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Inside the Institute

Newsletter for the Carolina Institute for Developmental Disabilities

Issue # 21
February 2017

Researchers Use MRIs to Predict Which High-Risk Babies Will Develop Autism as Toddlers

This first-of-its-kind study used MRIs to image the brains of infants, and then researchers used brain measurements and a computer algorithm to accurately predict autism before symptoms set in.

Joseph Piven, MD

Heather Hazlett, PhD

Using magnetic resonance imaging (MRI) in infants with older siblings with autism, researchers from around the country were able to correctly predict 80 percent of those infants who would later meet criteria for autism at two years of age.

The study, published February 15 in *Nature*, is the first to show it is possible to identify which infants – among those with older siblings with autism – will be diagnosed with autism at 24 months of age.

"Our study shows that early brain development biomarkers could be very useful in identifying babies at the highest risk for autism before behavioral symptoms emerge," said senior author Joseph Piven, MD, the Thomas E. Castelloe Distinguished Professor of Psychiatry at the University of North Carolina-Chapel Hill. "Typically, the earliest an autism diagnosis can be made is between ages two and three. But for babies with older autistic siblings, our imaging approach may help predict during the first year of life which babies are most likely to receive an autism diagnosis at 24 months."

This research project included hundreds of children from across the country and was led by researchers at the Carolina Institute for Developmental Disabilities (CIDD) at the University of North Carolina, where Piven is director. The project's other clinical sites included the University of Washington, Washington University in St. Louis, and The Children's Hospital of Philadelphia. Other key collaborators are McGill University, the University of Alberta, the University of Minnesota, the College of Charleston, and New York University.

"This study could not have been completed without a major commitment from these families, many of whom flew in to be part of this," said first author Heather Hazlett, PhD, assistant professor of psychiatry at the UNC School of Medicine and a CIDD researcher. "We are still enrolling families for this study, and we hope to begin work on a similar project to replicate our findings." (*see ibisnetwork.org for more information.*)

People with Autism Spectrum Disorder (or ASD) have characteristic social deficits and demonstrate a range of ritualistic, repetitive and stereotyped behaviors. It is estimated that one out of 68 children develop autism in the United States. For infants with older siblings with autism, the risk may be as high as 20 out of every 100 births. There are about 3 million people with autism in the United States and tens of millions around the world.

Despite much research, it has been impossible to identify those at ultra-high risk for autism prior to 24 months of age, which is the earliest time when the hallmark behavioral characteristics of ASD can be observed and a diagnosis made in most children.

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A University Center for Excellence in Developmental Disabilities Education, Research, and Service (UCEDD) with core funding from the Administration on Developmental Disabilities (ADD)

An Intellectual and Developmental Disabilities Research Center (IDDRC) with core funding from the National Institute of Child Health and Human Development (NICHD)

A Leadership Education in Neurodevelopmental and Related Disabilities (LEND) Program with core funding from the Maternal and Child Health Bureau (MCHB)

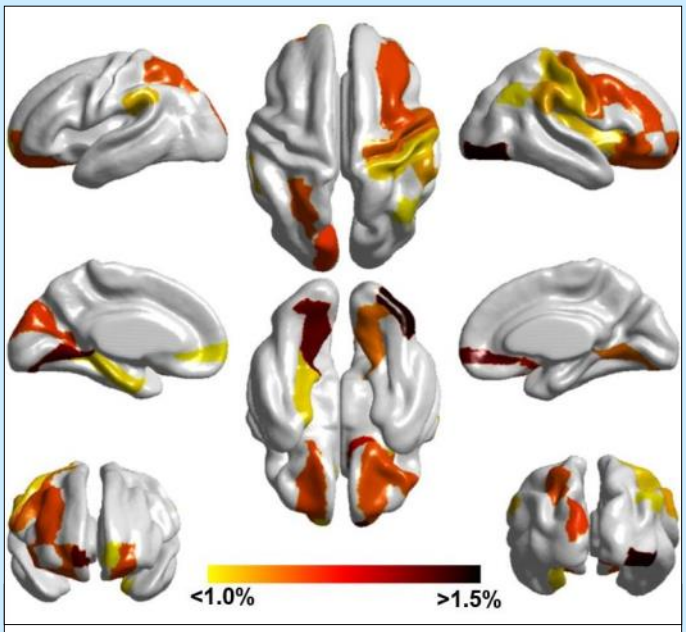
Researchers Use MRIs to Predict Which High-Risk Babies will Develop Autism as Toddlers *continued*

For this *Nature* study, Piven, Hazlett, and researchers from around the country conducted MRI scans of infants at six, 12, and 24 months of age. They found that the babies who developed autism experienced a hyper-expansion of brain surface area from six to 12 months, as compared to babies who had an older sibling with autism but did not themselves show evidence of the condition at 24 months of age. Increased growth rate of surface area in the first year of life was linked to increased growth rate of overall brain volume in the second year of life. Brain overgrowth was tied to the emergence of autistic social deficits in the second year.

Previous behavioral studies of infants who later developed autism – who had older siblings with autism –revealed that social behaviors typical of autism emerge during the second year of life.

The researchers then took these data – MRIs of brain volume, surface area, cortical thickness at 6 and 12 months of age, and sex of the infants – and used a computer program to identify a way to classify babies most likely to meet criteria for autism at 24 months of age. The computer program developed the best algorithm to accomplish this, and the researchers applied the algorithm to a separate set of study participants.

The researchers found that brain differences at 6 and 12 months of age in infants with older siblings with autism correctly predicted eight out of ten infants who would later meet criteria for autism at 24 months of age in comparison to those infants with older ASD siblings who did not meet criteria for autism at 24 months.



Coloured regions indicate areas of the cortex that grew significantly faster in infants who were later diagnosed with autism.

"This means we potentially can identify infants who will later develop autism, before the symptoms of autism begin to consolidate into a diagnosis," Piven said.

If parents have a child with autism and then have a second child, such a test might be clinically useful in identifying infants at highest risk for developing this condition. The idea would be to then intervene 'pre-symptomatically' before the emergence of the defining symptoms of autism.

Research could then begin to examine the effect of interventions on children during a period before the syndrome is present and when the brain is most malleable. Such interventions may have a greater chance of improving outcomes than treatments started after diagnosis.

"Putting this into the larger context of neuroscience research and treatment, there is currently a big push within the field of neurodegenerative diseases to be able to detect the biomarkers of these conditions before patients are diagnosed, at a time when preventive efforts are possible," Piven said. "In Parkinson's for instance, we know that once a person is diagnosed, they've already lost a substantial portion of the dopamine receptors in their brain, making treatment less effective."

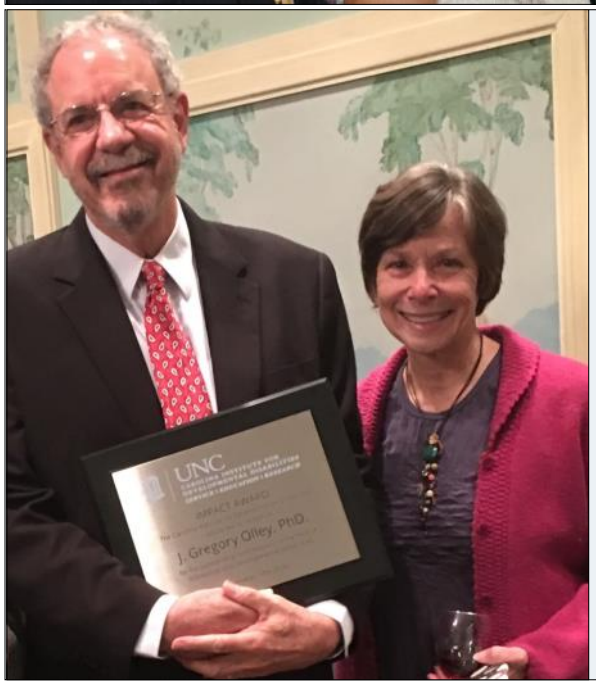
Piven said the idea with autism is similar; once autism is diagnosed at age 2-3 years, the brain has already begun to change substantially.

"We haven't had a way to detect the biomarkers of autism before the condition sets in and symptoms develop," he said. "Now we have very promising leads that suggest this may in fact be possible."

For this research, NIH funding was provided by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), the National Institute of Mental Health (NIMH), and the National Institute of Biomedical Imaging and Bioengineering. Autism Speaks and the Simons Foundation contributed additional support.

James L. and Nancy T. Hodgin Commit $1 Million to the Carolina Institute for Developmental Disabilities

James L. and Nancy T. Hodgin of Chapel Hill have made a $1 million commitment to the Carolina Institute for Developmental Disabilities Advancement Fund. "I have known Jim Hodgins since arriving at UNC 17 years ago. He has been a wonderful builder, landlord, friend and now philanthropist," said CIDD Director Dr. Joe Piven. "This is a wonderful and much appreciated gift to the CIDD that will make a huge impact on our Institute. My sincere thanks to Jim and Nancy Hodgin for this commitment."



Congratulations to Dr. Greg Olley, Recipient of the CIDD Impact Award

The CIDD Impact Award, established in 2016, recognizes the outstanding and lasting contribution of a professional, family member or self-advocate within the NC developmental disability community toward improving the quality of life for individuals and their families. Critical contributions to the field of IDD may be accomplished through innovative research, state-of-the-art interdisciplinary training/education, evidence-based clinical service, advocacy or policy and program development. Dr. Olley recently retired having spent almost 30 years at UNC, though he will continue his forensic work part-time at the CIDD. Dr. Olley is pictured left with his wife, Dr. Ann Cox.

Benefits of Broccoli Extract in Young Men with Autism

The Carolina Institute for Developmental Disabilities is conducting a clinical trial of a nutraceutical made from concentrated broccoli sprout extract, which is high in the antioxidant sulforaphane, to treat symptoms of autism. Neuroinflammation is believed to play a role in autism for some individuals, and sulforaphane has natural anti-inflammatory properties that contribute to the many health benefits of consuming broccoli and other cruciferous vegetables. The results of a recent clinical trial, published in the *Proceedings of the National Academy of Science* (PNAS) in 2015, showed a promising beneficial effect of a sulforaphane supplement for symptoms of autism in the majority of young men who took it.

The researchers (PI, Dr. Laura Politte) are currently recruiting young men between the ages of 13 and 30 years old with a diagnosis of moderate to severe autism to participate in the study. The trial consists of 6 clinical visits for the participant and a parent or guardian at the CIDD over the course of 5 months to assess the safety and efficacy of the broccoli supplement compared to placebo. Participants and caregivers will be compensated per visit, up to a total of $180 for caregivers and $120 for participants. Interested families can contact the research team at 919-962-8462 or by email at Olivia.Sawh@cidd.unc.edu.

Pediatric Audiology Grant Is Preparing Pediatric Audiologists to Work with Children with Developmental Disabilities

We are pleased to report that UNC has been awarded a supplemental grant of $400,000 over the next five years to support the educational preparation of pediatric audiology students funded by the North Carolina LEND program which is based at CIDD. NC-LEND Director, Dr. Jack Roush, notes, "We were proud to receive one of the first three LEND audiology grants when they were initially awarded in 2009 and are very pleased the funding will continue through 2021 to prepare pediatric audiologists from UNC's Doctor of Audiology (AuD) program with specialized training to work with children who have developmental disabilities and other complex needs in addition to hearing loss."

LEND Audiology Trainees 2016-2018. Back row left/right: Skye Dorsett, Jenna Sawafta, Katharina Boyce, Kelly Allison; Front row left/right: Arielle Abrams, Danielle Mitton, Lisa Copeland, Marisa Marsteller, Melissa Simpson.

NC-LEND

UNC SCHOOL OF MEDICINE

Left: Former LEND Audiology Trainee, Dr. Mallory Baker, (left) looks on as current LEND trainees Skye Dorsett (right) and Melissa Simpson (middle) from UNC's doctoral program in audiology conduct a hearing screening on a newborn infant.

CIDD Receives $2.5-Million Grant to Explore New Therapy for Anhedonia

Gabriel Dichter, PhD

Gabriel Dichter, PhD, associate professor of psychiatry in the UNC School of Medicine and adjunct associate professor of psychology and neuroscience in the UNC College of Arts and Sciences, is the principal investigator of a 5-year $2.5-million award as part of the Experimental Therapeutics Initiative of the National Institute of Mental Health (NIMH). This new grant will use ultra-high field 7-tesla functional neuroimaging to develop and evaluate a new form of psychotherapy to treat anhedonia – a condition marked by a decreased capacity to experience motivation and pleasure. It is a core feature of a number of psychiatric disorders, including mood and anxiety disorders, substance-use disorders, schizophrenia, and attention-deficit/hyperactivity disorder.

"Anhedonia is one of the most difficult psychiatric symptoms to treat and represents a critical vulnerability factor for a range of psychiatric disorders," said Dichter, who is also an investigator at the Carolina Institute for Developmental Disabilities . "We need better treatments, and we hope this project will establish a first-of-its-kind intervention for anhedonia."

NIMH's Experimental Therapeutics Initiative, which was launched in 2014, marked a major shift in the types of clinical trials funded through NIMH. Traditionally, clinical trials in mental health fields involved solely a focus on symptom reductions. Such trials, whether positive or negative, delivered little information about how an intervention might work or the underlying cause of the disorder, and therefore the trials provided little guidance for further treatment development.

The Experimental Therapeutics Initiative promotes research in which interventions are evaluated in stages. The first stage is to demonstrate that the intervention exerts an effect on a hypothesized "target" or mechanism of action. Targets may be molecular, cellular, behavioral, interpersonal, or neural circuitry. Once target engagement is demonstrated, the next stage of the trial evaluates relations between target engagement and symptom reductions.

These types of trials also focus on symptoms that cut across disorders, opposed to broad diagnostic categories in which not all participants share the same underlying disease process. In this way, a given trial will indicate not only whether a novel intervention works, but will provide information about the underlying etiology of both the disorder and the mechanisms of treatment response. In this way, future trials can build on the lessons learned from prior trials while increasing the understanding of the pathophysiology of the disorder.

Dr. Dichter's new study, to be conducted with collaborator Moria Smoski, PhD, in the department of psychiatry at Duke University, will investigate the viability and efficacy of a new "transdiagnostic" psychotherapy for anhedonia called Behavioral Activation Therapy for Anhedonia. This intervention is designed to restore reward motivation and reward responsiveness in individuals with clinically impairing anhedonia. The 15-week course of individual psychotherapy includes patient education about anticipatory versus consummatory anhedonia, positive versus negative reinforcement, and how anhedonia can foster avoidance. The treatment focuses on increasing the frequency of the initiation of new pleasurable behaviors, exercises to increase present-moment savoring, and the reduction of avoidance behaviors.

The research team will first evaluate the impact of the new treatment on brain systems that process rewards using ultra-high field 7-tesla functional brain imaging at the UNC Biomedical Research Imaging Center (BRIC). This phase will also collect brain imaging data at multiple time points during psychotherapy to derive an optimal "dose" of the treatment (in other words, how many weeks of treatment are needed to derive the most benefit). After demonstrating that the treatment engages this reward processing brain target and deriving the optimal treatment dose, a formal clinical trial will evaluate the impact of the novel treatment on patient symptoms.

Co-investigators for this study include BRIC Director Weili Lin, PhD; Stacy Daughters, PhD, associate professor in UNC's department of psychology and neuroscience; Susan Gaylord, PhD, associate professor in UNC's department of physical medicine and rehabilitation and director of the department's program on integrative medicine; biostatistician John Sideris, PhD, an advanced research scientist at UNC's Frank Porter Graham Child Development Institute; and Erin Walsh, PhD, a postdoctoral fellow in the program on integrative medicine in UNC's department of physical medicine and rehabilitation.

North Carolina Intellectual Developmental Disability Advance Practice Mini-Fellowship Program

The North Carolina Intellectual Developmental Disability Advance Practice Mini-Fellowship Program (NC-IDDAPP) is a new program based at CIDD. This effort is funded by the Special Hope Foundation and is directed by Robert Christian, MD. The aim of the project is to train Advance Practice Medical Professionals such as Nurse Practitioners and Physicians Assistants in Intellectual Developmental Disabilities (IDD) healthcare.

Rob Christian

Michelle Franklin

Cathy Kluttz-Hile

The NC-IDDAPP focuses on training post-graduate community practitioners through a combination of online learning, case-conferences via webinar, and experiential learning in clinical settings. In its pilot year, the program has two trainees: DeAnna Patterson, MSN, pediatric nurse practitioner, and Jane Carter, MSN, psychiatric nurse practitioner. The NC-IDDAPP program directors also include Cathy Kluttz-Hile, RN CDDN and Michelle S. Franklin, MSN, FNP-BC, PMHNP-BC.

Ms. Franklin and Ms. Kluttz-Hile bring extensive clinical and IDD systems/resources knowledge. Ms. Franklin is North Carolina LEND faculty and helped develop key components of the training curriculum. Ms. Klutz-Hille coordinates clinical observation learning experiences in 5 partner agencies located in central NC including the Murdoch Developmental Center, NC START, the Durham CDSA, the Tammy Lynn Center, and Life Enhancement Medical Services.

Trainees also spend time observing clinical encounters at CIDD with Dr. Christian. The didactic, case-conference, and experiential content is lifespan oriented covering topics ranging from early recognition to sexuality to aging. Further, the program works to de-emphasize the boundaries between mental and physical health and intends to "cross-train" professionals regardless of their background discipline.

Currently, Dr. Christian is planning for the program's second year and hopes to expand the capacity of the program with future rounds of funding from the Special Hope Foundation and other potential entities such as the NC Developmental Disabilities Council. The long term goal is for the program to be self-sustaining through a variety of mechanisms.

CIDD LEND Trainee Focuses on Act Early Messages

Jonet Artis is a LEND trainee and doctoral student in Speech and Hearing Sciences at UNC-CH. As a LEND trainee, Ms. Artis is working closely with Dr. Becky Pretzel, NC's Act Early Ambassador, and Dr. Betsy Crais at the Division of Speech & Hearing Sciences, on developmental monitoring and early identification activities, particularly providing outreach to rural and medically underserved communities. Most recently, Ms. Artis presented with Dr. Crais to nutrition staff at the Lumberton WIC clinic in Robeson County and shared information about the importance of monitoring developmental milestones and helping parents connect to early intervention and health care providers if concerns arise. Ms. Artis provided WIC staff with Learn the Signs, Act Early materials and discussed ways to engage parents in monitoring development.

"Autism 101" in the Great Hall of the Carolina Student Union

The UNC Chapters of the Autism Society of NC and Autism Speaks hosted "Autism 101" in the Great Hall of the Carolina Student Union on January 30, 2017. The goal of the event was to help undergraduate students learn more about autism services, research, and volunteer opportunities.

UNC SPARK, CIDD, TEACCH and the Autism Research Registry helped sponsor the event. Dr. Gabriel Dichter of the CIDD presented an overview of autism spectrum disorder, the services provided by the CIDD and information on autism research at UNC. Dr. Mark Klinger, Director of Research at TEACCH, presented findings from the Adult Outcomes Study. Finally, self-advocate and artist DJ Svoboda gave an inspiring talk about his personal journey as a person with autism spectrum disorder and displayed some of his remarkable Imagifriend drawings from his My Imagiville series (www.myimagiville.com).

Students had a chance to meet with Drs. Dichter (pictured above) and Klinger and sign up to be UNC SPARK Student Ambassadors.

Right: UNC SPARK Project Coordinator, Corrie Walston, meets with undergraduate students at the "Autism 101" event.

For more information on the Autism Research Registry at UNC, please visit: www.cidd.unc.edu/Registry/Autism

For more information on the UNC SPARK project, please visit: www.cidd.unc.edu/Registry/SPARK

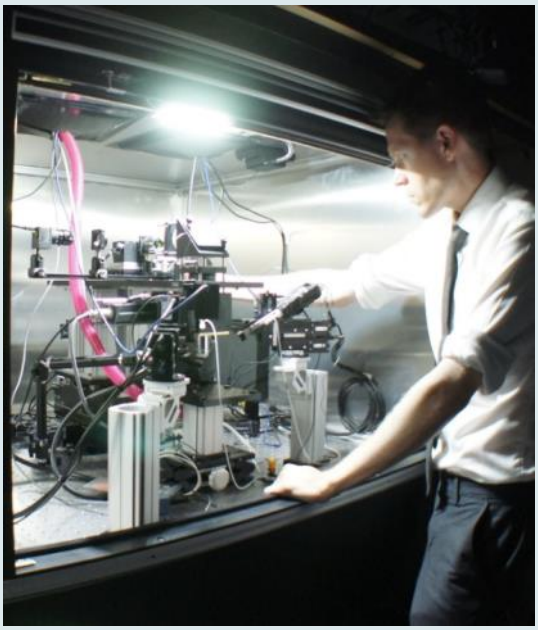
SPARK
Igniting autism research
Improving lives

The Science of Baby's First Sight

When a newborn opens her eyes, she does not see well at all. You, the parent, are a blurry shape of light and dark. Soon, though, her vision comes online. Your baby will recognize you, and you can see it in her eyes. Then baby looks beyond you and that flash of recognition fades. She can't quite make out what's out the window. It's another blurry world of shapes and light. But within a few months, she can see the trees outside. Her entire world is coming into focus.

UNC School of Medicine scientists have found more clues about what happens in the brains of baby mammals as they try to make visual sense of the world. The study in mice, published today in the journal Nature Neuroscience, is part of an ongoing project in the lab of Spencer Smith, PhD, assistant professor of cell biology and physiology, to map the functions of the brain areas that play crucial roles in vision. Proper function of these brain areas is likely critical for vision restoration.

"There's this remarkable biological operation that plays out during development," Smith said. "Early on, there are genetic programs and chemical pathways that position cells in the brain and help wire up a 'rough draft' of the circuitry. Later, after birth, this circuitry is actively sculpted by visual experience: simply looking around our world helps developing brains wire up the most sophisticated visual processing circuitry the world has ever known. Even the best supercomputers and our latest algorithms still can't compete with the visual processing abilities of humans and animals. We want to know how neural circuitry does this."



Spence r Smith, PhD, works at his microscope at the UNC Neuroscience Center

If cures for partial or entire blindness can be developed through, say, gene therapy or retinal implants, then researchers will need to understand the totality of visual brain circuitry to ensure people can recover useful visual function.

"Most work on restoring vision has focused on the retina and the primary visual cortex," Smith said. "Less work has explored the development of the higher visual areas of the brain, and their potential for recovery from early deficits. I want to understand how these higher visual areas develop. We need to know the critical time windows during which vision should be restored, and what occurs during these windows to ensure proper circuit development."

To understand the potential challenges that vision restoration later in life might entail, take the case of bilateral cataracts – when the lenses of both eyes are cloudy and vision is severely limited. In developed countries, it's common to have such cataracts surgically removed very early in life. If so, vision typically develops appropriately.

"But in less developed, rural parts of the world, people often don't get to a clinic until they are teens or older," Smith said. "They've gone through life seeing light and dark, fuzzy things. That's about it. When they have the cataracts removed, they recover a large amount of visual function, but it is not complete. They can learn to read and recognize their friends. But they have great difficulty perceiving some types of visual motion." It's the kind of visual perception needed during hand-eye coordination, or simply while navigating the world around you.

There are two subnetworks of visual circuitry, called the ventral and dorsal streams, and the latter of these is important for motion perception. Smith wanted to know if visual experience is particularly essential for proper development of the dorsal stream. And he wanted to understand what could be changing at the individual neuron level during this early development.

To explore these questions, Smith and his UNC colleagues conducted hundreds of painstaking, time-consuming experiments. In essence, Smith's lab is reverse engineering complicated brain circuitry with the help of specialized two-photon imaging systems Smith and his team designed and built at the UNC Neuroscience Center, where he is a member.

"If you want to reverse engineer a radio to know how it works, a good way to start would be to watch someone put together a radio," Smith said. "Well, this is kind of what we're doing. We're using our imaging systems to watch how biology builds its visual processing circuitry." *Continued on next page*

The Segregation and Integration of Distinct Brain Networks and Their Relationship to Cognition

Jessica R. Cohen, PhD

A critical feature of the human brain that gives rise to the wide range of behaviors and cognition of which we are capable is its ability to dynamically and adaptively respond to changes in the environment. It is important to understand how the brain dynamically adapts so we can understand both how this dynamic reconfiguration contributes to successful cognition, as well as how cognitive impairments and behavioral problems may arise in some individuals.

To probe this ability of the brain, Jessica Cohen, PhD, Assistant Professor in the Department of Psychology and Neuroscience at UNC, and her research team collected functional MRI data from healthy young adults. Investigators first measured how brain regions distributed throughout the entire brain communicated with each other using a measurement called functional connectivity. They then created a "brain graph" to describe how distinct brain regions interact intrinsically (during a baseline state with no cognitive demands).

Investigators found that the brain graph consisted of distinct, segregated networks of tightly interconnected brain regions that worked together, with some connections across brain networks that contributed to across-network integration. They then measured how the network organization of the brain graph reconfigured during different cognitive tasks.

During motor execution, which was a task that relied upon brain regions that fell within a single brain network, segregation of distinct networks increased. Conversely, during working memory, which was a task that relied upon brain regions that spanned multiple brain networks, integration across networks increased. These changes in network organization were related to better behavioral performance.

Results, which were published in the Journal of Neuroscience, underscore the human brain's ability to selectively and adaptively reconfigure network organization when confronted with changing cognitive demands to achieve an optimal balance between network segregation and network integration.

The Science of Baby's First Sight *continued*

In one series of experiments, Smith's team reared mice in complete darkness for several weeks. Even the daily care of the mice was in darkness with the aid of night-vision goggles. Using his imaging system and precision surgical methods, Smith and colleagues could view specific areas of the brain with neuron-level resolution. They showed that the ventral visual stream in mice did indeed come online immediately, with individual neurons firing as the mice responded to visual stimuli. But the dorsal stream did not.

"Keeping the mice in darkness significantly degraded the magnitude of visual responses in the dorsal stream – responses to what they were seeing," Smith said. The neurons in the dorsal area weren't firing as strongly as they did in mice raised with normal visual experience. "Interestingly, even after a recovery period in a normal light-dark cycle, the visual deficit in the dorsal stream persisted." This is reminiscent of the persistent visual deficits seen in humans with bilateral cataracts that aren't repaired until later in life. "Not only did the mice need visual experience to develop their dorsal stream of visual processing, but they needed it in an early developmental time window to refine the brain circuitry," Smith said. "Otherwise, their vision never properly developed."

These experiments can help explain what happens in the human analogs of the ventral and dorsal streams when we're babies, when part of our vision slowly develops and we try to make sense of the world moving around us during the first several months after birth. Smith added, "Now that we have a little bit of a feel for the lay of the land – how these two subnetworks develop – I really want to drill down into the actual computations that these different brain areas are performing. I want to analyze what information neurons in higher visual areas are encoding. What are they encoding better, or more efficiently, than neurons in the primary visual cortex? What, exactly, are they doing that allows us to analyze complex visual stimuli so quickly and efficiently?"

The National Eye Institute, the National Institutes of Neurological Disorders and Stroke, and the Whitehall Foundation funded this work. Spencer Smith is also a member of the Carolina Institute for Developmental Disabilities. Other authors include UNC graduate student Leah Townsend, Ikuko Smith, DVM, PhD, assistant professor of pharmacology and member of the UNC Neuroscience Center, UNC graduate student Ruth Huh, and Hongtu Zhu, PhD, professor of biostatistics in the UNC Gillings School of Global Public Health.

2017
YANG FAMILY BIOMEDICAL SCHOLARS LECTURES

Dr. Garret Stuber Receives Yang Family Biomedical Scholars Award

Congratulations to Garret Stuber, PhD, recipient of the Yang Family Biomedical Scholars Award. This award was established through a generous gift from Lenovo chairman and CEO Yuanqing Yang to recognize the research achievements of young tenured faculty in the UNC School of Medicine. Dr. Stuber is an Associate Professor in the departments of Psychiatry, and Cell Biology and Physiology and a member of the UNC Neuroscience Center and Carolina Institute for Developmental Disabilities. He will lecture on "Harnessing Neurotechnology to Unravel the Biological Basis of Motivation" on Friday, March 10, 12-1pm in 1131 Bioinformatics on UNC campus.

Garret Stuber, PhD

John Gilmore, MD

White Matter Structure in the Brain Predicts Cognitive Function at Ages 1 and 2

A new study led by UNC School of Medicine researchers concluded that patterns of white matter microstructure present at birth and that develop after birth predict the cognitive function of children at ages 1 and 2.

"To our knowledge, this study is the first to measure and describe the development of white matter microstructure in children and its relationship to cognitive development from the time they are born until the age of 2 years," said John H. Gilmore, MD, senior author of the study and director of the Early Brain Development Program in the UNC Department of Psychiatry. The study was published in the *Proceedings of the National Academy of Sciences*.

White matter is the tissue in the brain that contains axon fibers, which connect neurons in one brain region to neurons in another region. White matter is critical for normal brain function, and little is known about how white matter develops in humans or how it is related to growth of cognitive skills in early childhood, including language development. In the study, a total of 685 children received diffusion tensor imaging (DTI) scans of their brains. DTI is a magnetic resonance imaging (MRI) technique that provides a description of the diffusion of water through tissue, and can be used to identify white matter tracts in the brain and describe the organization and maturation of the tracts.

The study authors used these brain scans to investigate the microstructure of 12 white matter fiber tracts important for cognitive function, their relationship to developing cognitive function and their heritability. They found all 12 of the fiber tracts in the newborns were highly related to each other. By age 1, these fiber tracts had begun to differentiate themselves from each other, and by age 2 this differentiation was further advanced. The most interesting finding from the study was that the common relationship between white matter tracts at birth predicted overall cognitive development at age 1 and language development at age 2, indicating that it may be possible to use brain imaging at birth to better understand how a child's cognitive development will proceed in the first years after birth.

Because the sample included 429 twins, the study authors were also able to calculate that this predictive trait was moderately heritable, suggesting that genetics may be a factor in its development.

"There is rapid growth of brain structure, cognition and behavior in early childhood, and we are just starting to understand how they are related," Gilmore said "With a better understanding of these relationships, we ultimately hope to be able to identify children at risk for cognitive problems or psychiatric disorders very early and come up with interventions that can help the brain develop in a way to improve function and reduce risk."

In addition to Gilmore, authors of the study are Seung Jae Lee, Rachel J. Steiner, Yang Yu, Sarah J. Short, Michael C. Neale, Martin Styner, and Hongtu Zhu. All are at UNC except for Neale, who is in the Virginia Institute of Psychiatric and Behavioral Genetics at Virginia Commonwealth University. This study was supported by grants from the National Institute of Mental Health, National Institute of Child Health and Human Development and the National Science Foundation.

NC-LEND Trainees and Fellows, 2016-2017

Leadership Education in Neurodevelopmental and Related Disabilities

LEND is an interdisciplinary leadership training program funded by the U.S. Maternal and Child Health Bureau to prepare professionals for leadership roles that enable them to direct and facilitate culturally/linguistically-competent and family-centered interdisciplinary efforts, including systems change, to improve the health status of infants, children, and adults who have, or are at risk for developing, autism spectrum disorders or related developmental disabilities. Below, current trainees have shared brief bios to highlight background, interests, and area of study.

Arielle Abrams is a first year doctoral student in the UNC audiology program. She is interested in pediatric audiology. Her LEND project will focus on amplification and FM systems for hard-of-hearing students in the classroom.

Kelly Allison is a second year audiology doctoral student at UNC and a LEND trainee in audiology. Her clinical interests are around children with hearing loss and neurodevelopmental disorders.

Jonet Artis is a first year doctoral student in the Speech and Hearing Sciences Division of the Department of Allied Health at UNC. Research interests include autism spectrum disorders and early identification and early intervention with speech and language disorders.

Lauren Bangert is a fourth year doctoral student in the UNC School Psychology program and a psychology extern at CIDD. Interests include pediatric neuropsychological assessment and mental health outcomes for children and adolescents with neurodevelopmental and psychiatric disabilities.

Hunter Blanton is a LEND Family Fellow and mother and aunt of children with ASD. She has a PhD in Genetics and Molecular Biology. Interests include broadening her knowledge of developmental disabilities, growing her leadership skills and learning to build better connections between people.

Katharina Boyce is a third year audiology doctoral student at UNC. She is currently completing a research project investigating outcomes of children utilizing a cochlear implant in addition to a hearing aid (bimodal listeners).

Remington Brown is a LEND Self-Advocacy Trainee. He is interested in social justice and disability rights education, as well as using his music for advocacy.

Kelly Confroy is a first year graduate student at the UNC-Greensboro Genetic Counseling program. She is interested in the role of genetics in intellectual and developmental disabilities.

Lisa Copeland is a third year audiology doctoral student at UNC. She has an interest in Cytomegalovirus and plans to work with pediatric cochlear implant patients in the future. She currently works in the Human Auditory Development Lab at UNC as a research assistant.

Skye Dorsett is a second year doctoral student in audiology at UNC. She taught children with hearing loss for five years before returning to graduate school to become a pediatric audiologist. Research interests include cochlear implants in children, children with unilateral hearing loss, and newborn hearing screenings.

Erica Fornaris is a UNC school psychology doctoral student and a CIDD psychology extern. She is interested in educational supports for students with disabilities, gender differences in autism, and behavioral and emotional health in youth with neurodevelopmental disabilities.

Stephanie Fox is a pre-doctoral psychology intern specializing in autism and developmental disabilities. Her clinical and research interests include interdisciplinary assessment of I/DD, differential diagnosis, and behavioral interventions.

NC-LEND Trainees and Fellows, 2016-2017 *continued*

Sarah Griffin is a second year MS student in the UNC Speech-Language Pathology program and a LEND trainee. As a sibling of a young adult with autism, her interests include early intervention, social language use, and transition from high school for individuals with ASD.

Whitney Griffin is in the school psychology program at NC State University. Her area of interest/study is students with ASD and their social inclusion with peers.

Lauren Hamilton is in the LEND program as a Nurse Practitioner student working toward a Doctorate of Nursing Practice with a specialization in Psychiatry/Mental Health.

Cara Heaton is a Duke Pediatric Physical Therapy Resident and LEND fellow. She has a special interest in working with children and their families in the ICU setting.

Alissa Hopper is a master's student in Speech-Language Pathology at UNC. She works as part of the Clinical Affective Neuroscience Laboratory at the CIDD. Her work focuses on the speech and language differences found in young adults with autism, and how these differences are associated with changes in the brain.

Lillian Howard is a second year graduate student at UNC-Greensboro in the Genetic Counseling program. Her specific area of interest is neurogenetics.

Leanne Laffoon is a LEND family trainee and mother of three children who all have neurodevelopmental issues and one child who is now in heaven. Her interest is in working with the foster system to promote awareness for medically fragile children.

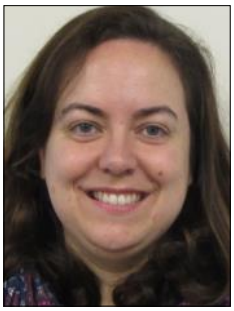
Jacqueline Lawrence is a doctoral student in the UNC School Psychology program. Her interests involve neurodevelopmental disorders across the lifespan. Her current research seeks to understand relationships among comorbid health and psychiatric conditions often found in ASD.

Marisa Marsteller is a second year audiology doctoral student at UNC and a LEND trainee. Her clinical and research interests are in the pediatric hearing loss population. In particular, she currently enjoys research in early hearing detection and intervention.

Nicole "Nikki" Michaelson is a second year Masters of Social Work student. She is interested in working with children and adults with disabilities and their families to find resources and supports within the community.

Danielle Mitton is a doctoral student in UNC's audiology program interested in early intervention and pediatric management of hearing loss, particularly for children with a severe/profound loss. She previously worked as an educational sign language interpreter and is interested in helping strengthen the relationship between the Deaf community and hearing healthcare providers.

Baiyina W. Muhammad is an Associate Professor of History at NCCU, parent advocate, and mother of four sons, two of whom have autism. Her research interests are interdisciplinary and intersectional; she plans to explore the overlapping relationship between race, disabilities, and public policy and desires to work within communities of color on behalf of neurodiverse individuals and their families.



Natalie Murr graduated from NCSU with a PhD in School Psychology. She completed her Postdoctoral Fellowship at CIDD in January and is currently the Psychoeducational Clinic Director at NCSU. Her interests include educational policy and legislation, advocacy, and improving educational and learning outcomes for all students, including those with developmental and intellectual disabilities.

NC-LEND Trainees and Fellows, 2016-2017 *continued*

Jackie Nesi is a fifth year graduate student in the Clinical Psychology program at UNC. Her research examines the developmental and clinical implications of adolescent social media use. Clinically, she has experience conducting CBT, DBT, and behavioral parent training with children, adolescents, and their parents.

Kayj Okine is a psychiatric nurse practitioner student and LEND Trainee. She works full time in the inpatient child and adolescent psychiatry unit at UNC. She is also a mother to three young children: 6 year old boy-girl twins and a 9 year old daughter.

Casey Okoniewski is a LEND Special Education Trainee and Psychology Intern. Her passion in research and clinical practice is with medically and psychosocial high-risk infants/toddlers. Her training and experience is focused on early developmental assessment, intervention, as well as family consultation and advocacy.

Dianna Padilla is a first year graduate MPH student in the Department of Maternal and Child Health. She is interested in early intervention programs for children with autism and other developmental disabilities. She hopes to focus on access to resources for Latinos and other underserved populations.

Erica Pollack is a second year doctoral student in the School Psychology program at UNC and a psychology practicum student at CIDD. She is interested in executive functioning as it relates to behaviors and emotions.

Jan Lee Santos is a second year master's student in healthcare administration in the UNC Gillings School of Global Public Health. He received his MD degree from Ross University School of Medicine. His goal is to increase healthcare access and coordinate resources for patients with neurodevelopmental disorders and their families.

Jenna Sawafta is a doctor of audiology candidate at UNC. Her primary interests include working with immigrant/refugee pediatric patient populations. She previously worked in a lab focused on human auditory development and as a research assistant for the Middle East Craniofacial Care Institute conducting research surveys in the West Bank.

Melissa Simpson is a second year audiology doctoral student at UNC. Her clinical and research interests involve children with hearing loss. Specifically interested in newborn hearing screenings, children with hearing loss and other co-morbidities, cochlear implantation, and the Deaf population.

Mae Thomas received her Doctorate of Physical Therapy degree from the UNC. She joins the CIDD after working as an outpatient pediatric physical therapist. She is a LEND Fellow in conjunction with UNC's Pediatric Physical Therapy Residency program.

Alice Verstrat is a third year doctoral student in the School Psychology program at UNC. Her area of research is improving post-secondary outcomes for adolescents with autism spectrum disorders, though her interests include a broad range of supportive services and interventions for children and families.

Cherish Williams is a Special Education LEND Trainee and a third year School Psychology doctoral student with a background in clinical counseling with small children and adolescents. Research interests include examining psychosocial factors and how they affect academic achievement and long-term outcomes for African American adolescents in racially segregated school settings.

Rya A. Williams is a LEND Family Fellow. Her interests include improving access to community resources for individuals and families with intellectual and developmental disabilities. She is a mother to three children, two with autism spectrum disorder.

NC-LEND Trainees and Fellows, 2016-2017 *continued*

Aimee "Chantelle" Williamson is a master of science student in communication disorders with a bilingual emphasis at North Carolina Central University. Her interests are working with multicultural and neurogenic populations. Chantelle recently finished research and providing speech therapy services to children with communication impairments in Beijing, China and has started a non-profit communication support group for geriatric populations with neurogenic disorders.

Ridley Zook is a current student enrolled in the Master of Public Health/Registered Dietitian Program at UNC. She works as a direct support professional for individuals with I/DD.

Charlotte Zuber is a second year Master of Public Health/Registered Dietitian student in nutrition. Her interests include prenatal and infant nutrition. She hopes to serve as an educator for individuals living with I/DD so that they may lead fulfilling lives supported through oral hygiene, individualized feeding or diet therapies, and proper nutrition.

2016 CIDD Community Talk Series

The CIDD hosts a series of talks to share information about recent advances in developmental disabilities. These sessions are a great opportunity for parents, teachers, professionals, and others to learn more about specific developmental disabilities topics. All talks are free! Join us 6:30PM to 8:00PM in the CIDD Castelloe Conference Room 101.

Wednesday, March 8

McCAFFERTY / Susan W. Kermon, BFA
LEND Advocacy Faculty, Education Coach
A Coaching Approach: Education Coaching as a Support for Adult Students with IDD in an Inclusive Environment.

Wednesday, April 12

Jan Combs
Autism Resource Specialist, Autism Society of North Carolina
Staying 2 Steps Ahead: Safety Considerations for Individuals with Special Needs

Wednesday, May 10

Laura Politte, MD
Clinical Assistant Professor of Psychiatry and Pediatrics, Carolina Institute for Developmental Disabilities
Treatment Options for Anxiety in Individuals with Intellectual and Developmental Disorders

RSVP to Debbie Reinhartsen at (919) 966-4138 or Debbie.Reinhartsen@cidd.unc.edu

Reception Celebrating Publication of Research Predicting Autism in Infants

See Story Page 1

UNC
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The programs of the Carolina Institute for Developmental Disabilities provide innovative, high-quality clinical, research, and training activities supporting individuals with developmental disabilities. Now, more than ever, we need well-trained practitioners, teachers, and researchers. State funds pay only part of the costs to recruit and retain the best faculty and support the unique training and programs that are the hallmarks of the Carolina Institute for Developmental Disabilities experience. It is private funds that sustain and enhance these extraordinary opportunities for students, patients, families, and faculty. We can't do it without you!

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Newsletter Editor—Keath Low