

Spring 2016

the IMAGER

NEWS FROM THE CENTER FOR COGNITIVE AND BEHAVIORAL BRAIN IMAGING



Students from Yorktown Middle School visit the Center for Cognitive and Behavioral Brain Imaging to explore how the brain functions and how these processes affect daily life. [\[read more on back\]](#)



THE OHIO STATE UNIVERSITY
COLLEGE OF ARTS AND SCIENCES

WELCOME TO THE CENTER FOR COGNITIVE AND BEHAVIORAL BRAIN IMAGING (CCBBI)

Founded in 2012 and directed by Dr. Zhong-Lin Lu, Distinguished Professor of Social and Behavioral Sciences and professor of psychology, the CCBBI is a state-of-the-art brain imaging facility that enables researchers and scholars to pursue structural and functional magnetic resonance imaging (fMRI) studies of the human brain.

The brain is the most complicated structure in the human body. The CCBBI is dedicated to understanding and decoding the mind by uniting Ohio State's diverse and abundant resources across disciplines to address common determinants and consequences of health and well-being across the lifespan. Through imaging research, researchers in the center investigate how people use their brains for various tasks, identify what exactly sparks emotions and seek to understand how the brain makes someone who they are.

By identifying variations in neural activity, the research conducted at the CCBBI aims to reveal interactions of core neurological and cognitive, emotional and social processes; we are better able to understand brain processes and mechanisms underlying the complex interactions of biological, psychological and social systems, and lead to advances in many critical fields.

The CCBBI is also committed to developing and training the next generation of brain scientists. The center offers unique opportunities for both undergraduate and graduate students to complete fMRI courses and conduct research alongside world-renowned innovators and researchers. These young scholars

will be at the forefront of future solutions to real-world problems. The cutting-edge research and educational activities at the center place us on the path to transformative discoveries that will fundamentally alter our understanding of health and well-being.

How does fMRI differ from MRI?

MRI (Magnetic Resonance Imaging) scans show a three-dimensional picture of the brain's anatomical structures; fMRI (Functional Magnetic Resonance Imaging) scans go beyond structural imaging and measure brain activity by detecting changes in blood oxygen levels in the brain. These changes allow researchers to identify specific areas of stimulation, and help to shed light on the brain functions and processes.

fMRI scans show what the brain is actually doing in real time. During an fMRI study, research participants are presented with stimuli and/or asked to perform tasks while being scanned. The fMRI records participants' neural activity, which researchers collect and analyze. These images allow researchers to identify areas of activity in response to study-specific stimuli and/or tasks.

Current areas of research at the CCBBI:

Anxiety, autism, childhood traumatic brain injury, chronic stroke, decision making, depression, developmental disability, emotion, health and wellbeing, memory, multiple sclerosis, neural responses to media, neuroscience of choice, occupational health, perceptual learning, pediatric stroke, reading and language, comprehension, social interaction and visual attention.

FOSTERING STUDENT SCHOLARSHIP: AN INTERVIEW WITH H. DEAN AND SUSAN REGIS GIBSON

Inspired by the possibilities that brain imaging holds for the future, such as the correction, treatment and eventual prevention of complex brain disorders, H. Dean and Susan Regis Gibson are invested in the work of the CCBBI. Through a generous endowment, the Gibson Research Award aids outstanding graduate and undergraduate students who conduct brain imaging research in the center.

"Giving has always been a part of my life – it was clear to us that we wanted to contribute to a cause that would have a far-reaching impact on society and its needs. To be a part of these changes is such an honor." {Susan Gibson}

With backgrounds in the social sciences and education, coupled with a strong interest in helping researchers in these areas, the Gibsons found supporting the CCBBI a rewarding way to stay involved with groundbreaking research at Ohio State.

Ohio State is one of the very few public research universities in the U.S. using a real-time, multi-disciplinary research approach with a dedicated fMRI staff housed in the Psychology Building.

"This has helped Ohio State recruit, motivate and retain some of the world's best and brightest researchers, faculty, staff and students from around the state, the U.S. and world." {Dean Gibson}

Susan and Dean thoroughly enjoy meeting with Center Director Zhong-Lin Lu, other principal investigators, and especially with Gibson Research Award recipients. These visits provide the opportunity to learn about the research, passion and aspirations of recipients, and demonstrate how the award helps student researchers achieve their goals. Through the Gibsons' scholarship, highly motivated and dedicated students can delve into their respective areas of interest and uncover data that is a catalyst for change.



“This research could have a profound impact for all people — the marginalized, all races, religions, socioeconomic levels — and bring greater peace, health and happiness to our country and the world. To be part of a movement that is uncovering so much information is indeed an exciting position in which to be!”

{Dean and Susan Gibson}

If you would like to learn more about how you can support student research at the Center for Cognitive and Behavioral Brain Imaging, please contact: Tammy Parker, Director of Development | parker.465@osu.edu | 614-688-5660.

.....

Maggie Mehling, a graduate student in psychology, received a 2014 Gibson Research Award. She shares how working in the CCBBI enhanced her research, as well as her professional goals.

Can you tell us about the research you are conducting at the CCBBI?

My research compares the impact of drama-based versus traditional social skills intervention on core social deficits associated with Autism Spectrum Disorder (ASD). Social skills interventions are a front-line treatment for ASD, particularly in school aged children and adolescents, as social communication deficits have an adverse impact on overall community inclusion and quality of life. We will be measuring social and communication deficits before and after treatment to evaluate the impact of treatment methods using fMRI, alongside parent-report and direct child behavioral measures. We will be analyzing this fMRI data with particular interest in activation in the fusiform gyrus and the amygdala, regions used for processing facial emotion which are characterized by decreased activation in children with ASD. We think that drama-based treatment will have a greater impact on processing and recognizing facial emotions compared to traditional social skills intervention.

How does fMRI help advance research goals within your field?

Understanding the brain-basis of deficits associated with autism has implications for understanding the etiology, course and treatment of autism. Furthermore, identifying structural and functional deficits can allow for early screening in high-risk populations based on neurological phenotype. This research project represents an innovative use of fMRI as an outcome measure of treatment effectiveness. We are using fMRI to determine if participating in social skills interventions impacts social deficits associated with autism, not just at a behavioral but a neurological level. This is really cutting edge, and will offer information about the differential benefits of these two types of treatments. More importantly, this will give us some insight into a potential neurological mechanism of treatment response in this population.

How have you benefitted from learning neuroimaging techniques in the CCBBI?

The CCBBI has had a profound impact on my academic and professional development. Because of the CCBBI, when I took the psychology department’s fMRI class, it wasn’t just theoretical; it was practical. We had the hands-on opportunities to learn how to actually design and conduct fMRI research. The mentorship I have received has been absolutely invaluable for learning how to design a study to answer my research questions. Because the CCBBI is a dedicated research facility with knowledgeable and accommodating staff, I was able to achieve an 80 percent scan completion rate, which is outstanding considering we were scanning children with an ASD diagnosis. Five years ago, when I began my graduate studies at Ohio State, the idea of incorporating my passion for neuroscience into my studies of autism seemed like a far-fetched dream but the CCBBI has helped me make that a reality.



Dean and Susan Gibson meeting the first recipients of the Gibson Research Award, Chelsea Voskuilen and Tabitha Kirkland

RESEARCH: STEPHEN PETRILL IDENTIFIES BIOMARKERS



Why do some children struggle to learn to read, have difficulty with language, or experience challenges solving math problems? Why do some children demonstrate resilience despite environmental challenges whereas other children show difficulties despite significant levels of support?

Stephen Petrill, professor of psychology and Arts and Sciences associate dean of research aims to help

answer these questions. Petrill studies genetic and environmental contributions to the development and impact of cognitive skills on learning. As an affiliate researcher in the CCBBI, he seeks to identify genetic and environmental biomarkers that show where learning difficulties develop, especially in reading, mathematics, language and attention.

Tell us about the research you are conducting at the CCBBI.

We are one of four Learning Disabilities Innovation Hubs funded by the NICHD. As part of this work, we are examining the neurobiological underpinnings of math and reading comorbidity within a longitudinal twin design. The goal of this study is to examine biological markers that explain some of the variability on how math and reading skills develop, as well as the pathways to learning difficulties.

How does fMRI technology help us understand learning difficulties?

We are collecting both structural and functional imaging data. The structural data will help us examine the role of differences in cortical surface area, cortical volume and interconnectivity among brain regions associated with reading and mathematics. The functional data will allow us to examine whether differences in activation in these regions are associated with the development of reading and mathematics. Because the study uses a twin design, we are also able to examine the genetic and/or environmental factors influencing these differences.

How has this work benefitted Ohio State students?

A major goal of the Learning Disabilities Innovation Hub is to develop multidisciplinary expertise in neuroscience, behavioral genetics and cognition in the next generation of scholars. We offer numerous opportunities for graduate and undergraduate mentorship.

What is the impact of your research for the future?

It is likely that many people arrive at the same reading or math achievement score through many different pathways. We believe that fMRI offers an important methodology that helps us understand at least some of them. It is our hope that better understanding the mechanisms of reading and math at the level of brain structure and function may result in more effective early identification, prevention and remediation of learning difficulties.



OUTREACH: BUILDING YOUNG MINDS

The CCBBI partnered with the ASC STEM Breakfast of Science Champions initiative to facilitate experiences for students from Yorktown Middle School. Ohio State faculty and students helped the young students build brain models, examine brain specimens in a lab and look inside the brain's internal structures with CCBBI brain imaging.

CENTER FOR COGNITIVE AND BEHAVIORAL BRAIN IMAGING

58 Psychology Building

1835 Neil Avenue

Columbus, OH 43210

ccbbi.osu.edu