

Bauer Memory Development Lab Newsletter

The members of the *Memory at Emory Laboratory* are excited to share with you our lab updates and most recent research findings!

Thanks to your willingness to participate in our research, we have welcomed hundreds of children and families from the Atlanta community into our lab over the past year. We greatly appreciate your generous support of our work: we couldn't have done it without your help!

Dr. Patricia Bauer, along with researchers Amanda, Anne, Aoxiang, Elizabeth, Jackie, Maria, Marina, Nicole H., Nicole V., Rebekah, and Shala, have spent the past year exploring memory development in both children and adults. Since our last newsletter in 2012, we have completed several ongoing projects, and have also started some new ones! We continue to use a wide variety of research tools and methods, such as event related potentials (ERPs), eye tracking, online surveys, and story reading tasks to better understand how memory skills develop, what factors contribute to memory, and how new knowledge is acquired. Further inside this newsletter you can read about some of our exciting findings and future directions!

We also have shared our research with the scientific community. In April, we presented our findings at the Society for Research in Child Development National Conference in Seattle, Washington. We also will present findings this October at the Cognitive Development Society Annual Meeting in Memphis, Tennessee. We also have published numerous articles in top-rated journals. Please check out these publications on our lab website under "Selected Publications."



Our lab is a very dynamic place. Every year there are changes in our research team as we welcome new members and say goodbye to those as they move on to their next endeavors. Aoxiang, who received his Bachelor's and Master's Degrees in Neuroscience, joined our lab from China and began his doctoral studies at Emory in the Fall of 2012. We have also welcomed three new lab coordinators, Manas (August 2012 – June 2013), Rebekah (January 2013-present), and Amanda (June 2013-present). Rebekah joined us after graduating from Georgia Tech where she received a Bachelors of Science in Psychology. Manas and Amanda, both Emory graduates, have transitioned from undergraduate researchers to full-time lab coordinators. Our former lab coordinators, Ayla and Jessica, have moved on from the lab to pursue further educational opportunities. Anne, one of our undergraduate honors students, will also be departing the lab this fall as she will be starting her graduate studies at Duke University. We are also proud to report

that Shala, Jackie, Jenni, and Theo have all completed their doctoral dissertations this year and are officially Ph.D's! We are lucky to have both Shala and Jackie continuing in the lab conducting post-doctoral research.

As always, if you have any questions about our research, would like to see continued updates on our studies, or want more information on how to participate in our current projects, you can visit us at <http://www.psychology.emory.edu/cognition/bauer/lab/index.html> or call us at 404-712-8330. We would love to hear from you!

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IS MORE ALWAYS BETTER?

The Impact of Background Information on Knowledge Integration in Children

A big area of focus for our lab continues to be how children learn and remember new information – a skill that’s especially important in a school setting. We began this line of research 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., what is the corolla used to make?).

In the first several studies using this design, we found that both 4-and 6-year-olds are very good at combining learned facts. Since then, we have looked at different ways of presenting

information to children and the factors that may increase or decrease children’s ability to combine these learned facts.

In the most recent study of this nature, we were interested in how such knowledge integration can be facilitated. To do this, we had 4- and 6-year-olds come into the lab for one session. During the session the children were read stories much like the ones mentioned above. This time, we were interested in seeing what happens if we give children facts that can be combined, and also supply them with additional information about the topic. For instance, if a child heard in Story #1 “a corolla is a bunch of flower petals,” in Story #2 that “flower petals are used to make perfume,” and then heard a third story stating “ tulips have six petals,” would they be more likely to correctly answer “what is a corolla used to make?”.

Interestingly, preliminary data suggest that providing additional related information may actually not facilitate learning for 4-and 6-year-olds. Though we sometimes think that the more information we can provide about a

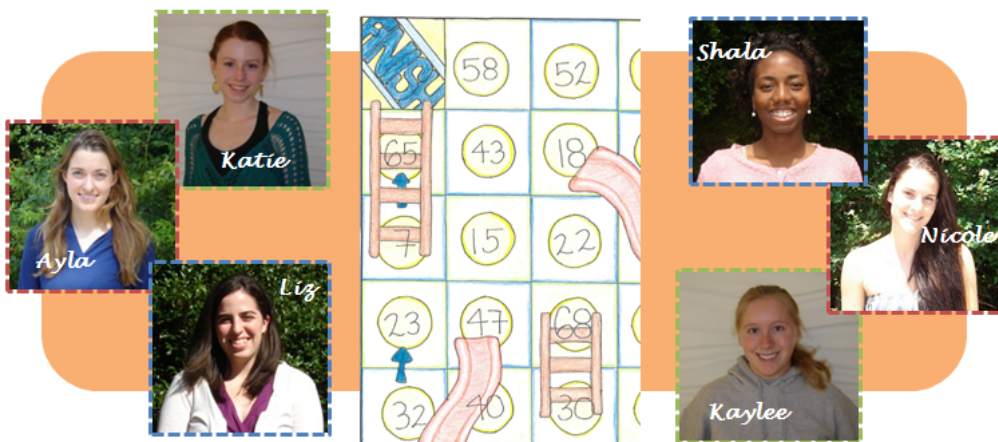


topic the better it is learned, it may actually not improve - or in the youngest children sometimes may actually inhibit - the knowledge integration process.

Our next steps will be in hopes of discovering if there is an age at which providing the extra information to children does in fact facilitate integration. These findings could have important implications for both classroom and everyday learning!

Have an 8-year-old that would like to participate in a similar study? Contact us at (770)712-8330 or e-mail us at memoryatemory@emory.edu . The study takes approximately 45 minutes, and all participants will receive a \$5 gift card and a toy as a token of our appreciation*

LEARNING NEW FACTS



We continue to examine learning and new knowledge formation using a story-reading paradigm. Over the past year we have implemented a new way of studying this question. Children who participated in this study (ages 7 to 11) played a board game similar to “Chutes & Ladders.” However in our version, children heard new facts as they landed on the spaces around the board. Some of the facts could be integrated, or combined, with another fact on the board to form a brand new fact. Some children participated in the lab. We also had the privilege of bringing this study to The Color Wheel Studio in Decatur, Georgia – and are very

LEARNING NEW FACTS (cont.)

grateful to the students there who participated! This “game” approach was our initial attempt to study knowledge formation in older children.

We found that older children are very good at combining learned facts presented to them in this game format. In fact, the children were successful at combining the facts both when they were read out loud to them by an experimenter, AND even when they were asked to read the facts themselves! Furthermore, all children engaged in a separate reading comprehension task during which they were asked to read sentences out loud and fill in missing words. As we might expect, children with higher levels of reading comprehension were better at integrating information from the facts they read themselves. More surprising, reading comprehension also was related to integration of the facts that were read by the adult. Thus this study indicates that reading comprehension is important for integration, regardless of how new information is received.

Our next step is to use eye tracking to understand how children process and develop new knowledge from information they read. Eye tracking is a novel way to measure what may be occurring during integration. In an upcoming study that extends from our game paradigm, we will have children read facts on a computer screen that can track their eye movements. Some of the facts they read can be combined, or integrated, whereas other facts cannot be integrated. We plan to assess the changes in children's reading and eye movements as a result of whether the facts can or cannot be integrated. This approach is very different from what we have done in the past and involves the use of a very cool device. Children really enjoy seeing how the eye tracker works.

For this new study, we will be recruiting school age children. If you are interested in having your children participate in this study, please call us at (404) 712-8318 or send us a message at memoryatemory@emory.edu. We also want to thank all of the families that have participated in our game studies. We appreciate all of your help!

EYETRACKING FOR CHANGES IN OBJECTS

Children develop memory for the relations among objects and their locations or contexts, which enable them to do activities like find their way to and from school or know that elephants may be at the zoo. A good way to understand the development of this ability in preschool and school age children is to use eye tracking. Eye tracking allows us to measure cognitive abilities like memory without asking children questions that require specific or detailed answers.

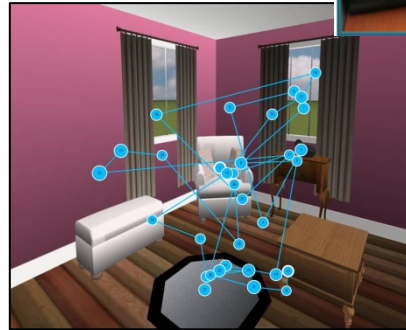


In a recent study, 4- and 8-year-old children saw a series of pictures on the eye tracker. Sometimes, a group of five objects was shown on the computer screen. After having some time to look at the five objects (learn them), two pictures were presented side by side. One picture was of the same five objects as the previous screen. The other picture was of different objects. Other times, children saw a single object on a special background. After spending time to learn the picture, they were again shown two pictures. This time, one picture was a new object or new special background and the other picture was the familiar object or familiar special background. If children remembered the old picture, they would be more likely to spend time attending to the new picture. Finally, we showed children a picture of a room (e.g. living room) that contained five objects. After the children studied the room, they were presented with the same room some of the objects in the room were either replaced or changed location. If the children remembered the original layout of the room they were more likely to attend to the items in the room that changed.

The eye tracker allowed us to tell whether children were able to detect changes when the objects themselves were new (memory for "item"), when the same objects were found in a new location (memory for "location"), or when the special background changed (memory for "context"). Our results indicated that memory for item and context appears to develop before memory for location. In addition, we found that putting the objects within a room affected both item and location memory in children. This tells us there are different developmental patterns of memory depending on the information being used.



New eye tracking studies with children are in the works. Please see our section above on Learning New Facts. We appreciate your support!



EYETRACKING AND EMOTION

Both adults and children have better memory for emotional compared to non-emotional events. What is it about the processing of these emotional events that helps us remember them later? To explore this question, we are using eye-tracking to look at how 8- to 9-year-old children process and remember emotional images.

In this study, children view a series of positive, negative, and neutral pictures (such as cute animals or a child crying) on a computer screen which is able to track where in the pictures children are looking. To test memory, we ask children return to the lab one week later and tell us which pictures they remember seeing before. We can then see if there are certain patterns of looking and attention that lead to better memory performance. This research will help us learn more about how the

processing of an emotional event is different from the processing of a non-emotional event, and how this helps children remember emotionally charged events better.

In a similar study with adults, we found that if adults focused their eye-gaze and attention on the most negative parts of a picture, they were more likely to remember that picture later.

This study is ongoing, but we expect similar results in children such that better memory for emotional pictures will be related to more focused eye-gaze and attention on central, emotional information. On a broader scale, this research can inform future studies investigating the development of emotion-related disorders, such as anxiety and depression, which often involve a bias of attention towards negative information.



MEMORY FOR LOCATION

Where did you leave your keys? Where did you park your car? We know a fair amount about how memory for the location of objects develops. But what about the development of memory for information that specifies where events took place? For example, where were we when we shared that delicious pasta dish? Where was it that we saw that funny movie? We know much less about how children's memory for the "where" of the events of their lives develops.

To learn about memory for "where," we conducted a study with 4-year-olds. The children completed four different activities in four different locations in and around the lab. At

the end of the session, we asked them to tell us where each activity took place. One week later they came back to the lab and we asked the questions again.

The study is still ongoing, but we already are seeing an interesting trend. At Session 1, children tend to remember either the activity or the location. When they come back a week later, they tend to remember both. Thus it seems that between the sessions, children's memories are becoming more tightly integrated. Integration is important—it is one of the ways we preserve memories over the long term. Stay tuned for further developments in the study of memory for location!

****Have a 4-year-old that would like to participate? Contact us at (770) 712-8330 or e-mail us at memoryatemory@emory.edu . ****



WHAT ARE THE ASSOCIATIONS BETWEEN MEMORIES THEN AND NOW?

We talk about our personal memories in social interactions nearly every day. Sometimes we refer to memories from very early life periods, for example our 5th birthday party, or we talk about the volleyball match we participated in last week. Memories about ourselves are called autobiographical memories and play an important role in our lives. But are these memories the same for different life periods we are referring to? Do we recall the same amount of information from early memories and are they as important to us as more recent ones?

In one of our studies we ask our adolescent and adult participants

about memories from different life-periods in their past. They filled out an online survey by reporting on 10-13 different memories from the life-periods at ages 1-5, 6-10, the previous year of life, and also their most significant memory. After writing about the memory, the participants rated them on different scales, for example: How important is this memory for you now? How important was it at time the event occurred? How sure are you about the details of this event?

The results are very interesting! We found that memories from early and recent life periods differ from each other, both in adolescents and adults. Specifically, early memories are less detailed, less important to us



then recent memories and we rate them as less unique. As these results appear in both adolescent and adult participants, it tells us that this difference is not due to the age of the participants but that the quality of memories from early life periods differ from recent ones.

Personal Location in Mothers' Written Narratives

Whether recounting the events of the day to our family or discussing a recent vacation with a friend, the act of sharing personal, or autobiographical, experiences is a major part of our culture. In these conversations, information regarding the time and place these events occurred plays a crucial role in creating a coherent story. Without this information, would we be able to understand anyone's description of his or her day? Therefore, the telling of these narratives would not be complete without the inclusion of details of when and where the event occurred. In order to start investigating this aspect of autobiographical memory, we wanted to know if and how adults would use information about different locations without being directly asked about those details. If adults do use this information, would it be different based on the type of event being discussed?

One of our studies investigated information about personal location in adults. All of the participants in this study were mothers who were also bringing a child in to participate in a related study of autobiographical memory development. We asked them to write in as much detail as they could about the following 5 different memories: earliest memory, transition to kindergarten, birth of a child, child's transition to kindergarten, and a recent memory. We wanted to know if different types of locations would be included in these memory descriptions (e.g. shopping in Paris vs. sitting at my desk) and how they might be included differently in different types of events.

We found some very interesting patterns! Adults spontaneously generated information about various different types of locations including geographical, transportation, and event specific (e.g. at summer camp). Since participants were not specifically prompted to provide any specific locations,

the inclusion of this information suggests its importance in providing an account of an event.

Results indicated different patterns of this location information both overall and within each type of event. In general, adults used information about buildings and themselves most frequently in their personal narratives. However, different patterns emerged based on the type of event. In the earlier memories, there was a larger variety in the types of location included in the narratives mostly focusing on the most specific (e.g. sitting at my desk) locations. The more emotionally significant memories (child's birth and transition to school) included less variety but more detail in the locations discussed in the narrative whereas the recent memories had more information on more global locations (e.g. shopping in Paris). Since location was present in all events but different types were mentioned with varying frequency, it tells us that when the event occurred (earlier vs. later) and personal significance plays an important role in our memory for personal location.



ERP: MEMORY AND EMOTION

Adults often have better memory for emotional experiences, and this has been observed in their behavioral responses and brain activity. In a continuing series of studies, we are examining how children think about and remember emotional experiences- both those from their own lives and those represented in emotional scenes (such as a cute puppy or a gross bug). Using a brain imaging technique called event-related potentials (ERP), we can see if there is a special pattern of brain activity for emotional versus neutral experiences and how the brain activity relates to behavioral responses.

In a previous study with 5- to 8-year-olds, we used ERP to examine brain activity when children viewed emotional scenes for the first time and when they participated in a memory task later. Children had larger brain responses for emotional scenes (positive and negative) than for neutral scenes. Though children remembered the scenes very well, only older children had better memory for the emotional scenes than the neutral ones. This tells us that the “emotion effect” emerges earlier in the brain than in behavior.

In a different study with 8-year-old girls, we once again tested memory for emotional and neutral scenes. We also added something new—brief stories that described the scenes as emotional (matching condition) or as neutral (reappraisal condition). We expected that if memory is better for emotional experiences and neutral stories reduce the emotionality of the

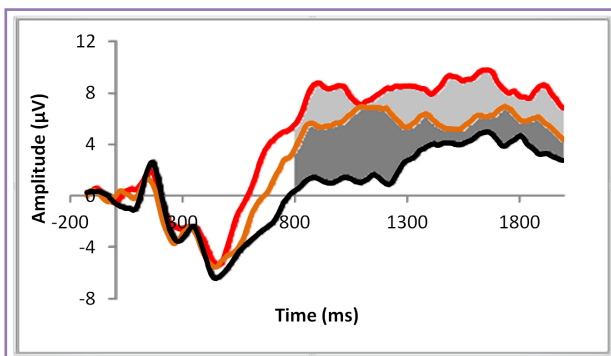


Illustration of emotion effects in the negative matching (red), negative reappraisal (orange), and neutral (black) conditions. The emotion effect is characterized by a larger positive-going amplitude compared to the response to neutral stimuli which is smaller in amplitude and closer to baseline. Here, we observed a reduced emotion effect for negative scenes presented in the reappraisal versus matching conditions.



scenes, then memory for emotional scenes in the reappraisal condition would be reduced.

We observed exactly that, for negative scenes, but not positive scenes. For negative scenes, the emotion response in children's brain activity was reduced and so was memory. The findings demonstrate that emotion enhances memory in school-age children, at least for negative scenes. Excitingly, these are the first data from children to show that manipulating emotion responses affects later memory. This indicated connections between emotion and memory even in school-age children.

In this study we also asked children to recall emotional experiences from their own lives as we recorded their brain activity using ERP. We are currently analyzing these data, and we are eager to see how children's memory for personally experienced emotional events compares with that of emotional scenes. We also are working to find out whether the way mothers and their children talk about emotional events relates to children's brain activity as they recall personal events and process emotional scenes. Stay tuned!

We are currently extending these studies to a group of older children and teenagers to examine the developmental trajectory of emotional memory.

If you have a child (or children!) between the ages of 8 and 16 and you are interested in hearing more about the studies, please give us a call at 404-712-8312 or email us at memoryatemory@emory.edu.

Thank You to Our Undergraduate Research Assistants!

We also want to take this opportunity to thank all of our undergraduate research assistants who have worked with us since Spring 2012. The students were/are involved in the lab while receiving research credits, conducting honors projects or participating in the Emory Undergraduate Research programs. They make a great contribution to our work, helping with all aspects of our research, from scheduling participants and conducting testing sessions to transcribing and coding, among many other lab activities!

Thank You!

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Jee Young Kim

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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](tel:404-727-7432)/childstudies@emory.edu