MRRI
MOSS REHABILITATION
RESEARCH INSTITUTE
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Elkins Park, PA 19027

MRRI Letters
Moss Rehabilitation Research Institute

Annual Newsletter
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Inside this issue:

In 2019, MossRehab was ranked by U.S. News & World Report magazine among the top 10 rehabilitation providers in the nation for the 10th consecutive year.

MESSAGE FROM THE DIRECTOR

Moss Rehabilitation Research Institute (MRRI) had a remarkable and productive 2019. Amongst the settling of new Institute Scientists, renovations for additional laboratory space at Elkins Park, and expansion of the Research Registry operations, the ongoing transformative experimental work continued at an exceptional pace. Scientists at MRRI published dozens of research papers, many in top-tier peer-reviewed journals, gave numerous presentations, and received multiple national and international awards and research grants. Several on-site scholarly meetings with renowned speakers took place in 2019, including a symposium honoring MRRI founders Drs. John Whyte and Myrna Schwartz, and a joint MRRI and MossRehab robotics in rehabilitation symposium that bridged clinical and scientific applications. In collaboration with colleagues at the University of Pennsylvania, MRRI continued a prestigious NIH-funded postdoctoral training program focused on translational neurorehabilitation research. The postdoctoral program provides a first-rate training environment for emerging scientists. Our adjunct staff now includes Scientist in Residence Dr. Lyn Turkstra (McMaster University, Ontario), who joins our existing Scientist in Residence Dr. Gabriella Vigliocco (University College London) in bringing international scientific expertise to our staff.

MRRI research continues to span basic cognitive and movement science to applied treatment research relevant to cognitive and movement disability from neurologic disorders. Recently, as a result of a generous donation, the TBI and stroke focus has broadened to include Parkinson's disease with the opening of The Klein Family Parkinson's Disease Rehabilitation Center of Excellence. We are grateful to the many donors who enable us to maintain and expand our clinical and translational research. MRRI and MossRehab strive for integration of research and clinical practice by providing structured as well as organic interaction between researchers and clinicians.

The Institute remains a vibrant and supportive environment that is conducive to ongoing high quality translational research. We look forward to continuing to work with clinical and scientific collaborators, research participants, and our community in the upcoming year.

D Edwards

Dylan Edwards, PhD

RESEARCH PARTICIPANT SPOTLIGHT

Letter from an MRRI Study Volunteer

I decided to volunteer for a treatment study of anxiety and depression after traumatic brain injury (TBI) for two reasons. First, I thought it would help bring me back into the world after feeling "boxed in" after my injury. I also wanted to help others who are dealing with the same problems that I am.

When I first started the study, I didn't know how the scientists would react to me. Sometimes people treat you like a child when you've had a brain injury, but the people at MRRI made me feel very comfortable. They asked for my feedback and wanted to know how I felt. I learned about how some people with TBI stay inside at home and don't take the initiative to do things. It hinders them from growing, and they end up not enjoying life. This happened to me. I was planning to go to New York City with a friend, but when my friend cancelled, I was scared to go by myself. Talking to my study therapist, I learned how to reorganize my thinking. I took a train to New York by myself, and I never would have done that before. Spreading my wings like this was one of my goals.

They showed me, 'hey, I can really do this!' They were rooting for me.

If you have a physical ailment, people can often see it right away. A mental disability, like TBI or stroke, may cause a lot of pain, but you don't see it. However, it's just as important as suffering with physical pain. The research at MRRI is important because they are addressing issues that people can't see.

Sincerely,

Donald Thomas

Donald Thomas

OUR MISSION

MRRI is devoted to improving the lives of individuals with neurological disabilities through research.

Research at MRRI occupies a unique position within a translational "pipeline" from basic neuroscience to clinical neuroscience and neurorehabilitation.

MRRI scientists perform basic research, framed by theoretical perspectives, that maintains contact with the complexities of real world functioning and leads to advances in neurorehabilitation assessment and treatment.

We are also leaders in patient-based research that informs basic science theories of complex cognitive and motor functioning and their neural bases, and on the processes of change in these systems.

Check out the MRRI YouTube channel (youtube.com/user/MossRehabResearch) to see our collection of short videos highlighting the exciting research at MRRI.

MOVEMENT SCIENCE AND MOBILITY REHABILITATION

New Institute Scientist Joins MRRI

In 2019, MRRI welcomed Dr. Amanda Therrien to our team of exceptional Institute Scientists. Dr. Therrien's interest in neurorehabilitation can be traced back to University of Ottawa in Ontario, Canada, where she completed her undergraduate honors thesis on ataxia – the disabling movement disorder that results from damage to a brain structure called the cerebellum. "Learning about ataxia, I became fascinated with the cerebellum. I gained an intense appreciation for the complexities associated with treating the disorder," Dr. Therrien notes. Her passion for this topic led her to pursue a PhD at McMaster University in Hamilton, Ontario, Canada, and then postdoctoral training with Dr. Amy Bastian at the Kennedy Krieger Institute at Johns Hopkins School of Medicine.

Since joining MRRI this year, Dr. Therrien has been busy setting up her lab to study mechanisms of sensory processing, movement control, and learning. Her work at MRRI will focus on further understanding the cerebellum's role in movement control, and how to leverage this knowledge to develop new therapies. Dr. Therrien's research complements the movement control and motor learning research programs at MRRI, led by Drs. Dylan Edwards, Laurel Buxbaum, Aaron Wong, and Shailesh Kantak.

"Finishing my postdoctoral training and starting my own lab has me looking forward to a new adventure."
—Dr. Amanda Therrien

She was excited to join the strong, multidisciplinary team at MRRI, with expertise spanning neuropsychology, speech-language pathology, motor neuroscience, and physiatry.

When she's not in the lab, you may find Dr. Therrien running, hiking, and doing yoga. "Given my background in kinetics, it may not be surprising that I love anything that gets me moving," she jokes, "but once I have exhausted myself, you will probably find me on the couch, knitting, sipping tea, and cuddling with a small grey cat named Zooey."

COGNITIVE NEUROSCIENCE AND COGNITIVE REHABILITATION

Reducing Phantom Limb Pain with Virtual Reality

Many people who have suffered loss of an arm or leg experience the persistent feeling that the limb is still present, called "phantom limb sensation." This feeling is often accompanied by pain that may persist for years, long after the limb has been amputated. Current therapies often fall short of bringing relief to most of these individuals.

In an NIH-funded study, Dr. Laurel Buxbaum, Associate Director of MRRI, and colleagues at the University of Pennsylvania are studying whether treatment using virtual reality may reduce pain associated with phantom limb syndrome. One possible reason for phantom limb pain is a mismatch between the sensory feedback the brain expects when it programs a movement, and the sensory feedback the brain actually receives. Dr. Buxbaum and colleagues reasoned that they could reduce this mismatch by providing high-quality visual feedback of a "virtual" missing limb while people play fun and interesting games in a virtual reality (VR) environment. It is one of very few studies in the country that is exploring VR as a treatment for this condition.

Joyce Johnson (pictured) is a patient who participated in the clinical trial, consisting of 17 sessions of VR treatment. Ms. Johnson's leg was amputated below the knee when she experienced a severe blood clot at age 44. Months later, she began experiencing persistent pain in the missing part of her leg. Within a month of the first treatment session, Ms. Johnson says, her pain was gone, and she remained pain free for nearly 6 months afterward. Now, after 6 months, Ms. Johnson says that she is just beginning to feel some phantom limb pain again.

The VR treatment study was recently highlighted in Philadelphia Magazine online. In the next stage of the research program, Dr. Buxbaum and colleagues plan to expand the treatment so that it can be used in people who have had amputations above the knee, and to develop a version of the treatment that can be used at home.

Research is an important part of treatment, often leading the way to new advances and innovations in medical rehabilitation.

To support our research at MRRI, visit the donation page of our website: http://mrri.org/donate-now/

Get connected with us!

To stay up to date on our latest announcements and activities:

Visit our website MRRI.org

Follow us on Twitter at @mossresearch

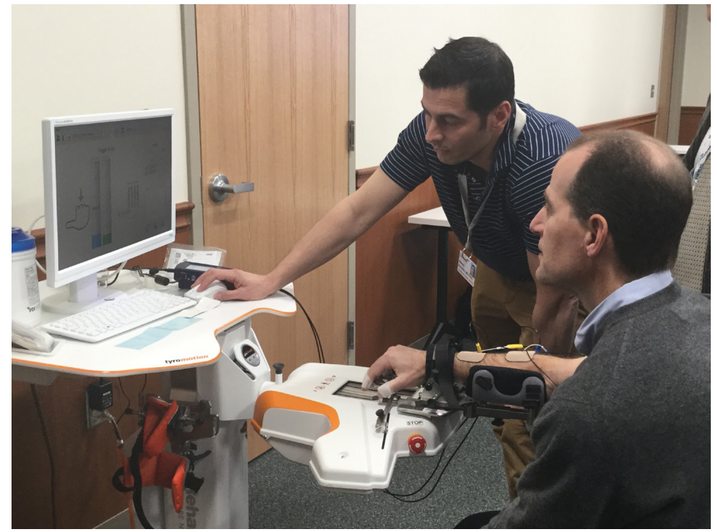
Subscribe to our YouTube channel at https://www.youtube.com/user/MossRehabResearch

Like and follow Moss Rehabilitation Research Institute - MRRI on Facebook

DONOR IMPACT

MRRI Expands Mission to Include Parkinson's Disease Research

Service to Einstein has been a family affair for the Kleins. Five generations of the Klein family have been involved with Einstein, serving as executive leaders, board members, volunteers, ambassadors, philanthropists, and avid supporters. Most recently, Peter Klein rallied the family—including Judy Klein Franken, Peggy Klein Mandell, Lawrence Klein, and Andrew Klein—to join in support of Einstein once again, this time establishing The Klein Family Parkinson's Rehabilitation Center at Einstein's MossRehab and MRRI.



Founded in 2019, the Klein Family Parkinson's Rehabilitation Center is led by Scientific Director and MRRI Institute Scientist Dr. Aaron Wong and Clinical Director Dr. Tariq Rajnarine. The Center combines the efforts taking place at MossRehab and MRRI to integrate research with innovative rehabilitative therapies that support daily activities and quality of life in people with Parkinson's disease.

The Center will serve as a leader in Parkinson's Disease rehabilitation research and therapy, advancing scientific and clinical knowledge that will help patients locally, regionally and internationally. Patients across the continuum of care will have opportunities to participate in leading edge clinically relevant studies, driving innovation to inform a continuous refinement of treatments and interventions.

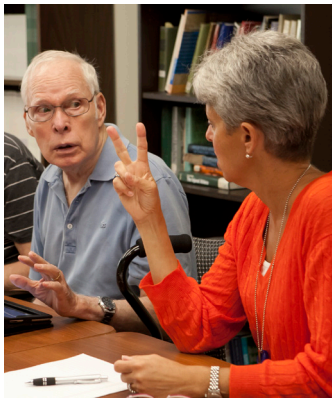
"For people living with Parkinson's disease, rehabilitation is an important component of their ongoing care. We are excited by the opportunity to bring together a team of clinicians, therapists, and researchers to advance evidence-based care at MossRehab and to facilitate rehabilitation research efforts at MRRI."
—Dr. Aaron Wong

MRRI MOSS REHABILITATION RESEARCH INSTITUTE

MossRehab EINSTEIN HEALTHCARE NETWORK

APHASIA CENTER

Constance Sheerr Kittner Conversation Cafes



The MossRehab Aphasia Center was founded over 20 years ago to meet the long-term communication and psychosocial needs of individuals who have been affected by aphasia. Conversation groups are a cornerstone activity the Center offers to people with aphasia. Many people with aphasia have said that it is difficult to stay connected with family and friends because it is hard to communicate. In our fast-paced society, people don't usually have the patience to wait while a person with aphasia finds the words he or she needs. In the Constance Sheerr Kittner Conversation Cafes, members have the opportunity to have their voices heard in a supportive environment in which adult conversation and social interaction are encouraged, and members share "recipes for success" for coping with aphasia and enjoying life.

Through an Albert Einstein Society funded research project, the Aphasia Center is currently engaged in assessing changes in language and communication effectiveness, as well as quality of life with aphasia, which are associated with conversation group participation.

For more information, watch Aphasia Center Director Dr. Sharon Antonucci discuss the project on our MossResearch YouTube Channel (https://www.youtube.com/user/MossRehabResearch).

TRAUMATIC BRAIN INJURY TREATMENT AND OUTCOMES

MRRI is Leading the Way in Mobile Rehab

More and more people use mobile technology to help with everyday tasks like keeping track of appointments and planning their morning commute. It seems like there's an app for everything from ordering coffee to finding romance, but could mobile technology be the future of healthcare?

Mobile healthcare, or mHealth, is receiving growing attention as a tool for managing chronic health conditions. mHealth refers to the delivery of healthcare services via mobile devices, such as cell phones, tablets, and wearable devices like smart watches. Recent years have seen a proliferation of mHealth products to facilitate self-management of a variety of chronic health conditions. However, despite tremendous growth in the general market, few products are available that address the needs and concerns of users with disability.

Dr. Amanda Rabinowitz is working to address this gap as part of a recently funded Rehabilitation Engineering Research Center (RERC) led by Dr. Mike Jones, of the Shepherd Center in Atlanta Georgia. This program, administered by the National Institute of Disability Independent Living and Rehabilitation Research (NIDILRR), aims to improve the effectiveness of services authorized under the Rehabilitation Act by conducting advanced engineering research and development of innovative technologies.

Dr. Jones is leading a team of researchers and technology developers from MRRI, Shepherd Center, Duke University, University of California Irvine, and private industry to improve information and communication technology access for mobile rehabilitation.

"We're calling this new area of healthcare technology 'mobile rehabilitation,' or 'mRehab,' to distinguish it from the broader world of mHealth, which has yet to adequately meet the needs and concerns of people living with TBI, stroke, and other disabling conditions."
—Dr. Amanda Rabinowitz

Under this award, Dr. Rabinowitz will lead a development project focused on mRehab tools for treating depression and anxiety in persons with TBI.

MRRI published 9 blog articles last year, and we're looking forward to sharing more news and updates in 2020!

Visit our blog at mrri.org/blog/ to keep up to date on what's new at MRRI.

2019 ACCOMPLISHMENT HIGHLIGHTS

4	41	8	66
Awards and Honors	Conference Presentations	Grants Funded	Research Papers

Dr. Sharon Antonucci was selected as one of four inaugural recipients of the Tavistock Trust For Aphasia Distinguished Scholar Award.

Dr. Laurel Buxbaum gave invited talks at the Shirley Ryan AbilityLab in Chicago, the University of Southern California, Johns Hopkins University, and Villanova University, and was invited to speak on a mentorship panel at the American Society of Neurorehabilitation meeting. Publications from the Buxbaum lab this year advance an understanding of movement planning and skilled action.

Dr. Dylan Edwards published a study in *Restorative Neurology and Neuroscience* showing that neurophysiological measures of brain connectivity can predict clinical improvement after intensive arm-hand robotic practice in community-dwelling stroke survivors. A study by Dr. Edwards and colleagues, appearing in *JAMA Neurology*, found that in-home 'tele-rehabilitation' involving digital gaming can lead to the same significant clinical gains as 'in-clinic' rehabilitation after stroke.

Dr. Erica Middleton published research in the journals *Cortex* and *Topics in Language Disorders* on how treatments using fundamental principles of learning may improve rehabilitation outcomes in aphasia, a disorder in language processing that is common after certain types of stroke.

Dr. Amanda Rabinowitz received funding from the Pennsylvania Department of Health to study the influence of positive personality traits on individuals' progress in brain injury rehabilitation.

Dr. John Whyte received the Jennett Plum Award for Scientific Achievement in the Field of Brain Injury from the International Brain Injury Association, and the Gold Key Award from the American Congress of Rehabilitation Medicine.

Dr. John Whyte chairs a new Community Group at the American Congress of Rehabilitation Medicine on the Rehabilitation Treatment Specification System (RTSS), which was developed by several MRRI staff and their collaborators.

Dr. Aaron Wong's research on the representation and planning of movements was presented at the annual meetings of the Society for the Neural Control of Movement and the Society for Neuroscience.

Dr. Umi Venkatesan published two articles on functional neuroimaging and cognition after brain injury. An article appearing in the journal *Neuropsychology* discusses regional changes in brain functioning and their relation to thinking, while a publication in *Frontiers in Neurology* reports on brain networks associated with social functioning after injury.

OUR RESEARCH REGISTRY

MRRI Database Supports Research in Neurorehabilitation

Moss Rehabilitation Research Institute (MRRI) maintains a registry with confidential information on over 2,000 research volunteers. These volunteers include adults who have a neurological condition such as such as a stroke, traumatic brain injury, or Parkinson's Disease, as well as adults who do not have a neurological condition.

The MRRI Registry helps support neurorehabilitation research in the MossRehab community.

We thank all of our research volunteers and their families. Your participation is vital to the discovery of state-of-the-art, evidence-based neurorehabilitation treatments at MossRehab.

To learn more about the MRRI Research Volunteer Registry, please visit http://mrri.org/patient-research-registry/