THE ELISON LAB

for developmental brain and behavior research

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2022 proved to be yet another exciting and productive year in the E-Lab! As we all have been adjusting to the new "normal" amidst the continuing COVID-19 pandemic, we've been able to safely continue to ramp up our in-person data collection - more than 100 participating families visited us at the Masonic Institute for the Developing Brain in the past year! We are so grateful for all our dedicated families who make this work possible, and we are looking forward to 2023 being another full year of learning and discovery.

In this newsletter, we'll tell you about the projects our lab has been working on, and how YOUR participation is helping to advance our understanding of child brain & behavior development. We will also provide you with information about how to get involved in more of our current research studies. If you have any questions, you can always reach us at elab@umn.edu.

Get in touch!

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BCP Study

Social attention and later development

By Carolyn Lasch

A major goal of our lab's research is understanding the early development of social attention, and how it relates to later development. Many infants who come into our lab play a "looking game" that allows us to learn about how babies follow others' social cues (e.g., pointing, looking at something exciting, verbalizations) called the Dimensional Joint Attention Assessment (DJAA). This ability to "share attention" with another person is called joint attention, and it is important for social learning and collaboration. So many families and infants have participated in our "looking game" that we were able to learn about how babies' joint attention relates to their cognitive and social skills in later toddlerhood.

Joint attention is important for infant word learning (e.g., a caregiver points to picture in a book and labels it a "cat" or "dog"). Social reciprocity and social behaviors are also related to joint attention, as it requires infants to pay attention to other peoples' faces and movements for cues about what to look at. Finally, joint attention requires babies to 'take perspective' and understand that someone else is seeing and interested in something else. In children and adults, this type of perspective taking is described as theory of mind. It plays a role in situations as common as toddlers expressing their hunger rather than simply expecting food.

We found that babies with more advanced joint attention skills for their age had stronger verbal skills at 1.5-3 years old and were more socially responsive at 1.5-2.5 years old. We found that joint attention was associated with theory of mind at 2-3 years old, but only in higher-income families (who were over-represented in our sample).

These results not only help us learn more about how early behaviors like joint attention relate to later development in typically developing kids. They are also important for better understanding ASD and other neurodevelopmental conditions that are associated with delayed or impaired joint attention.

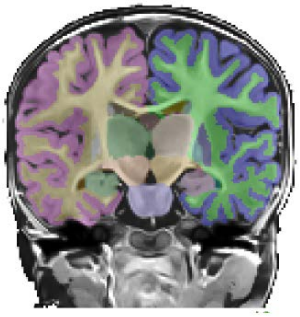
Do you recognize this game? 8- to 15-months-olds in our studies often get to explore toys throughout the room with our examiners as part of the DJAA

BCP Study

Segmenting infant brains

By Sally Stoyell

When we look at an image of the brain, we usually want to divide the brain into different regions so we know what part of the brain we're looking at in each area. Are we looking at white matter tracts, which connect different regions of the brain? Are we looking at the hippocampus, which plays a big role in learning and memory processes? There is software already available to automate these segmentations for adult brains, but infant brains are trickier! Infant brains are smaller, so the regions are harder to distinguish. As infant brains grow, the shape and size of different regions are continuously changing. Infants are also in the process of developing fatty tissue around their neurons that helps speed up processing - a process called "myelination". This process changes the color of brain structures as seen on MRI images, making it hard to tell apart different regions - especially for automated computer programs that are typically used to segment adult brains. In the E-Lab, we've been working on manually "coloring" the different regions of the brain in infants. We're using data from our Baby Connectome Project to create templates of infant brain regions for every month of age in early infancy. These templates will become available to any researcher interested in using them to allow us to develop better automated processing of infant brain images.



BCP Study

Localizing language processing

By Trevor Day

You may have heard that the left hemisphere of your brain is important for language. Scientists have long studied whether people with better language skills have more language function in their left hemisphere compared to the right hemisphere. Generally, we find this to be true, but in some types of MRI scans we do, like ones we'd do in babies, it's hard to estimate where language processing is taking place.

I came up with a new way of localizing language processing in these types of scans and tested it in the Adolescent Brain Cognitive Development study, a large, nationwide study of more than 6,000 10-year-olds. We found that it worked, and that participants with more left-dominant language processing did better on some language tasks. We also found that more left-dominant language processing didn't mean they did any better on tasks not related to language. Left-dominant processing was especially important for the area responsible for word recognition, rather than the area responsible for processing the meaning of sentences.

When the E-Lab ran the Baby Connectome Project, we didn't collect any measures of language *(continued on next page)*

processing in the MRI scanner. This project is an important first step toward deciding how to estimate where language processing is taking place in infants and toddlers. Because infants and toddlers' language skills are changing so rapidly, they are a more interesting population to study how their brain is changing than 10-year-olds.

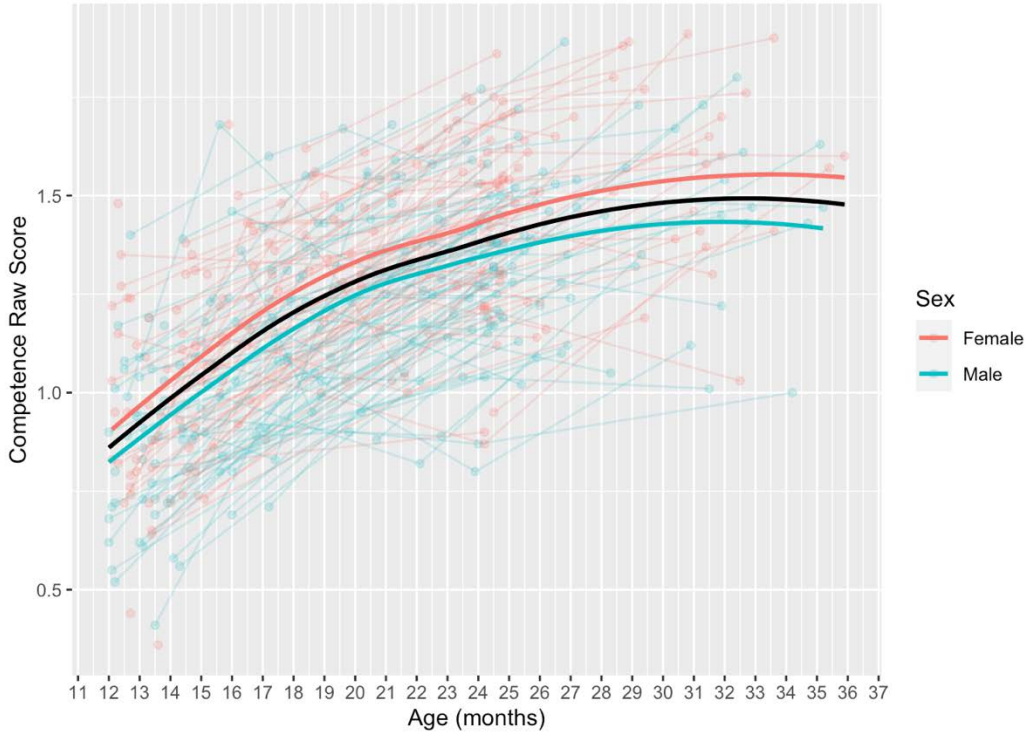
BCP Study

Early social-emotional competence

By Ekomobong Eyoh

As part of the Baby Connectome Project, we collected measures on social and emotional skills, including child compliance, attention, perseverance in challenges, imitation and play behaviors, empathy, and prosocial behaviors. In infants and toddlers aged 12-36 months, we found that children generally increase in these social-emotional skills with age. However, the progress isn't linear and doesn't follow the same trend for all children. Notably, even by 12 months old, it appears girls tend to have a bit more competence in social-emotional skills than boys and maintain that gap. However, girls and boys seem to gain competence in these skills at a similar pace during this time.

Thus, parents can continue to promote social-emotional skills in their kids and expect improvements regardless of sex. Just be aware that girls and boys of the same age may not demonstrate the same level of competence and that this isn't necessarily reason for concern. As kids grow, they transition from using parents or other trusted care givers to co-regulate their emotions and maintain relationships to being able to do it on their own. There are ways to promote this process. In particular, some promotive things parents can do to encourage the development of these skills are (1) facilitate cooperative interactions with peers and adults, including pretend play and (2) teach coping skills in response to emotions, including how to name emotions and devise strategies to examine and modulate positive and negative emotions.



IBIS Study

Early temperament, insistence on sameness, and later internalizing problems

By Dr. Chimei Lee

Autistic children are at an increased risk for behavioral and mental health challenges, and anxiety is one of the most common co-occurring conditions. Some autistic characteristics, including behavioral rigidity and resistance to change (i.e., insistence on sameness), share some behavioral similarities with anxiety but have been found to function as distinct constructs among autistic children across age and cognitive levels. Temperament such as behavioral inhibition, shyness, and fearfulness also overlapped conceptually with anxiety, and these initial temperamental differences increase the probability of developing a consistently fearful personality, resulting in anxious or introverted behavioral presentations. Despite various studies on early development, little is known about the developmental pathways and the associations between temperament, anxiety, and insistence on sameness during infancy.

Using the longitudinal data from the IBIS Network, we were able to examine the relationships between fearfulness (at 12 months), insistence on sameness (at 24 months), and internalizing problems (at 24 & 36 months) among infants who have an older sibling diagnosed with autism and no family history of autism in first-degree relatives. Results suggested that both early fearfulness and insistence on sameness were associated with later internalizing problems. Further analyses revealed that the effect of fearfulness on internalizing problems was fully explained by insistence on sameness, suggesting that early rigidity may play a critical role in the development of anxiety. Elevated and persistent rigidity behaviors may be the main barrier that impedes the emergence of more developmentally appropriate modes of self-regulation, which result in elevated internalizing problems in later childhood.

IBIS Study

Closing the gap in autism care for girls

By Dr. Casey Burrows

For a long time, people believed autism was more common in boys. E-Lab researcher Dr. Casey Burrows is challenging that belief and improving diagnosis and care for girls with autism. Boys are four times more likely to be diagnosed with autism than girls in the U.S. Girls were also diagnosed almost a year later than boys on average, according to the 2016 National Survey of Children's Health. Burrows and her colleagues in the E-Lab are working to change that.

The study set out to avoid some of the common sex biases affecting autism diagnosis. The new study used data from the Infant Brain *(continued on next page)*

Imaging Study (IBIS) that followed younger siblings of autistic children starting when they were 6 months of age, and recruited equal numbers of both boys and girls. The IBIS study followed children in the study four times from the age of 6 months to 5 years. They used data-driven methods to correct for sex-related measurement bias in assessment of autism symptoms and identified distinct groupings based on trajectories of behavior. Their results showed that one-third of the boys *and* one-third of the girls showed growing social concerns over time.

"In general, girls tended to show fewer social concerns," said Burrows. "We found we might have to weigh certain symptoms differently both by sex and over time in order to get more accurate diagnoses." Evaluating children over time could also help reduce the current sex bias in autism diagnosis, according to the study.

"Our research shows that some children who could be on the cusp of an autism diagnosis may need repeated assessment," said Burrows. "There are also some kids who might not meet full diagnostic criteria for autism but still have impairments and need support. In our study, this was more common in girls." As a clinician at UMN, Burrows and her colleagues are looking at ways to translate these findings into improved resources and clinical care for girls with behavioral health concerns.

ACC Study

Early development in agenesis of the corpus callosum

By Dr. Lauren Haisley

Agenesis of the corpus callosum (ACC) is a condition in which the part of the brain that connects the left and right hemispheres is fully or partially missing. It affects about 1 in 4000 live births. Our ACC Infant Study seeks better ways to help children grow to their full potential by studying mental and behavioral development in infants with ACC. We have enrolled 143 families from across the world who have completed a large set of questionnaires at 6-36 months. We have also had the privilege of seeing 22 of these families in-person at the Masonic Institute for the Developing Brain. We are just starting to look at some of the data from this project, and will present a symposium at the International Neuropsychological Society meeting in February 2023.

These initial projects look at early development in adaptive and language skills, as well as early emotionality and features of autism spectrum disorder. In adaptive skills, our results suggest that children with ACC show delayed motor and communication skills compared to their typically developing peers, but that they show a strength in interpersonal social skills. Specifically when looking closer at language, children with *(continued on next page)*

ACC showed delayed vocabulary expansion between 12 and 24 months. Regarding emotionality, parents reported that their children with ACC tended to show less emotionality including both positive and negative emotions. Finally, there is early evidence that children with ACC show more signs of potential autism spectrum disorder than the general population, and that these signs may be identifiable as early as 12 months. Upon closer inspection, some of these signs may be potentially related to early motor and coordination delays. These findings highlight the need for early intervention in motor and communication skills, as well as the importance of capitalizing on social strengths!

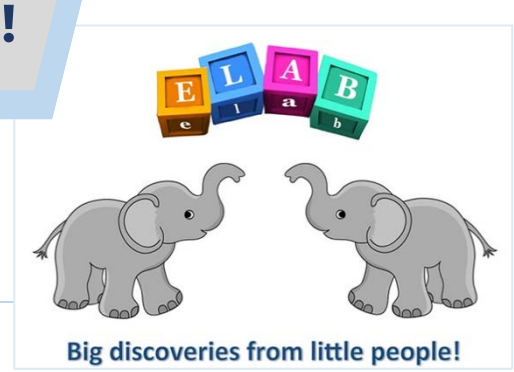
Global work

Assessing the cross-cultural utility of a useful autism screening tool

By Dr. Emmanuel Bonney

Most children with autism spectrum disorders (ASD) in many low-resource communities in the US and abroad experience inequalities in access to diagnostic and treatment services. Yet, we know that early detection of ASD can be critical to early intervention. The purpose of this project was to evaluate the cross-cultural validity of an autism screening instrument developed based on Western conventions-the **P**arent **R**ated **O**bservation of **C**ommunication, **E**motion, and **S**ocial **S**kills **(PROCESS)**. After adapting the original version of PROCESS to conform to the Ugandan context (using the available gold-standard approach), we invited 250 Ugandan mothers of 12–36-month-old infants and toddlers to complete the questionnaire. The Ugandan data were analyzed together with US data that our group had previously collected among Minnesotan families of children within the same age range. We found that the PROCESS was easy-to-use in both US and Uganda. The questionnaire had sound measurement characteristics among Minnesotan families. However, it performed poorly within the Ugandan group. Notable challenges included awkward response pattern, mismatch between the stimuli (nature of the questions) and the Ugandan mothers' knowledge about the autistic behaviors. This suggests that a Western-informed screening tool may be inappropriate for measuring early autistic traits in non-Western contexts where sociocultural norms and people's viewpoints about ASD may be different.

CURRENTLY RECRUITING!



Phenoscreening Study

Thank you to all who have been participating in our Phenoscreening Study, or what many of you may know as the Early Childhood Study! Early detection and intervention help to improve developmental outcomes for many children who are diagnosed with autism spectrum disorder. This study aims to improve the early detection of autism through a population-based screening approach. Toddlers between the ages of 17 and 25 months living in the Twin-Cities area are recruited for this study and are invited to complete an online battery of surveys. Using this survey data, we can determine which children are developing as expected and which children may be showing signs of ASD or other developmental delays. All families who complete the initial surveys are invited to complete a second set of surveys and a subset of children, some of which are typically developing and others who are showing some type of concern indicated in the surveys, will be invited to come into the lab for a behavioral visit and an MRI. Due to complications with the COVID-19 pandemic, many of these visits were virtual, but we are back in person. We have had over 1,700 surveys and over 200 in-person and remote visits completed so far! We are continuing to schedule visits and scans and look forward to seeing more of you in the next year.

In addition to our Phenoscreening Study, we are also working on our Infant Phenoscreening Study. Infants between the ages of 5 and 7 months living in the Twin Cities area are eligible to enroll. For more information, please reach out to earlychildstudy@umn.edu

IBIS Study

One of the goals of our research in the E-Lab is to improve early detection of autism spectrum disorder (ASD). In Minnesota, the ASD prevalence rate is higher with about 1 in 36 children diagnosed with ASD. Of that, research suggests that 1 in 5 siblings of children with autism will develop ASD themselves. While the average age of diagnosis is 4 years old, 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 likelihood of having another child with ASD. Early detection of autism and access to early intervention services is crucial to improving long-term outcomes for these children. *(continued on next page)*

IBIS

The E-Lab is a proud member of the IBIS (Infant Brain Imaging Study) Network. 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 ASD diagnoses.

The IBIS-EP research study is currently recruiting! We're looking for families who have a child with autism and a new baby who is 6 months or younger. 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 www.ibis-network.org.

Baby Sprout

We know the importance of early intervention. Researchers at the University of Minnesota are investigating ways to support families with infants who may be at an elevated likelihood of developmental disabilities sooner, as early as six months of age. Our team has developed and is currently investigating Baby Sprout, an infant intervention package that is based on areas we suspect to be important to later development. The effects of this intervention package and whether it better supports infants and families are unknown, which is why we are doing the Baby Sprout study. The Baby Sprout study includes family education and supportive telehealth-based coaching for caregivers in natural routines for their infant. Families connect from their homes to meet remotely over Zoom with study coaches for three months, at times convenient for your family. We also follow along until the infant is 24 months old to monitor development over time. The study includes a fully remote option (no in person visits) or an option combined with several in person visits to the Masonic Institute for the Developing Brain on the University of Minnesota - Twin Cities Campus for developmental evaluation. The in-person option is only available to Minnesota families at this time, the remote option is open to families in other states as well as Minnesota.

All in all, we hope to learn more about early development and how to provide infant coaching and interventions in ways that are helpful and easy for families who may have concerns about their infant's development.

The Baby Sprout research study is currently recruiting! We're looking for families who have infants between the ages of 5 months and 9 months. If you or someone you know is interested in participating in our study, please contact us at babysprout@umn.edu or call us at 612-624-1450.

CELEBRATIONS IN THE E-LAB!

Welcome to new E-Lab staff!

In the past year, we've welcomed four new members to our team — Welcome to Caitlin Sisk, Aaron Glick, Samantha Smalley, and Desirae Rambeck!

Caitlin Sisk, PhD
Postdoctoral Researcher

Aaron Glick, MSc
Data Manager & Developer

Sam Smalley
Study Coordinator

Desirae Rambeck, MA
Research Project Specialist

Isa Stallworthy completes dissertation defense

In May of 2022, former E-Lab graduate student Isa Stallworthy successfully defended her dissertation. Her work focuses on mother-infant synchrony and the psychobiological mechanisms of socialization and co-regulation. Congratulations, Dr. Stallworthy!

CELEBRATIONS IN THE E-LAB!

Sally Stoyell receives award from NSF Graduate Research Fellowship Program

E-Lab graduate student Sally Stoyell, who is a 3rd year Ph.D. student in the Developmental Psychology program at the University of Minnesota, was selected to receive a Graduate Fellowship from the National Science Foundation. These highly competitive fellowships are awarded to individuals who demonstrate potential to make significant contributions to research in STEM. This award will help fund her time with the E-Lab, as she continues her work studying early brain development and its association with the development of memory skills in infants and young children.

Trevor Day awarded MIDB Seed Grant

E-Lab graduate student Trevor Day, who is a 3rd year Developmental Psychology Ph.D. program at the University of Minnesota, was awarded a grant from the Masonic Institute of the Developing Brain's Seed Grant Competition. This will provide funding for his project, *An intensive longitudinal study of hemispheric specialization as related to emerging linguistic skill.*

SNAPSHOTS FROM 2022

Lab Climbing Day at Minneapolis Bouldering Project

E-Lab 2022 Summer Potluck

2022 Baby Siblings Research Consortium hosted at the MIDB

E-Lab Clinical Team's cookie decorating party!