FEBRUARY 2019
VOL. 2

THE ELISON LAB

For Developmental Brain and Behavior Research

Happy 2019 from the Elab!

2018 was a very busy year in the Elab! This year we had over 250 MRIs, ran over 450 visits in the lab, and had approximately 250 new families come to the lab for the first time. We are so grateful for all our dedicated participants who make this work possible, and we are looking forward to 2019 being another full year of research with growing babies, toddlers, and kiddos.

This newsletter contains updates on active studies in the lab as well as findings on some completed studies. If you have any questions about the studies included, or you and your child are interested in participating, you will find the name of the researcher leading the study at the top of the update. For information about the Baby Connectome Project, contact babymri@umn.edu. For all other studies, you can contact elab@umn.edu.

WHAT'S INSIDE THIS ISSUE?

Jed Elison, PhD
Principal Investigator of the Elab

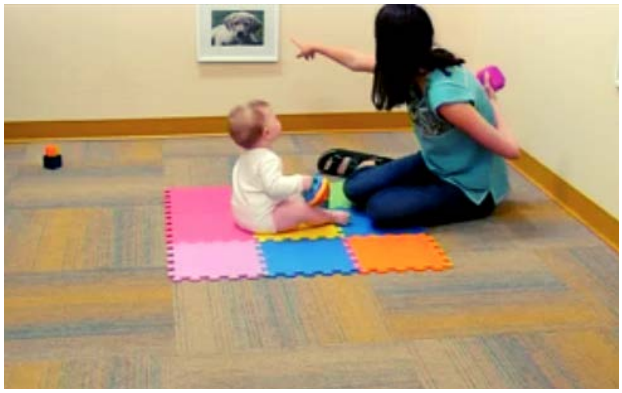
BABY Connectome Project

a UNC / UMN collaboration

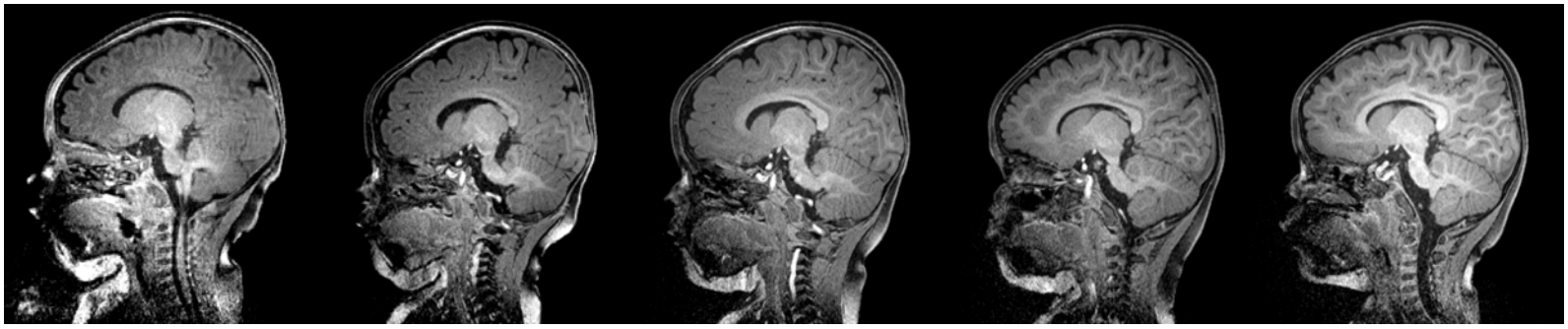
Jed Elison, Prinicipal Investigator

We have officially passed the midway point of the Baby Connectome Project. With the support of our families and the tireless effort of our team -- primarily Kristen Gault, Rachel Roisum, and Sooyeon Sung – in 2018 we recruited 60 new families into the study and conducted 5 MRI scans a week (total = 257). Overall, we have recruited 211 children, and conducted over 750 MRI brain scans and nearly 740 behavioral visits since the spring of 2015. These numbers are staggering, but necessary to achieve the ambitious goals we set out to characterize brain and behavioral development in the first 5 years of life. We have approximately 30 more children to recruit into the longitudinal portion of the study and approximately 50 children to recruit at various ages between 3 months and 5 years of age to participate in one behavioral visit and MRI brain scan. We have our work cut out for us over the remaining 1.5 years of the study, but we're nearing the end of recruitment, and then we get to focus on following up with families and watching your infant/toddler develop into a complex, sophisticated, albeit little, social being. I have been fielding requests from scientists all over the world who want to collect similar data or use our data to help answer questions they are asking in their labs. Ultimately, the value of this project will go far beyond any single scientific paper that will be written characterizing aspects of brain and behavioral development. Indeed, this study promises to alter the landscape of early childhood inquiry by making the dataset available to the broader scientific community. As one example, we have characterized the development of joint attention in the typically developing children who participated in Minnesota to a large sample of infants at high-risk for developing autism who were recruited into a large national network study.

The results revealed that high-risk infants who develop autism show fewer joint attention behaviors than the typically developing babies and the high-risk children who don't develop autism. Pictured below is an example of the joint attention assessment between an infant and a researcher.



These important findings have implications for improving early detection of children with autism, and could not have been possible without your contribution to the Baby Connectome Project. Due to the nature of this study, the potential impact of your contribution to the science of child development will be greater than just about any previous study on kids in this age range. While your identity will always remain anonymous, your investment in and commitment to the science of early brain and behavioral development is nothing short of heroic….and for that, we thank you! Pictured below is a series of scan images from a participant who was enrolled from 2 months old-14 months old.



2 months **5 months** **8 months** **11 months** **14 months**

How do parents influence the development of their child's social attention?

Carolyn Lasch

Much of our research explores how infants and toddlers learn about the social world. This includes learning more about their preferences for social and non-social images over time. We often try to address this by characterizing the looking patterns of children when we present images on a screen (faces vs. scrambled faces, happy vs. sad faces, etc.). In our Parent Eye-tracking Study, we hope to learn what parents' looking patterns can tell us about the patterns of their child's social looking and development by examining the differences and similarities between looking patterns between them and their children. Thank you to all of the families from our continuing longitudinal study, the Baby Connectome Project (BCP), who have agreed to participate in the "add-on" to your infants' visits! We already have 40 families who have participated, and 3 parents who have contributed at two data points. That's a lot of eye tracking! In the new year, we will begin to analyze all of our collected data and be able to learn more about relationships between parent and child looking patterns, so stay tuned!

Because our participating families also contribute MRI scans, we will be able to examine how relationships between parent and child looking patterns relate to changes in infants and toddler brain structures and function. Scheduling multiple visits over a longer period of time also allows us to examine changes in both child and parent looking over time, as well as how the relationship between these patterns changes with time.

The Baby Connectome Project-Enriched

Brittany Howell

The BCP-Enriched team has been very busy! To date we have collected more than 425 fecal samples, 750 saliva samples, about 800 diet records (that is more than 2 YEARS' WORTH) and over 220 milk samples (more than 35 GALLONS or 70lbs of cheese-worth!). We've processed the fecal samples to see what bacteria are present in the infant gut microbiome (see Figure 1 on the following page). There's a lot happening in the bellies of your little ones!

We've also been able to see the concentrations of several kinds of human milk oligosaccharides (HMOs) in the milk samples (see Figure 2 on the following page to see how their concentrations change across lactation). HMOs are especially important for nurturing a baby's gut microbiome, as well as the developing immune system.

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Figure 1

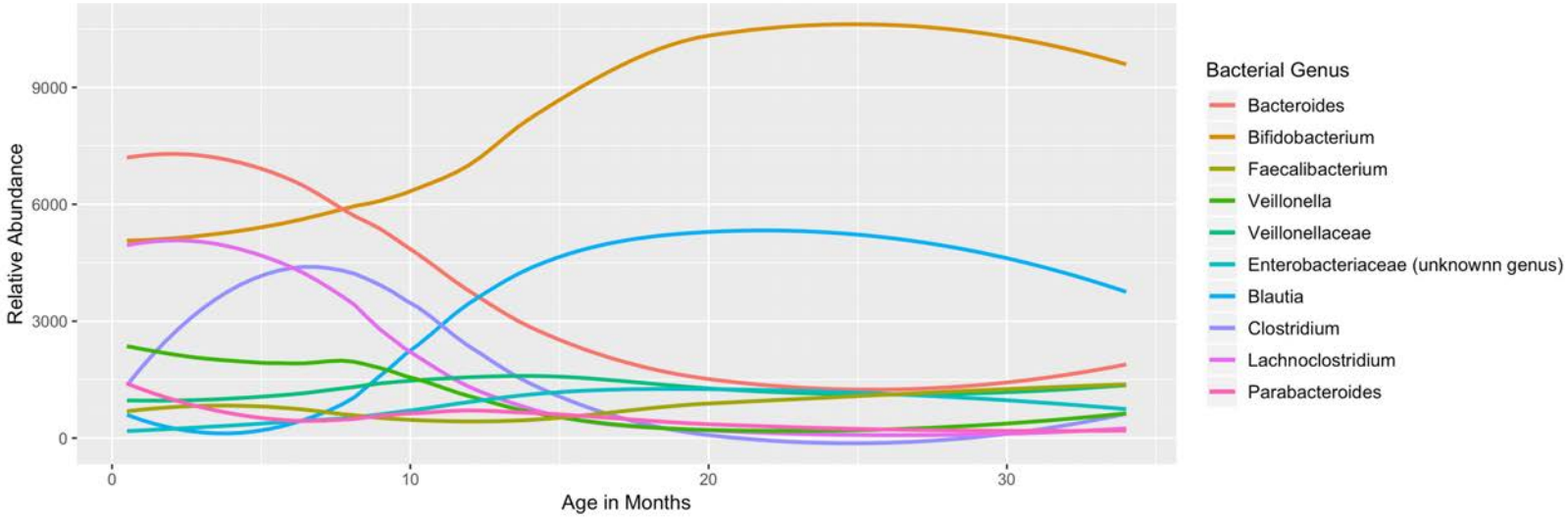
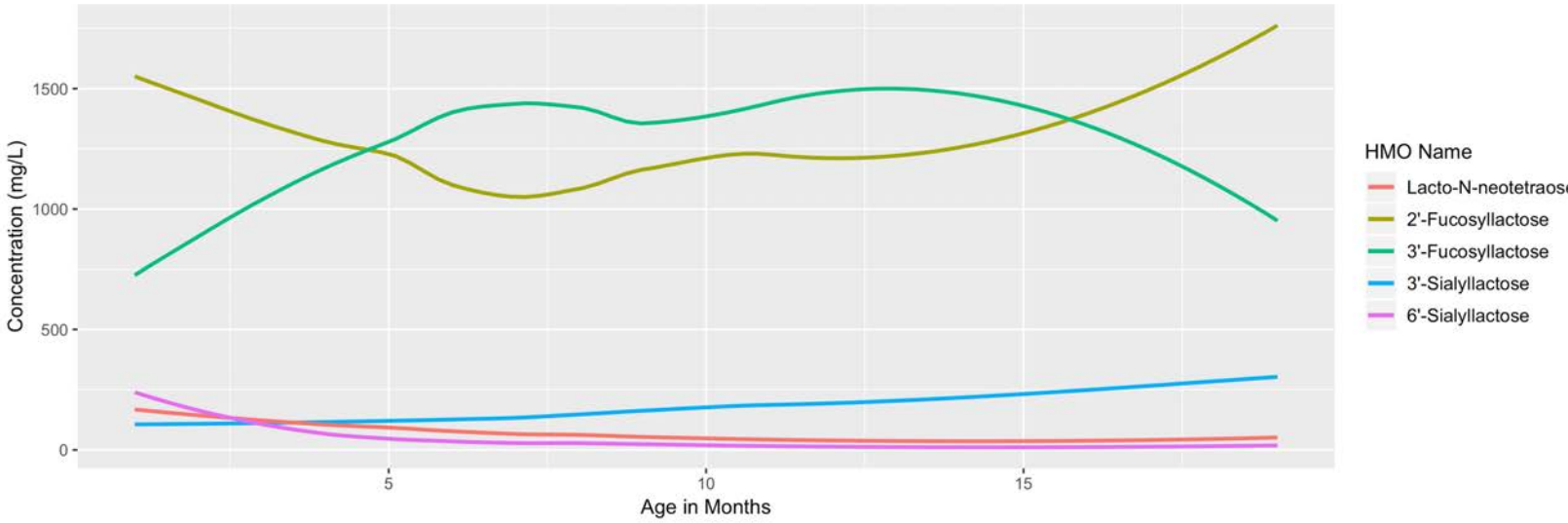


Figure 2



Our ongoing analyses will incorporate all of the amazing imaging and behavioral data you and your families have provided the ELab. We're going to answer questions like 1) Are there patterns of bacteria that are related to behavioral development?, 2) Are changes in the microbiome across time related to changes in brain structure and function?, and 3) How is diet related to development of the gut microbiome? There are so many questions to be answered with these data, and we couldn't do it without you!

Early Prosociality: The Development of Helping in Toddlers

Nadja Richter

Cooperative and prosocial behaviors are fundamental parts of human society. We care about each other, help each other in need, share resources, and sometimes give up our own comfort for that of others. Where do such abilities come from? How are they transmitted and internalized? One way to investigate these questions is to study children's earliest behaviors aimed at helping others. Recent developmental studies have demonstrated that children engage in a variety of other-oriented, so-called "prosocial" behaviors already at young age.

In one of our recent Elab studies, we specifically focused on aspects of helping behavior, namely empathetic and instrumental helping to understand what influences its early development and growth. In our study, children observed an experimenter who is having a tough time. Sometimes she's dropped or misplaced something, sometimes she's cold or sad. The experimenter then provided children with various kinds of information about her problem and how they can help. Altogether, she provided up to eight progressively more explicit cues, ranging from non-verbal gestures (i.e. shivering) to explicit verbal requests (i.e. "Can you bring me the blanket?") about her need or emotion and what the child could do to help or comfort her. Will children know what to do to help her? How much information do they need to intervene? How do such skills change between one and two years of age?

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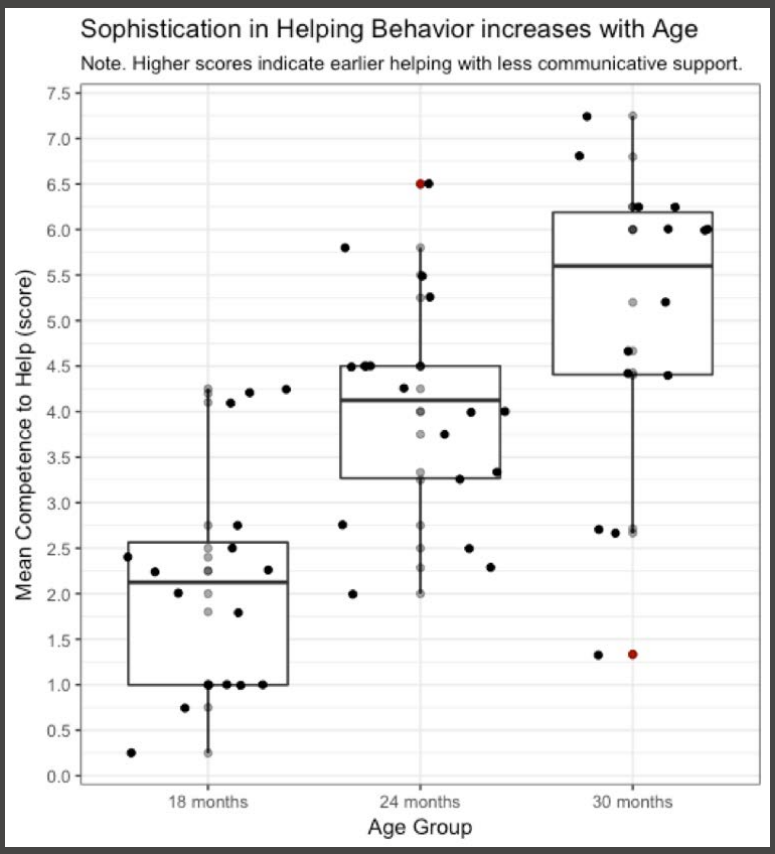
Participants helped more readily with increasing age, i.e. they needed less communicative support (corresponding to higher scores on y-axis).



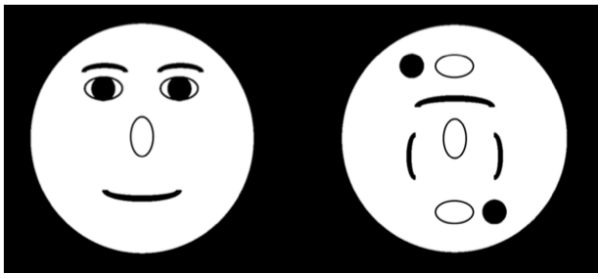
On average, at what point in the experiment did our participants help the distressed Experimenter?

- 18mos: Experimenter's verbal request "Can you help me?"
- 24mos: Experimenter provides a subtle, non-verbal cue (alternates gaze between blanket & child)
- 30mos: Experimenter does not provide a specific cue to the object needed, but merely expresses her state (“I need something to make me feel warm”)

We recently finished data collection in groups of toddlers at 18-, 24-, and 30-months of age. Our preliminary analysis is promising in that we are able to capture age-related differences in our participants' behavior: The general propensity to respond prosocially increases significantly between 18 and 24 months of age. Moreover, we are replicating findings from other studies that previously showed that on average, 18-month-olds' helping required significantly greater communicative support and scaffolding from the experimenter than that of 30-month-olds, whose prosocial behavior was more autonomous and demonstrated greater social understanding. Specifically, our 24- and 30-month-olds typically responded faster to the experimenter's mishap than our youngest participants. Quite strikingly, this difference was especially pronounced in scenarios where children had to infer the emotions of the experimenter.

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

Kirsten Dalrymple



Pictured on the left is the schematic face and on the right the scrambled face that the infants watched on a screen during this eyetracking study.

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 are asking 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.

Our preliminary results show 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 may not have this 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 might 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. It is unclear whether the left hemisphere plays an important role at this young age, too. We are in the process of recruiting more infants to increase our sample size in hopes of finding out. We hope to publish our findings in 2019.

Pictured is a mother and child in front of a Tobii eyetracker, similar to the one we have in the Elab.

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

Charisse Pickron

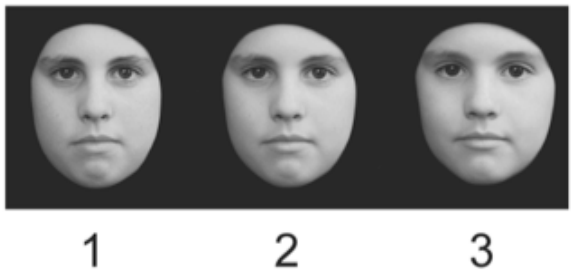
One of the goals of our research is to develop a better understanding of how toddlers perceive and reason about the different types of people in their environment. The current study investigates whether toddlers think about different kinds of faces as belonging to different groups. Specifically, we want to know whether toddlers will form representations of faces as belonging to one general human-face group or if they will use subtle features (e.g., race and gender) to categorize people as belonging to different kinds of groups. We are examining this by having toddlers complete an interactive reaching activity. Specifically we are measuring how many faces toddlers believe are hidden within a box. We assess the number of times toddlers search to find hidden faces and whether their searching behavior varies based upon the types of features the hidden faces have.

This study is currently taking place in two locations! We are set up at the Shirley G. Moore Lab School here at the University of Minnesota as well as the Minnesota Children's Museum, St. Paul, MN.

Assessing face recognition in school-aged children

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. Individuals with face recognition deficits often think they are "bad with names" or that they aren't paying enough attention to others. Parents also 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. This project is currently running, but slowly. We have tested nearly 50 children, but our goal is 300! If you 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.

How do infants pay attention to things that they find rewarding?

Robin Sifre

Infants live in complex and visually-cluttered worlds. Learning what information to pay attention to – and what to filter out – is arguably one of the most important tasks that infants face in order to most efficiently learn about the world. Scientists know a lot about how infants' pay attention to perceptually-salient things, like bright colors and shiny objects. We also know a lot about how infants pay attention to social information, like a parent's smile or a moving person. Both of these things are inherently rewarding to most infants, and easily capture their attention. However, we know less about how infants pay attention to things that they must learn are rewarding through experience. For example, even if your baby's favorite blankie isn't particularly flashy, it most likely captures their attention and "stands out" in a cluttered room.

To better understand how infants' attentional processes work, we are teaching infants to associate different shapes with a rewarding video. We do this by showing infants two shapes on a screen; once the infant looks at the rewarding shape, we immediately show them a fun video. When we do this enough times, they'll learn to associate the shape with a reward. Once they learn this reward association, we then measure infants' attentional responses to these rewarding shapes, and compare them to their attentional responses to an unrewarding shape. Since we started this study, we have had 33 8-month-olds participate! We are still analyzing the data, but hope to be able to share the results with you soon.

WISHES: Women & Infants Study of Health, Emotions, & Stress

Colleen Doyle

So far, 94 pregnant women have enrolled in the WISHES study. Recruitment is ongoing, and our goal is to include up to 120 women. To date, 64 women and their children have completed all visits. As data collection is ongoing, at this time we are not yet able to report on any significant findings. However, preliminary results suggest that approximately 15-20% of participants reported significant levels of symptoms of depression or anxiety at one or more pre- or postnatal study visits. This aligns with prevalence rates of perinatal mental health concerns that previous studies have reported, and for us, it also underscores an important point that is often overlooked in this area of research – prenatal stress is not exclusive to the prenatal period. We think this is important because it means that researchers, health care providers, and policy makers – not to mention partners, family members, and friends – have many opportunities during pregnancy and after delivery to help and support women and their children.

Cross-cultural study on the effects of child rearing practices on basic perception

Kirsten Dalrymple & Robin Sifre

As infants become more mobile, their world opens up to them. They become able to grab objects and move around, and start to experience an array of new sensations that help boost their perceptual development. One challenge with investigating the effect of infant mobility on 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 (Central Asia) use a "gahvora" cradle during infants' first two years of life. Infants sleep, eat, toilet, and stay in the gahvora throughout the day. Their 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), but decreases with age (average 7 hours/day by 24 months). 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.

Pictured is a Tajik infant laying in a gahvora

In this study, we ask whether partial visual and motor restriction affects the development of basic perceptual competencies such as pairing sights and sounds. We will collect data from 3-, 6-, 9-, and 12-month-old infants in villages in Tajikistan and compare it to data collected from infants of the same ages in the Twin Cities area. This study is in early stages, but 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. Furthermore, this study could provide information about the interaction between the development of perception and action in infancy. After extensive work trying out our tasks and our portable eye tracking technology with our amazing infant participants in Minnesota, we are ready and booked for data collection in Tajikistan beginning January 2019!

How do infants learn to share attention with others?

Isabella Stallworthy & Carolyn Lasch

A key research theme of the E-Lab is studying how babies develop the ability to understand social cues and interact with others. One example of this research examines how infants begin to respond to cues from others in order to share attention to objects in their environments.

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Responding to joint attention (RJA), or responding to the attention-directing cues of others, is an important milestone skill that babies learn in the first year of life. We were curious about how infants progress from being able to respond to easy, obvious cues (such as a head turn, point, and someone saying "Look at that!") to being able to respond to more subtle, sophisticated cues (such as just a head turn) to share attention.

We found that typically developing babies became more sophisticated in their RJA abilities from 9 to around 18 months of age. Our results also suggest that RJA abilities in the first year of life are related to concurrent fine motor (like gripping and handling small objects) and gross motor development (like walking, crawling, and rolling). RJA is also associated with later language development and social responsiveness at 24 months old. We also studied babies who are at high risk for developing autism (because they have an older sibling with autism) using data from our collaborators at other universities. These results suggest that those high-risk babies who developed autism had less sophisticated RJA, but that babies who were at high risk for autism but did not develop the disorder showed unusually sophisticated RJA abilities in the first year of life.

- **Picture citations (in order that they appear)**
- **Page 3:**
- Image 1: https://www.parents.com/baby/health/birth-defects/9-birth-defects-and-their-symptoms-and-treatments/
- Image 2: http://texasawhonn.com/2017/09/25/healthy-mom-and-baby/
- Image 3: https://www.flipkart.com/child-s-love-mom-baby-paper-print/p/itme5negbhgrhv4a
- Image 4: https://blog.frontiersin.org/2017/09/28/frontiers-in-pediatrics-formula-feeding-cesarean-section-infant-gut-microbiome-development/
- **Page 4:**
- Image 1: http://classicalfm.ca/station-blog/2018/07/18/probiotics/
- **Page 5:**
- Picture 1: https://babyology.com.au/toddler/behaviour-and-discipline/toddlers-prefer-help-familiar-people-new-research-reveals.html
- **Page 6:**
- Image 1: https://www.tobiipro.com/learn-and-support/learn/eye-tracking-essentials/what-do-we-study-when-we-use-eye-tracking-data/
- **Page 8:**
- Picture 1: https://www.nhs.uk/conditions/pregnancy-and-baby/your-baby-after-birth/
- Picture 2: https://www.workingmother.com/momlife/13647641/when-do-babies-start-pointing/
- Picture 3: https://vaccinebox.com/when-do-babies-realize-the-reflection-in-mirror-as-their-own/
- Picture 4: https://www.fromthegrapevine.com/health/pregnant-women-move-to-front-of-the-line-israel
- Picture 5: https://youaremom.com/babies/relatives-newborn-baby-before-mother/
- **Page 9:**
- Image 1: sherho.ortgk.ru
- Image 2: https://www.parents.com/baby/development/crawling/the-magic-of-crawling/
- Image 3: https://iwpr.org/issue/special-websites/student-parent-success-initiative/mother-and-baby-looking-up-and-pointing/
- Page 10:
- Image 1: https://www.newkidscenter.com/How-to-Help-Baby-Walk.html

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Angela Fenoglio, PhD

The Elab would like to offer a huge congratulations to our first graduate student, Angela Fenoglio, on her successful dissertation defense this November. During her time with the Elab, Angela could be found scanning baby brains by night and running behavioral assessments of infants by day. We are thankful for Angela's contributions to this lab, and we wish her luck on her future endeavors.

Congratulations Dr. Fenoglio!

Marie Manner, PhD

The Elab would also like to extend a warm congratulations to Marie Manner on completing her PhD in Computer Science from the AI, Robotics, and Vision Laboratory here at the U. While not a student in the lab, Marie worked closely with us, particularly providing expertise in complex data analysis. She also conducted her own study of toddler-robot interaction during her time in the Elab.

Congratulations Dr. Manner!

Thank you!

TO OUR FAMILIES THAT GIVE THEIR TIME AND ENERGY TO RESEARCH

We could not do any of this without you!