coordinator online, and is continuing to dedicate her work with the Bauer Lab remotely.

Life in the Bauer Lab

Dr. Bauer and Julia discussing ERP data

Dr. Bauer, Hilary, and Blaire looking at some eye tracking data



Katie, Dr. Bauer, and Jessica preparing a presentation

Demet, Claire, and Dr. Bauer thinking of ways to keep kids engaged during sessions

Lucy, Dr. Bauer, and Melanie discussing storybook stimuli for the book-reading study with 4-5 year olds

Thank you to our Undergraduate Research Assistants!

Many wonderful undergraduates have worked in our lab the past year. They provided support to all aspects of our research, from entering data to watching siblings during sessions! We are very grateful for them and we could not have done all this research without them!

Allie Udoff
Alissa Miller
Arden Godfrey
Ben Gilbert
Brittany Calkins
Britney Del Solar
Elena Bowie
Elizabeth Pittenger
Emily Beattie
Emma Simpson
Elana Herbst
Francesca Cabada
Jelena Pejic
Jessica Isabor
Madi Stephens
Michelle Zhang
Rachel Shanahan
Tulasi Kadiyala

Again, we would like to thank YOU for participating in our research! Our efforts would not be possible without such willing and enthusiastic participation. We would love to have you back for another study!

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