

COGNITIVE RECOVERY LAB



Issue 4 • Summer 2020

2019 - 2020 HIGHLIGHTS

This year has brought many changes for CRL, as it has for many people. We have learned to work remotely, but stay connected through video conferencing. We are very grateful to everyone who has participated in our studies in the past year. You've allowed us to keep working during this time of social distancing. We miss working with our colleagues and our participants in person, but we hope to see you soon!



BLACK LIVES MATTER

We deeply feel the recent murders of George Floyd, Ahmaud Arbery, Breonna Taylor, and others. Many lab members have participated in protests and have contributed to organizations supporting justice and equality for Black people. We recognize institutional racism is a vast, complex issue in academia and medical research. We and others at Georgetown are actively discussing ways in which we can improve diversity and inclusion. At CRL, we will continue to advocate for our Black professionals, students, and individuals with communication disorders. We stand against racism, racial bias, and inequality. Our mission and research aim to improve the lives of people with cognitive and language difficulties, and this begins with a clear understanding that “Black Lives Matter.”

The risk of stroke is higher for Black people than other groups, and aphasia outcomes may not be as favorable. Additionally, not all aphasia diagnostic tests account for differences in dialect, and consequently, tests are often biased against dialectal speakers of African American English. At CRL, we work hard to combat these biases. We choose tests that minimize bias, and try to make our research inclusive, welcoming and fair to everyone regardless of their background. D. Seles Gadson, PhD, CCC-SLP is studying racial and socioeconomic disparities in aphasia, and how they affect the brain and quality of life. We hope her research will provide insight into the lives of African Americans living with aphasia, and help make positive and productive change toward health equality.

To our Black participants, please know we see you and we care. If you as a participant ever feel that we can do better, please let us know. We welcome feedback and take it seriously.

RECENT NEWS

Graduate student Vivian Dickens was awarded the 2020 Dr. Karen Gale Exceptional PhD Student Award this year! Mackenzie Fama, a former graduate student, was awarded the 2020 Harold Glassman Distinguished Dissertation Award in the Sciences. Congratulations Viv and Mackenzie! This is a testament to how hard our graduate students work to produce science that is meaningful to our understanding of aphasia and recovery!



2020 Harry Potter themed lab party!

Postdoctoral researcher Andrew DeMarco was awarded a K12 NIH grant which will support the development of a new neuroimaging method that maps dysfunction of the entire brain after stroke. Graduate student Joey Posner also received an F30 NIH grant this year to support his dissertation research on brain networks for reading after stroke. Former graduate student Kelly Michaelis was awarded a travel grant to attend the 2019 Society for the Neurobiology of Language Conference in Helsinki, Finland. Postdoctoral researcher Seles Gadson won two travel awards to attend the 2019 American Society of Neurorehabilitation meeting in Chicago, IL and to present at the 2020 International Stroke Conference in Los Angeles, CA. Congratulations to everyone!!!

Brandi Ginn, an undergraduate research assistant, graduated in May with a Bachelors of Arts in Psychology with minors in Statistics and African American Studies. Brandi will be moving to California for a Research Coordinator position at Stanford University Graduate School of Business. Congratulations Brandi!!! Thank you for all your years of service with CRL.

Recruitment is paused, but we'd love to hear from you!

We are unable to recruit participants until the COVID-19 regulations are lifted and it's safe to be in social contact again. We will resume recruitment and running studies as soon as we can. If you are interested in participating in research, please reach out to us now. We can perform the phone screening and call you back as soon as it is possible to schedule an appointment. See the last page of this newsletter for more information on our current study, BUILD.

THANK YOU TO OUR PARTICIPANTS

We enrolled 55 participants in the BUILD study this past year. Without coronavirus, that number would have been even higher! We are very grateful to all of the people who have given us their time and energy. This research would not be possible without you, so thank you! Keep reading to find out where we've published and presented our research this past year.

CELIA RESULTS

We completed the CELIA study last year. In CELIA, we tested if mild electrical stimulation (tDCS) of the cerebellum could improve aphasia. Thank you to all of our participants who helped us finish this study quickly. There was a small effect of treatment,

but overall the results did not suggest that this will be a useful treatment approach in the future. We do think other approaches to brain stimulation are more promising, including the frontal lobe stimulation we used in our previous tDCS study. Although the results of CELIA were disappointing, it's important for us to test these new treatments in order to find the most effective ways to improve aphasia.

WELCOMING NEW LAB MEMBERS

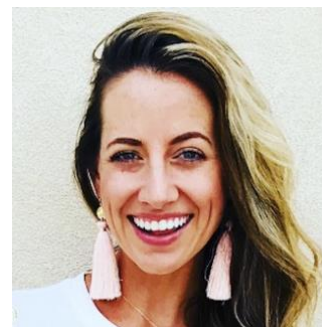
We are excited to have six new lab members this year! Tyler Ketchabaw joined the lab last summer. He is an M.D./Ph.D. student. Although Tyler is still developing his research focus, he is currently working on understanding wide-scale brain networks observed in healthy individuals and how they change after a stroke.

Richard Klein, an M.D./Ph.D. student, joined us this past Spring semester. Richard is also still developing his research focus, but is most interested in developing new brain imaging methods for studying brain changes associated with stroke recovery.

We are also excited to welcome new post-doc, Dr. Kyle Shattuck, to the lab. Kyle completed his Ph.D. in neuroscience at Georgetown University in 2016. He comes to CRL with extensive experience in neuroimaging methodologies, and is helping us to develop a stroke imaging database.

We are very fortunate to have graduate research assistants, Nikta Najib and Cassandra Dobbins. Nikta graduated from Mashhad Azad medical school in Iran in 2015. Cassandra is a current Master's student in Speech-Language Pathology at Florida State University.

Current lab manager, Candace van der Stelt, will be transitioning to a research speech-language pathologist position in CRL. We welcomed Sachi Paul as our new lab manager in July 2020! Sachi comes to us from Rice University with a Bachelor's in Cognitive



Pictured from top left: Tyler Ketchabaw, Richard Klein, Kyle Shattuck, Nikta Najib, Cassandra Dobbins, and Sachi Paul

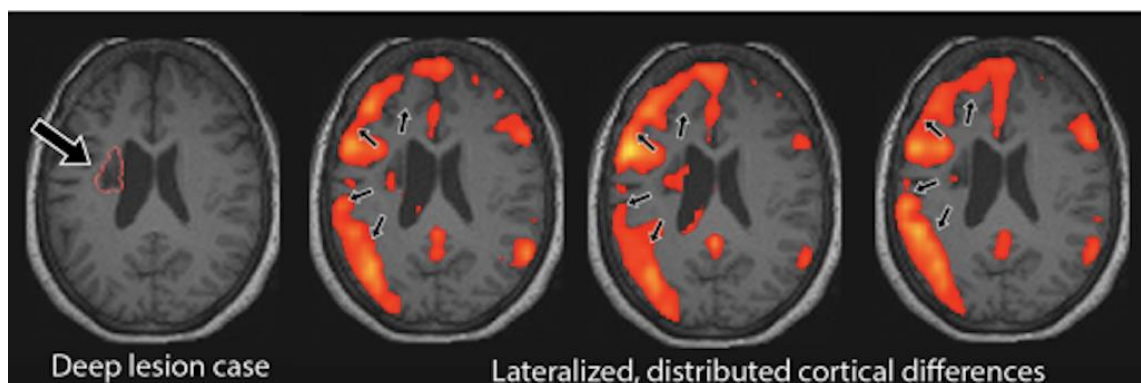
Science. Welcome to all our new lab members! We are grateful to have you as part of our team.

ALUMNI NEWS

In alumni news, prior graduate student Mackenzie Fama was offered a position as Assistant Professor in the Department of Speech-Language Pathology at George Washington University. She will begin in Fall 2020!

NEW RESEARCH PUBLICATIONS

Andrew DeMarco published a paper in *Neuroimage* on a new neuroimaging method. A major goal of our research at CRL is to understand how stroke lesions involving specific brain areas relate to particular aphasia symptoms. This type of research is usually based on areas of visible damage seen on a brain scan, but it does not consider that the stroke may also affect the functioning of other parts of the brain that aren't seen as damaged. Our brains are full of neural connections, so research on both brain structure and function is important. In this paper, we introduce a method called functional anomaly mapping (FAM) that measures these distant effects on brain function caused by the stroke. We hope this new method will help us track changes in brain function over the course of recovery, and understand why people have the particular problems they do after a stroke.



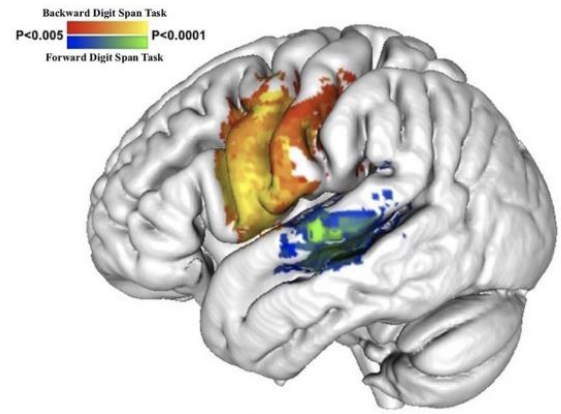
Location of visible stroke outlined in red in the left image. The hot, red color shows areas of remote dysfunction caused by the small stroke.

Andrew also co-authored a paper published in the *Journal of Speech, Language and Hearing Research*. This study investigated language tasks that can be used in MRI scans to accurately identify regions of the brain that support different language functions.

Former graduate student, Kelly Michaelis, published a paper in *Brain and Language* that examined how left hemisphere stroke survivors and people who have not had a stroke integrate auditory and visual information about speech across time. The results showed that integration of these two types of information changes as we age. The results also

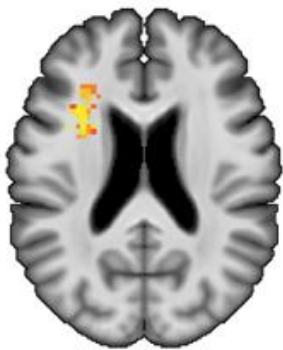
revealed a part of the left hemisphere that is essential to binding together auditory and visual signals when they occur close together in time.

Maryam Ghaleh published a paper in *Cerebral Cortex* on brain regions that support verbal working memory (VWM). VWM is a cognitive system that temporarily stores verbal information, and keeps it active for further processing. We identified damaged brain regions in the left hemisphere that resulted in lower scores in two VWM tasks (repeating a list of numbers forwards and backwards). Our findings demonstrated that forward digit recall relied on regions used to process sound (in blue and green) and backward digit span relied on brain regions used to produce speech (in orange and yellow).



This study is important because it shows there are two different ways people hold onto verbal information in their heads for a short time. This might help us hone our treatments for VWM, depending on which type of problem a person has.

Former research assistant, Ayan Mandal, published a paper in *Neurobiology of Language*.



Stroke in the yellow-orange spot caused difficulty recognizing speech errors.

This study looked at why some people with aphasia usually recognize when they've made a speech error, and others don't. The results of this study suggested that recognizing errors in sounds (e.g., saying "cak" for "cat") might rely on speech production systems, but recognizing errors in meaning (e.g., saying "dog" for "cat") might rely on speech comprehension systems. We also found that that damage to connections in the frontal lobe causes difficulty in recognizing errors. Understanding how we recognize speech errors is important because it may help us come up with treatments to help people improve their ability to recognize errors and correct them.

Peter Turkeltaub published a paper in the *Journal of Speech, Language, and Hearing Research* which proposes a new framework for thinking about how brain features may relate to language and cognitive outcomes after stroke. He argues that both neurological changes and behavior contribute to changes in the brain and impact stroke recovery.

Dr. Turkeltaub also co-authored four additional collaborative papers this year. One, published in *Neurorehabilitation and Neural Repair*, found that in people with severe arm paralysis after stroke, the "pre-motor cortex" in the hemisphere not affected by the stroke

may help them to reach for objects using their impaired arm. The second co-authored paper, published in *Aphasiology*, demonstrated that inconsistency in speech errors occurs in both aphasia and apraxia of speech. In the past, inconsistency of speech errors has been thought to be a distinguishing characteristic of apraxia. The third paper was also co-authored by Kyle Shattuck, and was published in *Neuroimage*. This study investigated the areas of the brain that support learning of tasks with sequences, such as dancing, playing an instrument, or using your smartphone. The final paper, published in the *American Journal of Speech-Language Pathology*, was first authored by alumna Mackenzie Fama. It reviews the existing evidence of inner speech in aphasia, and discusses how further research on inner speech can be useful to speech therapists.

All of this work is only possible with the help of our participants, so we thank you for your contributions! Please email us at crlab@georgetown.edu if you have any questions or if you would like a copy of any of our publications.

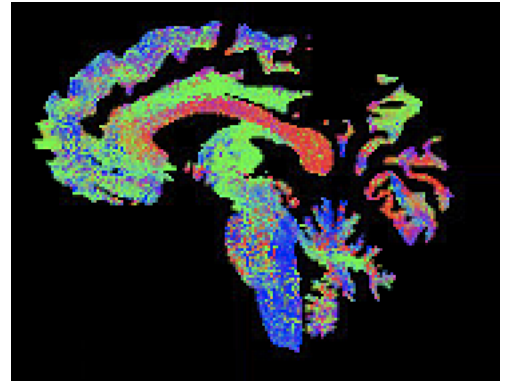
RECENT TRAININGS AND CONFERENCE PRESENTATIONS

- Vivian Dickens attended the **Mrtrix3 workshop** on diffusion weighted imaging and structural connectivity in Antwerp, Belgium in September 2019.
- Peter Turkeltaub gave a talk at the online **StrokeNet Grand Rounds** in September 2019.
- Liz Dvorak presented results of the CELIA study at the **Neuromodulation Conference** in Napa, California in October 2019.
- Seles Gadson presented on health-related quality of life and social support in African American stroke survivors at the **International Stroke Conference** in Los Angeles, California in February 2020.
- The lab had three presentations accepted to the **Clinical Aphasiology Conference** in Kohala Coast, Hawaii, including first authors Andrew DeMarco, Seles Gadson, and Candace van der Stelt. Unfortunately, this conference was cancelled in light of COVID-19.
- Josh McCall presented on brain regions involved in speech error monitoring at the online **Cognitive Neuroscience Society** meeting in May 2020.
- Kelly Martin and Josh McCall presented posters at the online **Organization for Human Brain Mapping** Conference in June 2020.

CURRENT STUDIES

Once we are able to resume social contact, we will continue enrolling participants for our NIH-funded study called **BUILD**. We are looking for people who have had a left hemisphere stroke, as well as healthy individuals to be control participants. What is the **BUILD** study about?

Have you ever wondered why you recovered so well after your stroke? Have you wondered why you didn't recover as well as you'd hoped? Have you wondered why your strengths and weaknesses are so different from other stroke survivors you meet? In **BUILD**, we're studying whether these differences are due to the nature of your stroke. We also want to understand how the strength of brain structures and connections that were not affected by your stroke impacts



An image from the BUILD study of white matter tracts in the brain that carry messages throughout our brain.

The BUILD Study

- Brain-based Understanding of Individual Language Differences after stroke
- 4-5 sessions of language, speech, and cognitive testing (at Georgetown or NRH)
- One MRI scan (at Georgetown)
- Help us understand more about aphasia and the brain
- After the study, you will receive a report with our observations about your language abilities and pictures of your brain

recovery. By understanding these “individual differences” in language and the brain, we hope that in the future we will be able to predict who will recover well and who may need extra help after their stroke. We also hope that **BUILD** will guide us toward new targets for brain stimulation treatment in the future. Participation requires a few sessions of language testing and an MRI scan.

Please call or e-mail Dr. Elizabeth Lacey (Elizabeth.Lacey@georgetown.edu or 202-877-1124), Candace van der Stelt (cv486@georgetown.edu or 202-687-5205), or Sachi Paul (sp1446@georgetown.edu or 202-687-5205) if you are interested in participating.

Need to update your contact information with us? Let us know!

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