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Inside the Institute
Newsletter for the Carolina Institute for Developmental Disabilities

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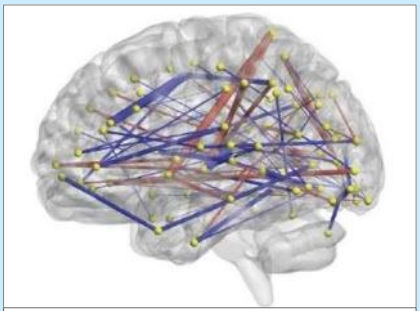
Predicting Autism: Study Links Infant Brain Connections to Diagnoses at Age 2

In two previous studies, Carolina Institute for Developmental Disabilities researchers and colleagues linked infant brain anatomy differences to autism diagnoses at age two. Now they show differences in functional connections between brain regions at 6 months to predict autism at age two.



Researchers use MRIs to make connections between brain regions to predict which high-risk infants will develop autism.

For the first time, autism researchers used MRIs of six-month olds to show how brain regions are connected and synchronized, and then predict which babies at high risk of developing autism would be diagnosed with the condition at age two. A previous UNC-lead study, published in *Nature* in February, used MRIs to determine differences in brain anatomy that predict which babies would develop autism as toddlers.

Published in *Science Translational Medicine*, this paper describes a second type of brain biomarker that researchers and potentially clinicians could use as part of a diagnostic toolkit to help identify children as early as possible, before autism symptoms even appear.

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"The *Nature* paper focused on measuring anatomy at two time points (six and 12 months), but this new paper focused on how brain regions are synchronized with each other at one time point (six months) to predict at an even younger age which babies would develop autism as toddlers." said senior author Joseph Piven, MD, the Thomas E. Castelloe Distinguished Professor of Psychiatry at the UNC School of Medicine, and Director of the Carolina Institute for Developmental Disabilities (CIDD). "The more we understand about the brain before symptoms appear, the better prepared we will be to help children and their families."

Co-senior author John R. Pruett Jr., MD, PhD, Associate Professor of Psychiatry at Washington University School of Medicine in St. Louis, said, "There are no behavioral features to help us identify autism prior to the development of symptoms, which emerge during the second year of life. But early intervention improves outcomes, so if in the future we could use MRI to identify children at ultra-high risk before they develop symptoms, we could begin treatments sooner."

During the study, sleeping infants were placed in an MRI machine and scanned for about 15 minutes to view neural activity across 230 different brain regions. The researchers analyzed how various brain regions were synchronized with each other. This synchrony reflects the coordinated activity of brain regions, which is crucial for cognition, memory, and behavior, and may be observed during sleep.

The researchers then focused on brain region connections related to the core features of autism: language skills, repetitive behaviors, and social behavior. For instance, the researchers determined which brain regions – synchronized at six months – were related to behaviors at age two. This helped Piven's co-investigators create a machine learning classifier – a computer program – to sort through the differences in synchronization among those key brain regions. Once the computer learned these different patterns, the researchers applied the machine learning classifier to a separate set of infants.

This part of the study included 59 babies enrolled at four sites, including the CIDD at UNC-Chapel Hill, Washington University in St. Louis, the Children's Hospital of Philadelphia, and the University of Washington in Seattle. Each baby had an older sibling with autism, which means each baby had about a one-in-five chance of developing autism, as opposed to one in 68, which is the approximate risk among the general population. Eleven of the 59 babies went on to develop autism.

Continued next page

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

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)

Predicting Autism: Study Links Infant Brain Connections to Diagnoses at Age 2 *continued*

The machine learning classifier was able to separate findings into two main groups: MRI data from children who developed autism and MRI data from those who did not. Using only this information, the computer program correctly predicted 81 percent of babies who would later meet the criteria for autism at two years of age.

Robert Emerson, PhD, a former UNC postdoctoral fellow and first author of the study, said, "When the classifier determined a child had autism, it was always right. But it missed two children. They developed autism but the computer program did not predict it correctly, according to the data we obtained at six months of age."

Emerson added, "No one has done this kind of study in six-month olds before, and so it needs to be replicated. We hope to conduct a larger study soon with different study participants."

This marks the fourth autism imaging study UNC researchers led or co-led this year. Along with the *Nature* paper, UNC researchers and collaborators published a study in *Biological Psychiatry (see page 4)* in March linking increased cerebrospinal fluid surrounding to autism diagnoses. In February, they published a paper in *Cerebral Cortex* about the brain network functional connections involved in social behavior deficits in children with autism.

"I think the most exciting work is yet to come, when instead of using one piece of information to make these predictions, we use all the information together," Emerson said. "I think that will be the future of using biological diagnostics for autism during infancy."

The National Institute of Mental Health and the Eunice Kennedy Shriver National Institute of Child Health and Human Development funded this study. Along with the four clinical research sites mentioned, which compose the Infant Brain Imagine Study (IBIS) Network, other research institutions had authors who were part of this study: The University of Minnesota, McGill University, New York University, the University of Alberta, and the University of Pennsylvania.

Brotherly Love: Working Toward a Brighter Future

When Austin Ludwig was 11, he didn't know what to make of his younger brother Mason. He didn't know what to tell friends who wondered why Mason couldn't talk at age 4. Austin felt embarrassed, but the older Austin got and the more he learned about autism, the more he wanted to help.

In high school, Austin would sit with students with special needs at lunch, get to know them, befriend them, get them things they needed. He volunteered during his free periods, during lunch, after school. He'd help teachers, doing whatever they needed him to do. He volunteered at state-run facilities for people with autism, at the Miracle League of the Triangle, and the Autism Society of NC.

As class president, Austin led a senior service project – a charity golf tournament to raise money for the North Carolina Autism Society. Calling it "Chipping in for Autism," Austin and a friend raised $2,045 for the Autism Society of NC. The money amount wasn't the point. The experience changed Austin.

One February day in 2016, Austin was online searching for research opportunities, when he came across the website for the Carolina Institute for Developmental Disabilities (CIDD).

"I knew Carolina was great at autism research, but I didn't know anything about it," Austin said. "When I found that site, I saw Renee Clark's number and called it." Clark manages the CIDD research registry, which contains the names of more than 6,000 North Carolina families with a child diagnosed with autism. These families have volunteered to be contacted by UNC researchers conducting various studies. They've been invaluable in helping UNC researchers study early onset of autism and develop interventions that have been shown to improve the social and emotional outcomes for kids.

The CIDD wound up hiring Austin to do community outreach to try to recruit more families to help with research. *Continued next page*

UNC undergraduate Austin Ludwig works at the CIDD to play a role in autism research he hopes will help millions of people, perhaps even his younger brother, Mason.

Brotherly Love: Working Toward a Brighter Future *continued*

Now Austin is part of SPARK, an ambitious research project in collaboration with the UNC TEACCH Autism Program, aiming to sequence the genomes of 50,000 people with autism, as well as immediate family members. It's funded by the Simons Foundation, which enlisted 21 research universities around the country to recruit families willing to participate. UNC-Chapel Hill is one of them. In fact, Carolina was one of three pilot sites Simons chose to determine if such a project was even feasible.

Austin hopes his younger brother will be able to overcome one of debilitating aspects of autism, the inability to speak.

SPARK is founded on the idea that autism is a complex disease that involves many genes. If scientists can analyze the genomes of many people with autism and family members, then they might be able to eventually link specific genetic profiles to specific kinds of behaviors and symptoms. If that's possible, then doctors such as those at the CIDD could begin to tailor interventions and treatments based on a person's genetic profile. SPARK, though, is just one part of UNC's massive research endeavor related to autism.

With the creation of the UNC Autism Research Center, Carolina's autism research base will expand even further. Under the leadership of the executive committee, whose members include Joe Piven, MD, and Mark Zylka, PhD, the UNC Autism Research Center has an opportunity to do what few others can: bring together the range of genetics, pharmacology, public health, and intervention expertise at UNC to work together on autism's greatest challenges.

"What's exciting here at UNC is that we have one of the largest programs of autism research in the world," said Piven. "And our research spans the full range from basic science to clinical research to applied research."

Earlier this year, Piven's team led research published in *Nature* in which they used MRIs to predict which high-risk babies would develop autism as toddlers. Piven's team also led research using MRIs to measure the amount of cerebrospinal fluid in the brains of babies (see story page 4). Researchers then linked increased amounts of fluid to autism diagnoses at age 2. Both papers, and the *Science Translational Medicine* paper (story page 1), show it is possible to predict autism before symptoms appear. "The more we understand about the brain before symptoms appear, the better prepared we will be to help children and their families," Piven said.

On the basic science front, last year Zylka, Director of the UNC Neuroscience Center, led groundbreaking work on potential environmental triggers of autism. His lab tested hundreds of commonly used chemicals to determine which ones produce gene expression changes in mouse neurons similar to genetic expression changes found in people with autism and neurodegenerative conditions, including Alzheimer's disease and Huntington's disease.

Zylka's lab also figured out how a particular kind of genetic mutation can increase the risk of autism. This work would have been impossible without Zylka having access to a collection of genetic information from the Simons Foundation, which funds some of Zylka's research. This compendium of genetic information – the Simons Simplex Collection – is only possible because families with a child with autism have gone beyond allowing their children to participate in research studies and allowed their children's genetic information to be used by researchers across the country.

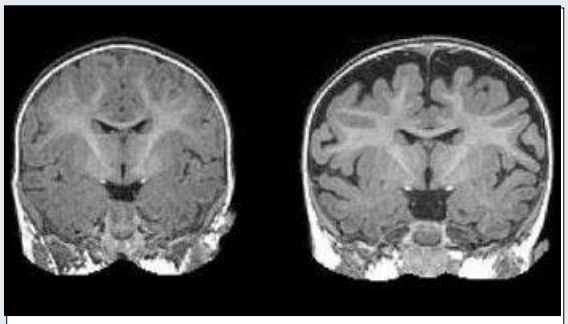
Through SPARK, Austin Ludwig's family is now part of this effort. "Once researchers have all these sequences of parents and children, it will be huge in terms of research and coming up with potential treatments," Austin said. "I'm very excited about it. My parents and I are very excited to be a part of it."

Though Austin hopes his brother improves, learns to speak, and is able to overcome some of the more debilitating aspects of autism, he is focused on the simple steps he can take to help his brother no matter what. "I want to take this Chipping in for Autism non-profit to the next level," Austin said. His second golf tournament raised nearly $6,000. "I hope pursuing a business degree helps. But I'm open. I'm not exactly sure what the future holds for me."

Except one thing: Mason. Austin wants Mason in his life.

"If Mason stays as severe as he is now at age 11, then I want to make as much money as I can so he can live with me. I'd have a professional assist with him so he can gain as much help as he needs and be a part of my life. I want my kids to be with him. He's my brother. I love him."

Infant MRIs Show Autism Linked to Increased Cerebrospinal Fluid



Right: MRI of a baby at 6 months who was diagnosed with autism at 2 years. The dark space between the brain folds and skull indicate increased amounts of cerebrospinal fluid. Left: MRI of a baby who was not diagnosed with autism at age 2.

A national research network led by Joseph Piven, MD, found that many toddlers diagnosed with autism at two years of age had a substantially greater amount of extra-axial cerebrospinal fluid (CSF) at six and 12 months of age, before diagnosis is possible. They also found that the more CSF at six months – as measured through MRIs – the more severe the autism symptoms were at two years of age.

"The CSF is easy to see on standard MRIs and points to a potential biomarker of autism before symptoms appear years later," said Piven, co-senior author of the study. "We also think this finding provides a potential therapeutic target for a subset of people with autism."

The findings, published in *Biological Psychiatry*, point to faulty CSF flow as one of the possible causes of autism for a large subset of people.

"We know that CSF is very important for brain health, and our data suggest that in this large subset of kids, the fluid is not flowing properly," said Mark Shen, PhD, CIDD postdoctoral fellow and first author of the study. "We don't expect there's a single mechanism that explains the cause of the condition for every child. But we think improper CSF flow could be one important mechanism."

Until the last decade, the scientific and medical communities viewed CSF as merely a protective layer of fluid between the brain and skull, not necessarily important for proper brain development and behavioral health. But scientists then discovered that CSF acted as a crucial filtration system for byproducts of brain metabolism.

Every day, brain cells communicate with each other. These communications cause brain cells to continuously secrete byproducts, such as inflammatory proteins that must be filtered out several times a day. The CSF handles this, and then it is replenished with fresh CSF four times a day in babies and adults.

In 2013, Shen co-led a study of CSF in infants at UC Davis, where he worked with David Amaral, PhD, co-senior author of the current *Biological Psychiatry* study. Using MRIs, they found substantially greater volumes of CSF in babies that went on to develop autism. But they cautioned the study was small – it included 55 babies, 10 of whom developed autism later – and so it needed to be replicated in a larger study of infants.

When he came to UNC, Shen teamed up with Piven and colleagues of the Infant Brain Imaging Study (IBIS), a network of autism clinical assessment sites at UNC, the University of Pennsylvania, Washington University in St. Louis, and the University of Washington.

In this most recent study of CSF, the researchers enrolled 343 infants, 221 of which were at high risk of developing autism due to having an older sibling with the condition. Forty-seven of these infants were diagnosed with autism at 24 months, and their infant brain MRIs were compared to MRIs of other infants who were not diagnosed with autism at 24 months of age.

The six-month olds who went on to develop autism had 18 percent more CSF than six-month olds who did not develop autism. The amount of CSF remained elevated at 12 and 24 months. Infants who developed the most severe autism symptoms had an even greater amount of CSF – 24 percent greater at six months. Also, the greater amounts of CSF at six months were associated with poorer gross motor skills, such as head and limb control.

"Normally, autism is diagnosed when the child is two or three years old and beginning to show behavioral symptoms; there are currently no early biological markers," said David G. Amaral, director of research at the UC Davis MIND Institute. "That there's an alteration in the distribution of cerebrospinal fluid that we can see on MRIs as early as six months, is a major finding."

The researchers found that increased CSF predicted with nearly 70 percent accuracy which babies would later be diagnosed with autism. It is not a perfect predictor of autism, but the CSF differences are observable on a standard MRI. "In the future, this sort of CSF imaging could be another tool to help pediatricians detect risks for autism as early as possible," Shen said.

Piven added, "We can't yet say for certain that improper CSF flow *causes* autism. But extra-axial CSF is an early marker, a sign that CSF is not filtering and draining as it should. This is important because improper CSF flow may have downstream effects on the developing brain; it could play a role in the emergence of autism symptoms."

The National Institutes of Health, Autism Speaks, and the Simons Foundation funded this research.

Drs. Heather Hazlett and Mark Shen Invited to Speak at Interagency Autism Coordinating Committee of NIH

The National Institutes of Health (NIH) Interagency Autism Coordinating Committee (IACC) is a Federal advisory committee that coordinates all efforts within the U.S. Department of Health and Human Services concerning autism spectrum disorder. The IACC is also responsible for developing the strategic plan that will guide federal research funding in autism over the next few years. At the quarterly meeting of the IACC in April, the IACC held a special panel of experts on the advances of autism biomarkers research. CIDD investigators, Heather Hazlett, Ph.D. (pictured below left), and Mark Shen, Ph.D. (pictured below right), were presenters invited on this panel. Dr. Hazlett presented her findings on the differences in early brain development in predicting ASD outcomes in high risk infants (Hazlett et al., *Nature* 2017). Dr. Shen presented findings from his research on extra-axial cerebrospinal fluid detected in infants, prior to their later diagnosis of autism (Shen et al., *Biological Psychiatry* 2017). In addition, Dr. Meghan Swanson's research on the early language environment of high-risk infants was also highlighted and discussed at the IACC panel as potential early behavioral markers for autism (Swanson et al., *Child Development*, 2017). All three papers include data from the NIH ACE Network Infant Brain Imaging Study (IBIS) led by Dr. Joseph Piven.

Mark Shen Receives NIH Career-Development Award

Mark Shen, Ph.D., has been awarded an NIH-funded K12 career-development award, and he has been promoted from postdoc to Assistant Professor with a joint appointment at the CIDD and Department of Psychiatry.

Dr. Shen's grant will follow-up on his discovery of a brain anomaly detected in infants who later develop autism, by conducting a series of new studies to validate its potential as an early biomarker for autism. In two independent studies, Dr. Shen and his colleagues found that infants who later developed autism had an excessive amount of cerebrospinal fluid surrounding the brain (i.e., extra-axial CSF). The amount of extra-axial CSF at 6 months of age preceded the onset of autistic symptoms, and was predictive of both their later autism diagnosis and severity of autism symptoms two years later. Dr. Shen has replicated this finding in a second, independent sample of infants who developed autism from the Infant Brain Imaging Study led by Dr. Joe Piven (Shen et al., 2013, *Brain*; Shen et al., 2017, *Biological Psychiatry*).

Dr. Shen's current grant supports a multidisciplinary research program, which he has developed with his colleagues at UNC, to: (1) determine if this early brain marker is specific to autism by comparing to infants at risk for schizophrenia (*with John Gilmore*); (2) explore the genetic variants associated with extra-axial CSF using molecular genetics (*with Patrick Sulliv*an); (3) test the pathogenic biological mechanisms using animal models (*with Ben Philpot*); and (4) identify objective, sex -specific biological markers to establish separate diagnostic thresholds for girls vs. boys during infancy (*with Joe Piven*).

Dr. Shen's research was selected for the NIH-funded career development program (K12 award), "Building Interdisciplinary Research Careers in Women's Health" (BIRCWH). NIH funds this program at UNC through NC TraCS (P.I. Kim Boggess), as well as 20 other universities around the country. The K12 award covers 3 years of salary support and research budget, with the grant and his faculty appointment starting July 1st.

NEW Resource on Autism and Health

UNC's Carolina Institute for Developmental Disabilities and the Department of Allied Health Sciences partnered with the Autism Society of NC, NC Council on Developmental Disabilities, Easter Seals UCP NC, and the Arc of NC to create a new health resource for individuals with ASD/DD and their families. Supported in part by UNC's HRSA-funded ASD State Implementation Grant (PI:s Steve Hooper & Becky Pretzel), an electronic toolkit was developed and will be maintained and housed on the ASNC website. This toolkit helps individuals and caregivers organize their health information, share important information with their health-care provider, and prepare for appointments. It also provides information about the benefits of a medical home, sample schedules to use for appointments and additional health resources. Specific thanks to Karen Luken and Maureen Morrell for their work on this!

The Health toolkit can be accessed at http://www.autismsociety-nc.org/index.php/get-help/toolkits

Higher Education, Employment, Living Success

Planning is underway for HEELS UP [Higher Education, Employment, Living Success--University Participant], a new, two-year, on-campus living and learning opportunity for college-aged students with an intellectual disability.

The HEELS UP steering committee is a collaborative effort based at the CIDD with participation from the Department of Allied Health Sciences and the School of Education. HEELS UP students will take the lead with individualized person-centered planning meetings to set goals for their college experience and for their transition to a meaningful future.

HEELS UP participants can enjoy a full college life alongside other UNC students, with supports as needed. They audit job-related college courses, live in the dorm, work at internships, enjoy UNC clubs and activities, and develop skills for an independent adult life. HEELS UP will be modeled on the University Participant (UP) Program at Western Carolina University, which was developed in 2007 to address a need for inclusive postsecondary education (IPSE) opportunities for individuals with ID. UP was a federally-funded model demonstration site and is nationally recognized as a leading IPSE site. Applications for HEELS UP are expected to become available Fall 2017 for a soft launch Fall 2018.

www.heelsup.cidd.unc.edu

Michael O'Shea Awarded NIH Grant to Research Environmental Influences on Child Health

The National Institutes of Health (NIH) recently launched a seven-year initiative called Environmental influences on Child Health Outcomes (ECHO), which will investigate how exposure to environmental factors in early development – from conception through early childhood – can influence the health of children and adolescents. The UNC project, led by Michael O'Shea, M.D., Division Chief of Neonatal-Perinatal Medicine in the Department of Pediatrics in the UNC School of Medicine, was awarded $5 million over two years by the NIH, will join several other universities to focus on enrolling more than 50,000 children from diverse racial, geographic, and socioeconomic backgrounds to become part of the ECHO consortium. These studies will analyze existing data, as well as follow children over time to address the early environmental origins of at least one of ECHO's health outcome areas, including upper and lower airway health and development, obesity, and brain and nervous system development.

Spencer Smith Receives Award from the Human Frontiers Science Program to Build a Novel Brain Imaging System

Spencer Smith, Ph.D., Assistant Professor in the Department of Cell Biology and Physiology, is part of an international team that hopes to create a new imaging system to study individual neurons in high resolution throughout the entire brain of a freely moving vertebrate. Smith's lab at UNC is building the optics. The program funds high-risk, high reward international and interdisciplinary projects.

Gabriel Dichter Awarded 2017 NARSAD Independent Investigator Grant

Gabriel Dichter, Ph.D., has been awarded a new Brain & Behavior Research Foundation Independent Investigator grant, "Inflammation as a Candidate Mediator of Anhedonia Treatment Response." This is an add-on project to an ongoing NIMH experimental therapeutics trial evaluating a novel anhedonia treatment with ultra-high field 7-tesla functional neuroimaging. The goal of this project is to evaluate relations between changes anhedonia, peripheral inflammatory markers, pro-inflammatory cytokines, and brain activation and connectivity in responses to rewards during the course of anhedonia treatment.

Meghan Swanson Speaks at the International Meeting for Autism Research

CIDD Postdoc Dr. Meghan Swanson was selected to give an oral presentation at the 2017 International Meeting for Autism Research (IMFAR). Meghan's presentation "Language Development in High-familial Risk Infants Who Go on to Have Autism Or Language Delay" outlined data on the early language skills of 525 infants at high and low familial risk for ASD that were part of the Infant Brain Imaging Study (PI Joseph Piven). IMFAR is the largest conference for autism research and was attended by more than 2,300 researchers and stakeholders.

Team UNC/CIDD raised $1,190.00 at the Angelman Syndrome Foundation Walk on May 20, 2017!

Left to right: Alisa Kyrychenko, Anna Kyrychenko, Margaret DeRamus

Long Distance Visitors Come to CIDD

After more than seven months of planning and waiting, Alisa Kyrychenko, a two year old, and her mother, Anna Kyrychenko, traveled from Dnipropetrovsk, Ukraine to Chapel Hill the first week of May. In September 2016, Alisa received a diagnosis of Angelman syndrome following genetic testing in Israel. Mrs. Kyrychenko reported that although the prevalence of Angelman syndrome is approximately 1 in 12,000-20,000 people, due to lack of genetic testing capabilities in the Ukraine, Alisa is the only one in their city of 1 million residents with this diagnosis.

Following Alisa's diagnosis, Mrs. Kyrychenko learned of the Angelman Syndrome Clinic at CIDD and requested an appointment with the interdisciplinary team. During their visit to UNC, Alisa and her mother also spent an afternoon touring the labs of Ben Philpot and Mark Zylka, who are among the top basic scientists researching Angelman syndrome.

During their visit at CIDD, the clinicians were impressed, not only by sweet Alisa, but also by Mrs. Kyrychenko, who earned a degree in criminal defense just before Alisa was born, because she has designed the Dnipro Sensory World, a state of the art sensory integration clinic scheduled to open this summer. Mrs. Kyrychenko is also working on a medical tourism business for families, like hers, who cannot get necessary evaluations and treatment in the Ukraine. Mrs. Kyrychenko has invited Ben Philpot, Margaret DeRamus, and other members of the research and clinic teams to come to Ukraine to provide professional trainings.

More information about the Dnipro Sensory World can be found at www.sensory-world.com.ua, and more information about the medical tourism business can be found at www.dnipro-clinic.com.ua.

NC– LEND Trainee Accomplishments and Plans

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.

Whitney Griffin presented at the NASP conference on her thesis research, defended her dissertation proposal, and worked with the AFIRM Team at FPG to create and publish online learning modules on evidence-based practices for learners with ASD. She will return to the CIDD next year as a part time psychology intern.

Lisa Copeland will complete her externship year at the Children's Cochlear Implant Center at UNC. She will continue her research on hearing loss resulting from congenital cytomegalovirus in this population.

Charlotte Zuber will be an intern at the WakeMed NICU in the fall, in addition to working on her master's thesis addressing breastfeeding and malnutrition in premature and special needs newborns. She also anticipates beginning UNC's IBCLC program and hopes to work as a registered dietician (RD) next year, focusing on women's health or pediatric nutrition.

Jackie Nesi will begin her predoctoral internship in clinical psychology at Brown University on the clinical child track.

Cherish Williams will soon be featured as an author of a chapter in her first book, which addresses social justice in the classroom. She will begin her clinical psychology internship at the Kennedy Krieger Institute at the John Hopkins School of Medicine.

Stephanie Fox will spend the upcoming year as the postdoctoral fellow in psychology at the CIDD. She will work as part of interdisciplinary teams to evaluate individuals across the lifespan for intellectual and developmental disabilities, as well as assist with ongoing research projects and intervention programs.

Sarah Griffin will begin her clinical fellowship year in speech language pathology at the Center for Autism and Related Disorders at the Kennedy Krieger Institute in Baltimore, Maryland.

Alice Verstrat will begin her school psychology internship year with Wake County Public School System next fall. She is grateful that her work with LEND will serve her so well as she focuses on expanding her understanding of effective assessment and intervention for elementary age students.

Rya Williams is interviewing for an Employment Specialist position, which helps adults with IDD secure and maintain employment.

Erica Pollack will begin her psychology internship at Terry Children's Center in New Castle, Delaware, where she will be working with children in the crisis stabilization, day treatment, residential treatment, and juvenile justice programs.

NC– LEND Trainee Accomplishments and Plans *continued*

Lauren Bangert will complete her pre-doctoral clinical psychology internship year with Franciscan Children's Hospital in Boston, specializing in pediatric neuropsychological assessment and behavioral health intervention with children on inpatient medical rehabilitation units.

Casey Okoniewski will be joining RTI International and the Newborn Screening, Ethics, and Disabilities research team as a Public Health Analyst. In this role she will be bridging clinical and research skills and interests to serve young children and families with genetic and developmental disabilities.

Lillian Howard has accepted a position at the University of Iowa as a genetic counselor in pediatric neurology. In addition to counseling in the pediatric neurology clinic, Lillian will be counseling in both Huntington's disease and amyotrophic lateral sclerosis (ALS) clinics.

Katharina Boyce presented her LEND project, "Bimodal Hearing in Children," at the annual Early Hearing Detection and Intervention conference in February. She will complete her fourth year audiology externship at Riley Children's Hospital in Indianapolis, where she will work with hearing aids, cochlear implants, diagnostics, and balance assessments.

Mae Thomas has spent her physical therapy residency year exploring opportunities to teach physical therapy students about pediatric development. She has facilitated gross motor labs, guided students through clinical evaluations, lectured on developmental coordination disorder, and presented a grand rounds case study on patient management. Upon completing her residency, she hopes to find a position that allows her to provide pediatric physical therapy and continue to educate future physical therapists.

Former LEND Trainee Updates

Angie Waitt, former LEND speech and language trainee, was honored with the Lara Jane Parker Award earlier this year. The award was established to reward and recognize outstanding teachers, therapists, parents, education and health professionals, and leaders who work daily to improve the lives of children with severe communication and mobility challenges to facilitate their inclusion in all aspects of daily life. Ms. Waitt is now a speech-language pathologist with the Orange County Public Schools preschool program.

Dr. Dani Warmund, 2015-2016 LEND Audiology Trainee, was an invited speaker for Pediatric Grand Rounds at the 2017 annual convention of the American Academy of Audiology in Indianapolis. Dr. Warmund graduated from UNC with a Doctor of Audiology degree in May 2017. In addition to completing a pediatric audiology traineeship with NC-LEND, she was the first student from the Division of Speech and Hearing Sciences to earn the Developmental Disabilities certificate at CIDD. Dr. Warmund is now a pediatric audiologist at Children's Hospital of Colorado.

THANK YOU

to our LEND Trainees, fellows, & faculty for helping make the 2016—2017 training year a success!

CIDD Together with the TEACCH Autism Program "Light It Up Blue!" for 2017 World Autism Awareness Day

CIDD Participates in Carolina Cares, Carolina Shares Campaign

The CIDD helped kick off the 2017 Carolina Cares, Carolina Shares campaign with a breakfast for CIDD participants. The Carolina Cares, Carolina Shares campaign is UNC-Chapel Hill's campaign in support of the State Employees' Combined Campaign (SECC). UNC-Chapel Hill is historically one of the largest statewide participants in the SECC.

Pictured above left to right: Tom Struchen flips a pancake while making breakfast, as Jeff Low and Brian Wrighten look on in surprise.

Your Support

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!

A gift to the Carolina Institute for Developmental Disabilities is an investment in the lives of thousands and in the future of our communities. Join us by giving today. To make a donation by credit card, please visit the Medical Foundation of North Carolina's gifting page and choose "Carolina Institute for Developmental Disabilities:" Click Here.

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Newsletter Editor—Keath Low