THE ELISON LAB

for Developmental Brain and Behavior Research

Vol 3. January 2020

Happy 2020 from the Elab!

Big discoveries from little people!

What's inside this issue?

This newsletter contains updates on active and completed studies in the lab.

If you have any questions about these studies, or you and your child are interested in participating in ongoing or future studies, email us at elab@umn.edu.

For information about the Baby Connectome Project, email us at babymri@umn.edu.

The Baby Connectome Project (BCP) – Enriched

By Brittany Howell & Sharlotte Irwin

2019 was a busy year for the BCP-Enriched research team! Over just the past 12 months, we've collected 175 fecal samples, 59 breast milk samples, 276 saliva samples, and 343 diet records. We truly couldn't have collected all of this data without all of you!

After analyzing the fecal samples, we have seen that *Bifidobacteria* are the primary bacteria in your baby's stomach during their first few months. Then, around the time they start eating solids, other bacteria, such as *Bacteroidaceae,* become dominant. We are also beginning to see how using formula or breastmilk during those first few months impact the bacteria in your baby's gut.

As we wrap up BCP-Enriched in 2020, we hope to look at the connection between breastmilk, bellies, and brains. We plan to do even more in-depth fecal and breast milk analyses, while also looking at brain imaging and behavioral data. We are excited for the final year of data collection, and are so grateful for all of you amazing families!

Infant Brain Imaging Study – Early Prediction

By Tessa Djiko

One of the goals of our research in the Elab is to improve early detection of autism spectrum disorder (ASD). In the US, 1 in 59 children are diagnosed with ASD and the average age of diagnosis is 4 years old. However, children can start showing early signs of ASD as young as 6 months old. Moreover, families who have one child with ASD have an increased risk of having another child with the disorder. Early detection of autism and access to early intervention services is crucial to improving long-term outcomes for these children.

In 2019, the Elab joined the IBIS (Infant Brain Imaging Study) Network as a data collection site for a new study. The IBIS Network is a consortium of researchers across North America that use a combination of behavioral testing, parent interviews, MRI brain imaging, and EEG to uncover important clues about infant development that can aid in early detection of ASD. Previous research by the IBIS network on infants with older siblings with autism found that MRI brain scans of infants as early as 6 months old can accurately predict later diagnoses of autism.

The goal of this new study is to replicate these previous findings for the purpose of helping to improve early identification of autism. We will recruit 250 infants total across the five IBIS locations. Infants enrolled in the study will be at an increased risk for developing ASD by having at least one full sibling with the diagnosis. Families will visit our lab when their infant is 6, 12, and 24 months old, and each visit will include behavioral testing, parent questionnaires and interviews, EEG testing, and an MRI brain scan when the infant is naturally sleeping.

We are still in the early stages of recruitment for this study! All IBIS Network locations are currently recruiting families who have an infant 6 months old or younger who has a full sibling diagnosed with autism. If you or someone you know is interested in participating in the study, please contact us at ibis@umn.edu or visit our website at ibis-network.org.

IBIS

A population-based screening approach to identifying developmental differences in toddlers

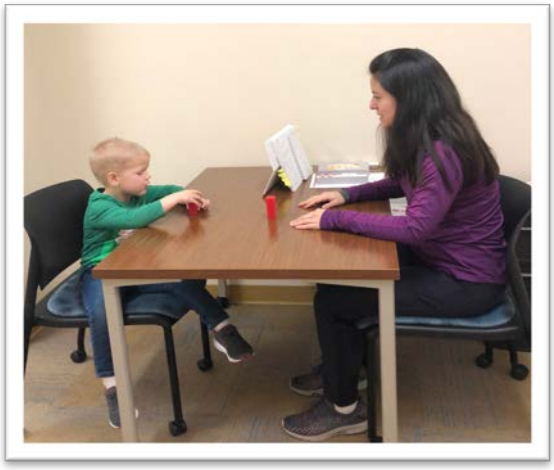
By Tessa Djiko

Tons of exciting developmental milestones occur during toddlerhood. This is the time when your child is beginning to actively explore their world through learning how to walk and run, how to communicate their emotions and needs with gestures, words, and sentences, how to pick up small objects and draw, and how to play socially with others, among other key milestones. This is also the time when some children begin to show developmental delays and behavioral patterns consistent with autism spectrum disorder (ASD). Identifying early developmental delays, or "red flags", is crucial so that these children can receive services as soon as possible. The current study investigates whether a population-based screening approach can accurately predict later autism diagnosis at 3 years old. We are asking parents to complete online questionnaires about their toddler's behavior and development when their child is between the ages of 17-24 months. From this data, we can identify children who are typically developing, or who may be showing early developmental markers of ASD. Based on questionnaire responses, we are inviting families who have typically developing children and also families who have children who are showing developmental delays or concerning behaviors to participate in behavioral testing at our lab. So far, we have recruited over 400 families and are beginning to invite interested families back for an in-person visit to our lab.

We are still recruiting families to participate in this study! If you or someone you know with a young toddler are interested in learning more, please contact us at earlychildstudy@umn.edu.

Early Academic Skills Development (EASD) Project

By Astrid Schmied



In order to master reading, writing, and mathematics, children must develop several cognitive skills (e.g., attention and memory). When reading, for example, attention is essential to follow the text. Additionally, memory plays a key role in connecting letters and sounds and understanding words and text. Therefore, the combination of these cognitive skills and several others, allows for reading to be accomplished. Formal learning of reading, writing, and mathematics starts in school, so the influence that different cognitive skills have on their acquisition have mainly been investigated during this time. Yet, little is known about how the early development of these skills—before formal schooling, influences children's reading, writing, and mathematics later on. The aim of the EASD project is to characterize the developmental trajectories of the cognitive skills that influence reading, writing, and mathematics in 3- to 5-year-olds. Tracing these trajectories is important, not only because they contribute to learning other academic domains—such as science and art—but also because impairments in reading, writing, and mathematics may trigger the development of Specific Learning Disorders (i.e., dyslexia, dysgraphia, and dyscalculia). This study started in November 2019. To date, 15 little scientists have participated. We look forward to enrolling 30 more participants and sharing the data next year!

Assessing cognition in 12-24-month-old infants

By Kirsten Dalrymple

When you bring your child to a well-child check-up, your pediatrician will typically assess basic functions such as vision, hearing, breathing, and heart rate, but not cognitive functioning. Yet, we know that early detection of social and cognitive impairments can be critical to early intervention. The purpose of this study is to develop a low-cost, easy-to-use, portable neurocognitive assessment tool for infants and pre-school children. We asked 100 families with 12- and 18-month-old infants to participate in this study. Toddlers watched cartoons on a tablet computer while a small eye-tracking device tracked where they looked on the screen. The cartoons were specially designed to assess executive function, social cognition, number processing, and language. Toddlers also took part in well-established tests of executive function and/or social cognition to help determine whether the cartoons that we designed were providing useful measures of cognitive functioning (i.e. that results from eye tracking match measures from established behavioral tests). The goal is to develop standardized measures of cognitive functioning that are quick and easy to administer, standardized, and widely accessible. We are currently testing toddlers for a second time-- 6-months after their initial visit to the lab-- to determine whether our eye tracking measures provide useful information about development over time.

Eye-Tracking & EEG

By Charisse Pickron & Carolyn Lasch

A major part of the research in the Elab examines how infants and toddlers learn about the social world. This includes learning more about preferences for particular types of images, such as human faces. We explore this by characterizing the patterns of eye movements or strategies young children use when they see particular images (e.g., faces vs. scrambled faces, happy vs. sad faces, etc.). In addition to eye-gaze measures, we have started using EEG to record how the brain responds to pictures of faces expressing different emotions. With EEG we are able to measure neural activity related to changes in attention and how specific areas of the brain (e.g., the visual area) respond to our pictures.

In our **parent eye-tracking study**, we are examining differences and similarities between parent and child looking patterns in hopes of learning whether a parent's looking patterns can tell us about their child's social looking behaviors and development. We are currently recruiting parents of infants aged 9-15 months. If you are scheduled to come into the lab for an infant study, feel free to reach out to us at socdev@umn.edu to schedule a parent eye-tracking session for the same day!

In our **infant eye-tracking & EEG study**, we hope to better understand the way both eye movement and brain responses relate to one another in the context of watching pictures of faces with different emotional expressions. Infants wear a hat that looks a little like a swim cap. The hat has sensors that can pick up the brain's electrical signals, similar to recording your voice into a recorder. Infants sit on their parents' lap watching pictures of faces appear on the screen while we simultaneously record their eye movements and brain activity. We are currently recruiting families who have 6-month-old infants for this project. If you are interested, please contact us at elab@umn.edu

Which side of the brain drives our early interest in faces?

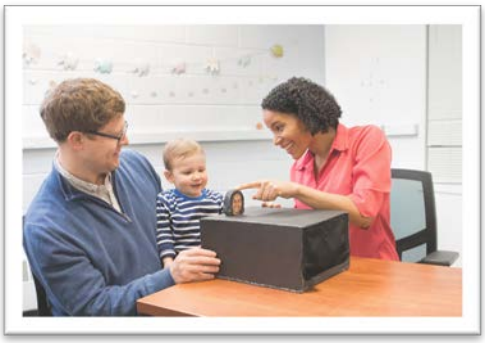
By Kirsten Dalrymple

Infants show an interest in faces from birth. In both children and adults, face processing happens predominantly in the right side of the brain. In this study, we asked whether the right side of the brain also drives infants' early interest in faces. To answer this question, 3-month-olds were recruited to watch moving schematic faces paired with scrambled faces on a computer screen. Infants were randomly assigned to use both eyes, just the left eye, or just the right eye. Research shows that early in infancy visual information travels mostly from one eye to the opposite side of the brain, so the infants in our study who had both eyes open should process the stimuli with both sides of the brain, while "left eye open" infants should process the stimuli with the right side, and the "right eye open" infants with the left. We presented our results at the annual Vision Sciences Society in May 2018 showing that infants with both eyes open or just their left eye open like looking at faces more than scrambled faces, but the "right eye open" infants have no preference. In other words, infants processing the stimuli with the right side of the brain demonstrate a preference for faces, while infants using the left side only do not! This effect did not hold true to a matched experiment featuring objects, meaning that it reflects something special about faces. So to answer our question: it seems that infants' early interest in faces is mediated by the right side of the brain, the same side that processes faces later in life. We are in the process preparing these results for publication.

Are toddlers using different types of facial features to group people together?

By Charisse Pickron

One of our goals is better understand how toddlers perceive and reason about the different types of people in their environment. This past year we investigated whether toddlers think about people as belonging to or representing different types of groups. Specifically, we wanted to know whether 1- and 2-year-old toddlers would think that all faces belong to one general human-face group or if they would use subtle facial features (e.g., race and gender) to categorize individuals as belonging to different kinds of groups. We studied this by having toddlers complete an interactive reaching activity. Toddlers watched as either 1 or 2 faces of varying features were hidden inside a box. We recorded the number of times and for how long they would reach inside of the box to find a face they believed to be hidden within. We were curious if toddler's reaching would differ based on the number and types of faces they saw being hidden in the box. We found that after seeing 2 different faces shown separately and then hidden in a box, toddlers reached inside of the box for longer periods of time when they couldn't find the second hidden face. Toddlers of both age groups did this longer reaching when they saw a human face versus a non-human face go inside of the box. Interestingly, only 24-month-old infants showed this longer reaching behavior following the presentation of a male vs. a female face and a Caucasian vs. African American face. Our findings indicate that both 12- and 24-month-old infants represent human faces as being distinctly different than to non-human faces. Additionally, between 1 and 2 years of age toddlers begin to use other, subtler facial features of gender and race to categorize individuals into different groups. This may suggest that children are becoming more aware of socially relevant information that both group and individuate people in their environment.



Assessing face recognition in school-age children

By Kirsten Dalrymple

About 2% of the population has a condition called faceblindness (prosopagnosia), which is an inability to recognize faces. Children who are faceblind have trouble recognizing even very familiar people, like their friends, siblings, teachers, or even their parents. It's difficult for children (and even adults) to realize that they have difficulties with face recognition and parents have difficulty determining that face recognition deficits are the reason that their child is struggling socially. To address this issue, we are developing a questionnaire to help evaluate face recognition abilities in children. We are inviting typically developing children 8-12 years to come to the lab to play some computer "games" of face and object recognition. Children are asked to remember a face and pick it out from a group of faces, or determine whether two faces are the same or different. While children are working on these tasks, parents complete questionnaires about their child's everyday behavior. We plan to relate the results of the face recognition tests to the results from the parent questionnaires to determine whether our questionnaires are useful for evaluating face recognition in children. We have already tested over 100 children, but our goal is 300! If you have, or someone you know has, a child between the ages of 8-12, and would like to participate in this study, please email us at elab@umn.edu, subject line: PI-20 Study.

Cross-cultural study of child rearing practices & basic perception

By Kirsten Dalrymple

As infants become more mobile, their world opens up to them. They become able to grab objects, move around, and start to experience an array of new sensations that help boost their perceptual development. One challenge with investigating the effect of infants' mobility on their perceptual development is that these abilities develop together, making it hard to tease them apart. A traditional childrearing practice in Tajikistan, Central Asia, offers a rare opportunity to study effects of early immobility on perceptual development in humans. Caregivers in Tajikistan use a "gahvora" cradle during infants' first two years of life. Infants' legs, arms, and torso are swaddled, with heavy drapes placed over the entire cradle. Daily gahvora use is extensive, especially during younger ages (average 18 hours/day). Previous research by our collaborators at CUNY Staten Island has shown that onset ages for sitting, crawling, cruising, and walking are delayed in Tajik infants relative to Western norms. In this study, we ask whether these motor restrictions affect the development of basic perceptual competencies such as pairing sights and sounds. In 2019 we collected preliminary data from 3-, 6-, 9-, and 12-month-old infants in remote villages in Tajikistan and a small group of infants of the same age from the Twin Cities. We are in the process of analyzing the data to see if meaningful differences exist between these groups, but these data could have far-reaching implications: most of our knowledge of human development is based on research done on Western populations, so this cross-cultural comparison could call into question what we think we know about human perceptual development.