

CHILD DEVELOPMENT  
RESEARCH GROUP



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## 2019 Annual Newsletter

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**The Child Development Research Group (CDRG) at the University of Tennessee, Knoxville has five research labs, which examine many aspects of development from birth to early childhood.**

### **Thank you to our families!**

Without you our research is not possible! We appreciate the time and effort given by families who have participated in our studies that allow us to better understand child development!

This newsletter will provide more information on previous and ongoing projects that our labs have been busy running!

Also, thank you to all the new families who signed up with us through our recruitment events (Boo at the Zoo, Farmer's Market, etc.) or website. You make our research possible!

Please pass our info along to friends and family who may have children between 0 and 5 years of age!



Attention, Brain, and Cognition Lab

Department of Psychology  
University of Tennessee, Knoxville

### Directed by Dr. Aaron Buss

The focus is to study the development of executive function using a combination of behavioral, neural, and computational methods. The primary question addressed centers around how children learn to control their behavior and follow rules.



Developmental Cognitive  
NeuroScience Laboratory

### Directed by Dr. Greg Reynolds

The focus is to study early development of attention and memory. We use video analysis of infant behavior, eye-tracking, and EEG to examine how infants pay attention and learn while viewing animated characters, visual patterns, objects, and faces.



### Directed by Dr. Shannon Ross-Sheehy

The goal of the IVCLab is to study the way infants use their eyes and ears to learn about the world around them. To accomplish this, your infant will be shown a colorful series of images or animations. Using eye-tracking, researchers are able to determine exactly what kinds of events are most engaging to your baby, and how your baby learns best.



### Directed by Dr. Jessica Hay

The broad goal is to understand how young children begin to make sense of the world around them. Researchers use behavioral methodologies to study how perceptual experience affects infants' learning of sounds, words, and word meaning in their native language.



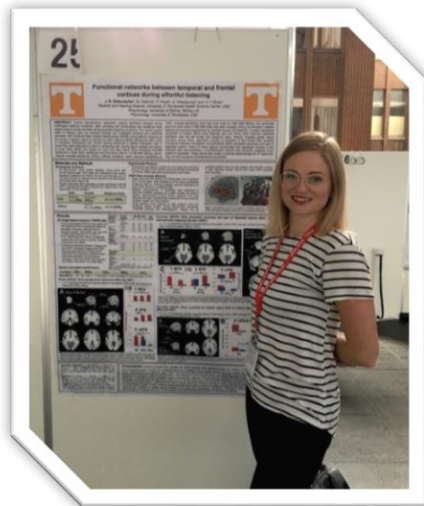
### Directed by Dr. Daniela Corbetta

The focus is to understand how multiple factors in development impact early infant perceptual and motor development. We use movement analysis and eye-tracking to study the development of reaching and/or locomotor skills (crawling, creeping, walking) often in conjunction with visual attention, hand preference, or parental interactions.

The Attention, Brain, and Cognition (ABC) Lab is directed by Dr. Aaron Buss. Research in this lab focuses on how children learn to control their behavior and follow rules – processes referred to as executive function. Our lab studies different aspects of executive function across lifespan. We use a variety of tools, including behavioral measures, computational modeling, functional near-infrared spectroscopy (fNIRS), fMRI, motion-tracking, and eye tracking. With technology like fNIRS, we can ‘peer’ in to the minds of children to understand how their thinking change in ways that allow them to regulate their behavior.

Our lab recently received an RO1 Grant from the National Institutes of Health and the National Institute of Child Health and Development. The funding will help us conduct a study that will follow groups of children from age 2.5 to 4.5. We will examine how language learning shapes the brain in ways that allow children to be flexible and selective

thinkers! We are currently recruiting families to enroll in this study, so we may be reaching out to you soon to get involved in this research!



We have completed two studies that we have been presenting at conferences in Madison, WI and San Francisco, CA. These studies provide critical information about what children learn that contribute to their emerging executive functions. One study identified the neural networks that are involved in the comprehension and production of labels of colors and shape. A second study examined relationships between flexible thinking and selective attention. These results showed that children who are better at selectively attending to either the color or shape of an object are also better at thinking about the object in flexible ways. Additionally, children who were good at thinking flexibly about objects, showed activation in frontal cortex that was less spread out compared to children who were not very good at thinking flexibly about objects.

These results suggest that as the brain develops, specific regions get good at performing particular tasks!

Our 5th year graduate student, Anastasia Kerr-German (picture on the right), has recently accepted a research position at Boy's Town National Research Hospital in Omaha, Nebraska. There, she will be the leading expert on fNIRS, and will be conducting experiments with both clinical and typically developing populations.

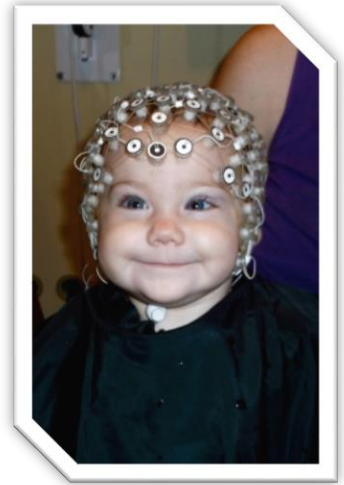


Additionally, we are excited to welcome our new lab manager, Bhoomika Nikam (picture on the left). Bhoomika is a recent graduate of the University of Tennessee, Knoxville and has her B.A. in Psychology. She was a research assistant in the ABC lab during her undergraduate career and is happy to be back.



Research in the Developmental Cognitive Neuroscience (DCN) Lab examines topics related to the development of attention and memory in infancy. We use eye tracking and ECG (heart rate) to measure attention. Interestingly, infants' heart rate slows down when they pay attention to things. We also use EEG to analyze infant brain activity associated with attention, memory, and perception.

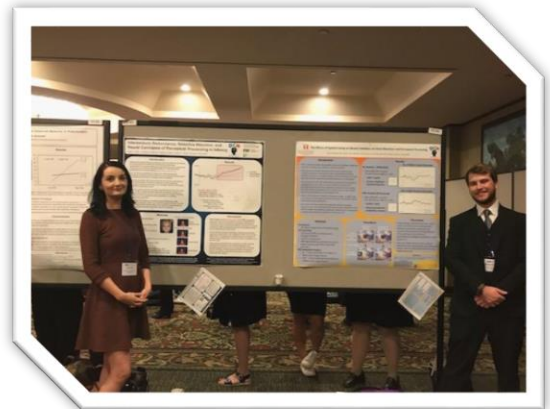
We are currently funded by a major grant from the National Science Foundation (NSF) examining the development of categorization. With the support of NSF, we were able to purchase brand new EEG equipment, and hire our new lab manager, Hannah Miller. Hannah earned a B.S. in Neuroscience from Maryville College in 2015. We also recently learned that our lab was approved for grant funding from the National Institutes of Health (NIH)! This research will examine the effects of directing infants' attention to different locations (spatial cueing) on their visual processing of patterns that later appear in those locations.



We have been busy publishing articles describing our recent research findings. Our lab director, Dr. Greg Reynolds, was invited by the editor of the Journal of Neurophysiology (a flagship journal of the American Physiological Society) to write a paper on the development of working memory, which he co-authored with Dr. Buss (of the ABC Lab) and Dr. Ross-Sheehy (of the IVC Lab). Dr. Reynolds and Kelly Roth also published a paper describing research on infants' attention to faces. They propose that enhanced attention to faces is not a characteristic that infants are born with but that it is a developmental process that is affected by many things, including previous experience. Other articles we have published have shown that infants' attention to objects is influenced by a wider range of characteristics as they get older, and symmetry enhances infants' processing of visual patterns.



Our lab has also been very busy giving presentations at international conferences. Kelly Roth and William Chollman, our current doctoral students, presented research posters (see picture) at the International Society for Developmental Psychobiology (ISDP) conference in San Diego, California. Their posters were among a select group chosen for a special cross-over session of the ISDP and Society for Neuroscience conferences!



Research topics we will be focused on in the coming year include:

(1) Kelly Roth's dissertation on infants' categorization of human faces, (2) infants' attention to and processing of different types of speech, and (3) differences in how infants process things they hear and see at the same time compared to how they process things they only hear or they only see. We've been incredibly fortunate to have the support of hundreds of wonderful parent and infant Volunteers over the years! We appreciate you all, and we hope to see you in our lab soon!

We are currently in the 4th year of our 5-year NIH grant: “Infant Statistical Learning: Resilience, Longevity, and Specificity.” We would like to thank all families who participated in one or more of our studies! We have been busy collecting and analyzing data and would like to highlight a few of our findings and share some exciting lab news.

### ACCOMPLISHMENTS:

**Dr. Ferhat Karaman** successfully defended his PhD dissertation, entitled ["Incorporating Memory Processes in the Study of Early Language Acquisition"](#). His work explored the memory processes involved in statistical word learning and the results suggest that statistical learning facilitates future word learning. Dr. Karaman is now a faculty member of the Department of Psychology at Uşak University, Turkey. You can read more of Dr. Karaman's work [here](#).

**Dr. Jessica Hay, Ryan Cannistraci, and Qian Zhao** published a [new paper](#) on infants' ability to learn labels that differ in non-native pitch contours. Infants did best when one of the labels had a rising pitch. Parents often use a rising pitch when they are talking to their infants and asking them questions. Thus, our findings suggest that although

rising pitch is not associated with specific word meanings in English, infants appear to be sensitive to rising pitch during early word learning.

Our lab was recently awarded a [SARIF grant](#) to buy a new state of the art **eye-tracker**. We are looking forward to using this new instrument in our research projects to measure speech perception and language development, and their underlying cognitive processes, using measures of infant eye movements and pupil dilation.

### NEWS:

Meet our **new lab manager!** Daniela (picture on the right) earned her PhD in Speech Science from UT Health Science Center. Her research interests are phonology, phonetics and language learning. We look forward to developing and collaborating on some new, interesting research projects with her.



We also have a **new visiting lab member!** Rodrigo dal Ben de Souza (picture on the left) is a Psychology PhD student who is visiting from the Universidade Federal de São Carlos, Brazil. He is spending a year with us, under Dr. Hay's supervision. He is investigating how speech and visual regularities integrate to promote language learning in both infants and adults.



In June, 2018, Dr. Jessica Hay was interviewed as part of the [Land Grant Films](#) production of the first feature-length documentary about [Dolly Parton's Imagination Library](#). The documentary covers the history, impact and future of America's largest non-governmental children's literacy program and include original interviews with recipients of the books, parents, policy makers, authors, program organizers, and the legend herself, Dolly Parton.



Currently, the research in the Infant Perception-Action Laboratory is aiming to understand how infants develop a sense of their body in their environment, how action helps them learn to map new labels onto new objects, and how they reach for objects of varied shapes.

**DEVELOPING A SENSE OF THE BODY:** A big accomplishment for 2018 was finishing data collection for a longitudinal study following infants from 3-weeks to about 25-weeks old. These families came in every week during this period so we could record the spontaneous arm activity of their infant laying down up to their development of reaching. We found that from 3 weeks old, young infants actively touch their body and the surface they are laying on over 100 times in a 5-minute trial! These babies are clearly actively exploring their body and environment. They also spent close to half of the 5 minutes with their hands in the air moving from location to location on their body and floor. We presented these data at a workshop in Leiden, The Netherlands and we published our first report:

<https://www.frontiersin.org/articles/10.3389/fpsyg.2018.02613/full>



**HOW DOES ACTION INFLUENCE NEW OBJECT-LABEL MAPPING?** This past year, we completed data collection with our 18-22 months-olds in a project examining how playing with toys influenced novel object-label mapping. And we found it does! The study also examined the timing of the label production on learning. Abby DiMercurio will present these results at this year's Society for Research on Child Development conference in Baltimore this March! Thank you to all the families that came in and contributed to this project.

**NEW PROJECTS ON INFANT REACHING:** We are starting a new project investigating how different object shapes of different sizes influence looking and reaching patterns in 9-month-olds. Another ongoing study with the same age infants, examines how well infants plan their actions when looking and reaching at objects placed directly in their reaching space. We will also be starting a new collaboration with the ABC lab. We will be studying infant reaching and measure brain activity using objects that have details versus and plain objects.



This year we are also thrilled to have Dr. Marianne Jover visiting our lab from the University of Aix-Marseille, in Marseille, France. While in our lab, she has been collecting longitudinal data with 2-, 4-, and 6-months old infants to study the relationship

between manual asymmetries and early communication with a caregiver.

### ***Congratulations!***

One of our doctoral students, Rebecca Wiener, graduated in May of 2018 with her Ph.D.! Rebecca is now a User Experience Researcher at Newell Brands in Kalamazoo, Michigan. Rebecca's dissertation entitled: "Perceptual-motor exploration and selection of objects in 11-month-old infants" was looking at how visual complexity vs. auditory complexity influenced selection for objects. Her results showed that object manipulation influenced selection in the auditory condition, but not in the visual one. Her dissertation can be found here:

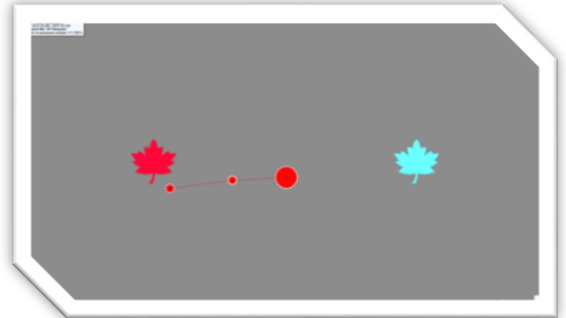
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*Congratulations again to Dr. Rebecca Wiener!*



***Does holding something in memory influence eye movements?*** Amanda Rosales, a current PhD student, is exploring how visual short-term memory develops, and how holding something in memory influences eye movements. Preliminary results suggest that both 5- and 11-month-old infants are more likely to look at something they have seen before (e.g., a red leaf), even if they only saw it for ½ second! However, this is only part of the story. Although infants prefer to look at familiar things, eye movements are actually slower when they look at something brand new. This suggests that even our youngest infants are capable of rapidly encoding and remembering objects and using that memory to bias attention. These results clearly demonstrate that even as early as 5 months, infant brains are remarkably well-developed and highly interconnected.



***Infant attention predicts memory in preschool:*** Esther Reynolds, an incoming PhD student, is using an attention assessment task to determine if very young infants show distinct attentional patterns, and if these patterns are stable across childhood. To accomplish this, Esther is following-up a group of 3.5-year-olds who participated in our attention task as infants. This project is still ongoing but has yielding exciting preliminary results! For example, infants who have a slower visual style at 11 months show distinctly different patterns of memory at 3.5 years. Esther is also interested in how things like temperament and stress are related to visual behavior and has presented some exciting findings at the **International Congress on Infant Studies** held in Philadelphia this past July.



***It's not all about babies!*** Recently, **Bret Eschman**, a current PhD student, has been working with both infant and adult participants to better understand visual working memory (WM). Visual WM allows us to rapidly store information so that we may quickly act on a goal. Importantly, WM facilitates reasoning

in much the same way that RAM facilitates computer processing – and more is better. Though WM capacity is easy to measure in adults through simple visual tasks, there is no easy way to do this in infants. However, Bret has made tremendous progress exploring new ways to assess memory in infants using eye tracking. Spoiler alert, the eyes have it! When memory for a set of colored squares is strong, adults make fewer eye movements, and look for shorter durations. These results are important, as we see the exact same pattern of responding in infants. These measures may one day allow us to identify infants who are at risk very early in infancy, when interventions are most successful. **After 5 years with the IVCLab, Bret Eschman has accepted a postdoctoral position working with Dr. Lorraine Bahrack at Florida International University. Congratulations Dr. Eschman, you will be missed!**

