MRRI
MOSS REHABILITATION RESEARCH INSTITUTE

Annual Report
2020

Moss Rehabilitation Research Institute

From Theory-Driven Research to Clinical Treatments in Neurorehabilitation

MossRehab
EINSTEIN HEALTHCARE NETWORK

120 YEARS

BEST HOSPITALS
U.S.News
NATIONAL REHABILITATION
2020-21

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.

We 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 perform 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.

Table of Contents

2020 Update

The 2020 fiscal year saw a buzz of activity and solid progress at the Moss Rehabilitation Research Institute. At the core of our mission to advance translational neuroscience, MRRI contributed over 40 research publications to the scientific literature, many in high impact journals. These publications represented the diversity of topics and depth that makes MRRI unique, including both basic and clinical neuroscience and neurorehabilitation.

MRRI scientists were engaged in a range of professional activities, including invited conference presentations (40+), and committee membership and leadership for professional organizations and meetings (such as the American Society for Neurorehabilitation, the Association of Academic Physiatrists, and the American Congress of Rehabilitation Medicine). Once again our scientific staff continued to make important contributions to the peer review process, both internally, and externally for respected journals and funding agencies.

Our ongoing Institute Forums included presentations from our own staff and invited speakers on cutting-edge research findings or technical aspects of new methodological approaches in translational neuroscience. The outstanding facilities and environment at MRRI and MossRehab, together with scheduled scholarly activities, and intra- and cross-lab discussions, promotes a think-tank environment where new ideas can be shaped and reworked until many can culminate in a grant proposal. A number of new and revised proposals were successfully submitted over this past year, and several grants under review were awarded from a highly competitive field.

Innovation in our programs included the MossRehab Aphasia Center commencing online activities for members, while the Research Registry put systems in place for remote or minimal contact consenting of study participants. The Klein Family Parkinson's center developed recruitment capacity, an expanded registry database and a data repository, as part of programmatic building for recruiting patients for studies, and tracking clinical therapy and outcomes. The NIH T32 post-doctoral fellowship training program continued to flourish with a comprehensive lecture series and opportunities for engagement for individual fellows, and discussion of projects and career development. Two outstanding post-doctoral fellows recently completed the program, with exceptional opportunities emerging as they grow further professionally and scientifically. Two new fellows were recruited from a talented and competitive pool of applicants commencing in the 2020 Fall. The ongoing collaborative partnership with renowned scientists at U Penn remains strong for the post-doctoral training program, as well as with experimental work through joint grants in stroke and traumatic brain injury.

MRRI Scientists in Residence, Dr. Vigliocco and Dr. Turkstra, presented scientific findings and contributed to joint projects. Our Emeriti maintained important and diverse input, including guidance and advice on scientific projects, co-authorship on peer reviewed publications, and presentations representing the Institute. The distinguished scientific advisory board attended onsite in Elkins Park during the Fall of 2019, to be introduced to the scientists, incoming director and administration, new members, and advise on scientific composition and strategic direction of MRRI.

The bridge between contemporary clinical practice at MossRehab (again ranked among the nation's best by U.S. News and World Report) and the ground-breaking translational research at MRRI is one of the strengths of our organization. This includes a history of integrative educational activities such as the Shrier Family *Topics in Rehabilitation* lecture series, with lectures spanning the latest research findings from our scientists, to clinical research from experienced MossRehab clinicians. In a joint effort by MRRI and MossRehab, a successful International Symposium on Rehabilitation Robotics was held onsite in 2019, showcasing the local practical applications by clinicians and discussing the theoretical grounds and scientific data for robotics. The meeting attracted leading external speakers and an international audience, together with representation from the rehabilitation technology industry. Both the structured and the organic interaction between researchers and clinicians remains an important ongoing focus, and is considered a key to our organizational success.

The talent and dedication of research staff are matched by the collaborative and supportive teams within MRRI administration, MossRehab and Einstein Healthcare Network that contribute critical research support and ancillary activities such as marketing, development, and grants submission and management, and the Institutional Review Board. Our marketing efforts have expanded on a number of metrics, increasing MRRI visibility, communicating achievements and activities, and communicating the outstanding work of the Institute to the public as it occurs.

The 2020 fiscal year saw the unanticipated challenge of the COVID-19 pandemic, where the adaptability of MRRI was evident. Individual staff acted quickly to ensure safety of each other and research participants, while pivoting from in-person experimental work and recruiting, to remote work such as data analysis, manuscript and grant preparation. The entire MRRI community is to be acknowledged for the sometimes trying personal circumstances and challenges brought by the pandemic. Despite the clear health and socioeconomic impact caused by the pandemic to society, efficiencies and methods have been developed that will carry forward in a post-COVID era. The work of our clinical colleagues at MossRehab and EHN was remarkable, continuing to deliver first-rate clinical care, while remaining a top

workplace for employees. A notable achievement in collaboration with MRRI was the development of a COVID-19 clinical database to track patients and understand outcomes.

MRRI continues to be a vibrant and supportive environment that is conducive to ongoing high-quality translational research, allowing our scientists the intellectual freedom to pursue their programmatic research goals in support of the mission of MRRI. We look forward to 2021 and interaction between internal staff, clinical and scientific collaborators, and affiliates.

Dylan J. Edwards, PhD
Director, MRRI

Laurel J. Buxbaum, PsyD
Associate Director, MRRI

Staffing

Total FTEs	53
Institute Scientists	9
Post Doctoral Fellows	5
Research Support Staff	27
Research Assistants	22
Participant Recruitment	5
Administrative	6
Scientist Emeriti	4
Scientists in Residence	2

Space

MAB	sq ft
1st Floor	6,590
2nd Floor	2,370
3rd Floor	8,000
subtotal	16,960

Hospital – MossRehab – Elkins Park	
2nd Floor West	410
4th Floor - TBI	100
subtotal HEP	510

Hospital – MossRehab – Tabor Road	
4th Floor Sley	100
Subtotal	100

Total Allocated Space	17,570

Moss Rehabilitation Research Institute, MossRehab and Albert Einstein Healthcare Network

Moss Rehabilitation Research Institute

MRRI is an internationally recognized institute for rehabilitation and neuroscience research whose mission spans a translational "pipeline" from theory-driven research to clinical treatments in neurorehabilitation. The 10 scientists at MRRI and their laboratory staff of postdoctoral fellows, research assistants, and visiting students perform basic research, framed by theoretical perspectives that maintain contact with the complexities of real-world function and lead to advances in neurorehabilitation assessment and treatment. We also perform patient-based research that informs basic science theories of complex cognitive, perceptual and motor functioning and their neural bases, and on the processes of change in these systems. MRRI occupies ~17,000 square feet in a renovated office building on the campus of MossRehab Hospital in Elkins Park, PA. Testing and office space is also available within the hospital (MossRehab, Elkins Park, and MossRehab at Einstein Medical Center Philadelphia).

MRRI Research Registry: MRRI has a unique and valuable infrastructure for patient-based research. The MRRI Patient Research Registry, directed by Dr. Sharon Antonucci, currently includes approximately 1,201 active research volunteers with imaging-verified stroke and 607 individuals with traumatic brain injury from which we draw study participants. Research-quality MRI or CT scans and hand-drawn lesion reconstructions are available for 215 individuals with stroke, and resting-state fMRI and diffusion data are available for 104 of these individuals. The MRRI Registry also includes approximately 201 active neurotypical volunteers, with similar age range and demographics as the stroke population, and it expanded to include individuals with Parkinson's Disease/Parkinsonism in fiscal 2020. Administrative staff assist in recruiting participants into the Registry from MossRehab's inpatient and outpatient facilities. Retention is aided by annual mailings with birthday cards.

Academic and Educational Forums: MRRI hosts numerous regular meetings of relevance to translational neurorehabilitation research, including 1) Shrier Family Topics in Rehabilitation Science Lecture Series, a monthly presentation by an MRRI or outside researcher, 2) Institute Forum: Grants, a monthly workshop for MRRI senior staff and postdoctoral fellows focused on grant-writing skills, 3) Visiting Scholars, a series of talks by influential external scientists, 4) Innovation Café, a lunch-and-learn series bringing together MRRI staff and MossRehab clinicians, and 5) the T32 Lecture Series, a monthly colloquium covering a broad variety of relevant topics.

Postdoctoral Training in Translational Neurorehabilitation Research: Since 2013, MRRI has been funded by a T32 grant from the NIH for postdoctoral training in translational neurorehabilitation research, to supplement postdoctoral training slots supported by research grants and institutional funds. The training grant, under the direction of Dr. John Whyte, involves mentors from MRRI and from behavioral neurology and neuroimaging at the University of Pennsylvania. The program provides support for 4 trainees for 3 years and recruits basic scientists to learn rigorous methods of clinical research, and clinical researchers to enhance the theoretical and methodologic sophistication of their clinical research. Regardless of funding source, postdoctoral fellows affiliated with MRRI receive a rich didactic curriculum, along with structured career goal setting and mentored research. Trainees benefit from the clinical and technical resources available across the 2 institutions and from the existing programs of collaborative multidisciplinary research in which their mentors are engaged.

MRRI Laboratories

Brain Trauma and Behavior Laboratory: (Umesh "Umi" Venkatesan, PhD, director) The Brain Trauma and Behavior Laboratory studies the cognitive and functional health of individuals with a remote history of moderate or severe traumatic brain injury (chronic TBI) as well as older individuals with new-onset TBI. One of its major goals is to characterize the potential for and optimize the detection of pathological brain aging in TBI. To this end, the lab uses cognitive neuroscientific approaches to identify or develop behavioral assessments and potential treatment interventions that are informed by neurobiological models of TBI and aging.

>   Programs of Research:
>   - Cognitive, functional, and neurobiological characterization of chronic TBI
>   - Neuropsychological methods for evaluating neurodegenerative disease risk or prodrome in chronic TBI
>   - Assessment of episodic memory in chronic TBI
>   - Pre-, peri-, and post-morbid health considerations for outcome in older adults with more recent TBI
>   - Health behavior and health literacy contributors to long-term health integrity or decline

Brain Injury Neuropsychology Laboratory: (Amanda Rabinowitz, PhD, director) The Brain Injury Neuropsychology Laboratory studies the neurobiological and psychosocial factors that influence recovery from traumatic brain injury (TBI) across the spectrum of injury severity. This lab houses the National Institute of Disability, Independent Living, and

Rehabilitation Research (NIDILRR)-funded MossRehab Traumatic Brain Injury Model Systems project, which supports a 16-center network to study outcomes and treatment of TBI collaboratively as well as a local program of research.

Programs of Research:
- The use of mobile technology for brain injury rehabilitation assessment and intervention
- Neuropathological substrates of chronic and neurodegenerative effects of brain injury
- Treatment of depression in persons with moderate-severe TBI
- Resilience after brain injury
- Chronic effects of moderate-severe TBI on functional outcomes and brain health
- Participation in contact sports as a risk factor for cognitive and emotional impairment in later life

Cognition and Action Laboratory: (Laurel J. Buxbaum, PsyD, director) The Cognition and Action Laboratory investigates the interface between cognitive representations of objects, tasks, and action planning processes using behavioral testing with healthy and brain-damaged participants, support vector lesion symptom mapping (SVR-LSM, a machine learning approach), Functional Connectivity, eye tracking, Virtual Reality, and fMRI. This work enables us to understand how conceptual representations may be "grounded", and the aspects of object representations that may be disrupted after stroke to frontal, temporal, or parietal brain regions. In addition, we study the role of spatial and body representations in the control of attention and action.

Programs of Research:
- The role of body representations and visual information in action production
- Task-related activation of tool-related actions
- Virtual reality treatment of phantom limb pain
- Representations of the body in phantom limb syndrome
- Functional and resting state connectivity of the skilled action network
- Action and non-action sequencing in the left hemisphere
- Apraxia rehabilitation using network-strengthening treatment
- Multimodal communication and co-speech gesture

Cognitive-Motor Learning Laboratory: (Aaron L. Wong, PhD, director) The goal of the Cognitive-Motor Learning Laboratory is to understand how interactions between the cognitive and motor systems allow us to acquire and maintain skilled actions and become movement experts. This includes identifying the processes that contribute both to the planning and the

online control of actions. Using motion tracking of the eye and arm in healthy individuals and in patients with neurological disorders, the aim is to not only gain a better understanding of the motor system from a neurological and computational standpoint, but to also identify new approaches to enhance rehabilitation efforts.

Programs of Research:
- The use of trajectory and body configuration representations in planning and on-line control during movement imitation
- The contribution of verbal, visual, and proprioceptive instructions in planning praxis actions
- Interactions between motivation, effort, and learning in neurotypical individuals and in patients with Parkinson's disease

Language and Learning Laboratory: (Erica L. Middleton, PhD, director) The Language and Learning lab is dedicated to understanding the processes involved in language production as well as how such processes are disrupted in acquired language disorder (aphasia). A major focus is to develop efficacious treatments of aphasia grounded in a theoretical understanding of fundamental mechanisms of language use, learning, and language change.

Programs of Research:
- Representation of homophones (e.g., dear/deer) in the mental lexicon
- Monitoring of speech
- Retrieval practice (i.e., testing) effects in rehabilitation of naming impairments in aphasia
- Distributed practice effects and treatment of naming impairments in aphasia
- Retrieval practice and distributed practice effects in treatment of word comprehension deficits in aphasia
- Semantic context effects in aphasia
- Conceptual combination in aphasia

Neuroplasticity and Motor Behavior Laboratory: (Shailesh Kantak, PhD, director) The main goal of the Neuroplasticity and Motor Behavior Laboratory is to optimize motor recovery and learning in patients with neurological disorders (e.g. stroke, cerebral palsy) through a better understanding of neural plasticity that underlies motor performance, recovery and rehabilitation strategies. The research in this laboratory encompasses a spectrum from basic science experiments to understand motor behavior in healthy controls and patients at one end to exploring the effects of innovative treatment strategies to augment motor recovery at the other end. The research employs motion analyses to characterize and quantify movement strategies as they evolve with motor practice and time in patients with neurological disorders. Further, another goal is to probe noninvasive brain stimulation techniques applied through

careful neuronavigation to probe specific brain regions to understand their role in motor learning and recovery. Finally, the acquired information is used to plan innovative strategies to promote learning and recovery in patients with neurological injuries.

> Programs of Research:
> - Brain-behavior correlates of motor skill learning and transfer following stroke
> - Physiological strategies to improve memory processes for motor skills
> - Practice structure and motor skill learning: role of non-invasive brain stimulation
> - Bimanual coordination after stroke: effect of task constraints and practice
> - Pain modulation with noninvasive brain stimulation

Sensorimotor Learning Laboratory: (Amanda Therrien, PhD, director) The Sensorimotor Learning Laboratory will investigate how complex upper extremity movements are learned and controlled and how damage to specific brain areas may alter these processes. Our lab will use a combination of 3-D motion capture, virtual reality and robotic techniques to assess human behavior in both healthy individuals and neurologic populations with damage to the cerebral cortex or cerebellum. This work will enable us to understand (1) the neural mechanisms through which different sources of sensory information are integrated, (2) how this information is used to learn and control complex, high-dimensional upper extremity movement, and (3) whether these mechanisms can be leveraged in the development of new rehabilitation therapies for individuals with motor impairment.

> Programs of Research:
> - Motor learning in low dimensional vs high-dimensional movement conditions
> - Cerebellar contributions to somatosensory perception during movement
> - Interactions between adaptive and reinforcement motor learning
> - Validation of clinical outcome measures for cerebellar ataxia

Human Motor Recovery Laboratory: (Dylan J. Edwards, PhD, director) The Stroke Motor Recovery Laboratory has several lines of research addressing recovery of voluntary movement control in humans following stroke. Quantitative clinical neurophysiology, neuroimaging and kinematic data are studied to understand the basis of motor symptoms, and inform emerging physical rehabilitation strategies. Clinical treatment trials using intensive motor training are supplemented by experimental non-invasive neuromodulation.

Programs of research:
- Systems-level neurobiology of dysfunction and recovery
- Intensive robot-assisted training, combinatorial interventions
- Non-invasive stimulation technique development
- Outcome prediction

MRRI Core Facilities

MRRI Virtual Reality Core Facility: This shared facility provides the infrastructure to support experiments conducted using virtual reality. Available equipment includes a head-mounted virtual-reality system (Vive, HTC) with two hand-held wands and an optical tracking system, a magnetic tracking system (TrakSTAR, Ascension Technologies), an optical hand-tracking system (Leap Motion), and an integrated eye-tracking system (Pupil Labs), as well as a dedicated PC running custom-written software in Unity. Virtual Reality Core Facility software is supported by a dedicated programmer who is experienced in the design and implementation of experiments in virtual reality settings.

MRRI Eyetracking Lab: MRRI houses a dedicated eye-tracking suite, with state of the art Eyelink® tracking system and computing equipment, used by several laboratories for clinical and translational research projects.

Clinical

MossRehab: MossRehab and Moss Rehabilitation Research Institute (MRRI) are part of Albert Einstein Healthcare Network. Housed in the same campus in Elkins Park, MossRehab and MRRI have fostered a close collaboration to create a true "research culture informed by clinical needs" within the continuum of patient care for neurological rehabilitation, and an impressive array of resources to support clinical research. MossRehab is Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and Commission on Accreditation of Rehabilitation Facilities (CARF) accredited, and has been cited for more than 20 years as one of the nation's best rehabilitation hospitals in the US News and World Report survey, and was just named, for the 10th year, one of the "Best Workplaces" among large employers in the Philadelphia area. The inpatient programs at MossRehab admit close to 1000 patients with stroke and TBI and 250 persons with spinal cord injury and nearly 300 with limb amputation annually across five sites; the campus at Tabor Road in Philadelphia, the Elkins Park Hospital site in suburban Philadelphia, and satellites at Jefferson Frankford and Bucks Hospitals in metropolitan Philadelphia and Doylestown hospital. The outpatient stroke programs provide services to approximately 2,500 patients annually. Services are provided at 8 additional

locations in the Philadelphia area, three in its suburbs, and one in Voorhees, New Jersey. MossRehab is recognized for excellence in care with outcomes that consistently exceed the national mean when measured by the functional index measure and percent of patients returning to home with higher Functional Independence Measure (FIM) score change and % of patients returning home. In addition, MossRehab has high patient satisfaction. MossRehab is an early adopter of technology and is a leader in rehabilitation technology innovation with a number of first in the nation regarding the use of robotics in rehabilitation. MossRehab was first in introducing the REO®, Armeo® Power and the Tyromotion® upper limb robots to clinical use and was first in the nation with Geo-Evolution® and Lyra®. MossRehab has designed and performed clinical trials with ReWalk®[12], Lokomat®[13] Geo, ReStore, Lokomat and Armeo, and recently completed a trial in robotics in acute stroke rehabilitation. MossRehab has an established, world-class rehabilitation robotics program.

MossRehab Aphasia Center: (Sharon Antonucci, PhD, CCC-SLP, director) Founded in 1996, the MossRehab Aphasia Center is a joint endeavor by MossRehab and MRRI to meet the long-term communication and psychosocial needs of individuals who have been affected by aphasia. It is a warm and welcoming place where people can find information and peer support, as well as participate in research and treatment.

The Aphasia Center provides focused and meaningful intervention at strategic points in the recovery process. This can occur through short-term outpatient therapy in the Advance Clinical Therapy (ACT) program, through the various groups and classes in the Aphasia Activity Center, or through participation in research at the Moss Rehabilitation Research Institute (MRRI).

MossRehab Aphasia Center was founded on several basic principles:
- Recovery from aphasia involves a life-long process of re-education, adaptation and support
- Under the right conditions, people with aphasia can continue to recover even years after the onset of aphasia
- Participating in social, recreational and educational activities reduces isolation and helps people with aphasia and their families make psychosocial adjustments
- Individuals with aphasia and their families can play an important role in increasing public awareness of aphasia

Dr. Antonucci directs the Aphasia Center research program. Her work focuses on theoretically-motivated aphasia rehabilitation informed both by cognitive neuropsychological models of language and by the Life Participation Approach to Aphasia.

Right Hemisphere Stroke Center: (Laurel J. Buxbaum, PsyD, director) The Right Hemisphere Stroke Center (RHSC) is a specialized treatment center with outpatient programs developed by Moss Rehabilitation Research Institute researchers and expert rehabilitation clinicians in right hemisphere stroke. It is the only center in the nation devoted to managing the unique needs of patients with right hemisphere stroke syndrome.

Patients receive targeted treatment for their difficulties, guided by the latest research findings, including:
- A specialized, brief evaluation designed to triage patients into treatment protocols tailored specifically to their needs
- An interdisciplinary assessment and treatment team that meets frequently to review recommendations and treatment results
- A Virtual Reality Laboratory to assess for the presence of visual and spatial problems that affect everyday life
- Targeted treatments for spatial neglect (patient unawareness of objects or people to their left) using prism glasses, as recommended by the latest research
- Counseling and education to help stroke survivors and families obtain support and better understand right hemisphere stroke syndrome
- Medication treatments, when appropriate, to help address lowered energy or motivation
- Follow-up evaluations designed to assess possible needs for adjustments in the treatment recommendations
- Data analysis tools developed by researchers to facilitate tracking of improvements during the course of treatment
- Family training to facilitate carry over of skills at home

Klein Family Parkinson's Rehabilitation Center: (Aaron L. Wong, PhD, director-scientific; Tariq Rajnarine, MD, director-clinical) Founded in 2018 with the generous support of the Klein Family, the Klein Family Parkinson's Rehabilitation Center is dedicated to improving the lives of patients with Parkinson's disease by integrating clinical, rehabilitation, and research efforts throughout MossRehab and MRRI.

The Center has three primary aims:
- Increasing opportunities for patients to engage in research by expanding the current MRRI Research Registry to include patients with Parkinson's disease
- Promoting evidence-based care by establishing a clinical database to track treatment efficacy and patient outcomes for Parkinson's patients longitudinally throughout the Einstein Healthcare Network, with the goal of finding ways to improve treatment efforts and anticipate future needs across cognitive and motor domains

- Increase interaction amongst clinicians, therapists and researchers to facilitate collaborative efforts across departments and to collectively identify new approaches for improving patient care

MRRI Emeriti

Ruth Fink, MA, CCC-SLP: Ruth Fink a cofounder and former Clinical Director of the MossRehab Aphasia Center and MRRI clinician researcher, remains involved with the Aphasia Center as an informal consultant. She supports ongoing Development efforts, providing input to annual campaigns, maintaining contact with supporters and lending her name to solicitation letters and follow-ups as needed. Outside of MRRI, Ruth has increased her involvement with Aphasia Access, an organization of which MossRehab Aphasia Center is a founding member, and whose mission is to transform services and environments so people with aphasia can participate fully in life. In 2018 and 2019, Ruth served as Board President and continues to serve on the board.

Tessa Hart, PhD: Dr. Hart directed the Traumatic Brain Injury Clinical Research Laboratory at MRRI until her transition to Emerita status in January, 2019. Since then, Dr. Hart has continued to work with TBI Model System investigators, both at MRRI and nationwide, on collaborative manuscripts and projects; this includes a clinical trial of Behavioral Activation for depression/ anxiety in chronic moderate to severe TBI. Dr. Hart was Co-Investigator on Dr. Amanda Rabinowitz's NIH-funded project entitled "Temporal Patterns of Participation Restrictions and Depression Symptomatology after Traumatic Brain Injury," primary findings from which were published recently. She remains site Principal Investigator for the NIDILRR-funded multi-center trial, "Multicenter Evaluation of Memory Remediation after Traumatic Brain Injury with Donepezil (MEMRI-TBI-D)," currently in the dissemination phase. Dr. Hart continues to serve on federal grant review panels and journal Editorial Boards, and was invited to participate in the upcoming NINDS/ NICHD Common Data Elements Working Group focused on neurorehabilitation interventions.

Myrna Schwartz, PhD: Dr. Schwartz, the former Associate Director of MRRI, provides consultation to several MRRI scientists. In Dr. Erica Middleton's lab, Dr. Schwartz is serving as a Co-Investigator on the NIH award to Middleton titled "Retrieval Practice Principles: A Theory of Learning for Aphasia Rehabilitation." In that capacity, Dr. Schwartz provides feedback on methodological and study design details, and is currently working with Dr. Middleton to prepare a manuscript reporting a project on error monitoring in naming in aphasia. In 2019, she also collaborated with Dr. Laurel Buxbaum and Visiting Scientist Dr. Gabriella Vigliocco on resubmission of an NIH grant proposal, "Multimodal comprehension and production in aphasia".

John Whyte, MD, PhD: Dr. Whyte stepped down as Director of MRRI in 2018. He has remained involved in clinical research on recovery from moderate/severe brain injury, with a particular emphasis on disorders of consciousness (DOC). He is a co-investigator on MossRehab's Traumatic Brain Injury Model System (TBIMS), and several other TBI-related projects. Dr. Whyte also led the development of the Rehabilitation Treatment Specification System (RTSS), which provides a standard framework for defining rehabilitation treatments of all kinds with respect to their known or hypothesized active ingredients. The *Manual for Rehabilitation Treatment Specification* now serves as the basis of RTSS implementation efforts, which are centered at the American Congress of Rehabilitation Medicine's (ACRM) Rehabilitation Treatment Specification Networking Group, which Dr. Whyte chairs. In addition to his research, Dr. Whyte serves as a career mentor to junior scientists at MRRI and beyond. He developed, and now co-leads the Rehabilitation Medicine Scientist Training Program (RMSTP), which grooms promising physician scientists from around the country for careers in rehabilitation research. He also serves as Principal Investigator of a T32 postdoctoral research training program in Translational Neurorehabilitation Research, in collaboration with mentors at both MRRI and the University of Pennsylvania.

Scientists in Residence

MRRI adjunct staff include two Scientists in Residence who each participate in several extended visits per year at MRRI. During this time, they give lectures, attend lab meetings, and provide consultative input to MRRI Senior Staff.

Gabriella Vigliocco, PhD: Dr. Vigliocco is a Professor at the University College London, where she directs the Language and Cognition Laboratory. She collaborates regularly with researchers in the language and action domains.

Lyn Turkstra, PhD: Dr. Turkstra is a Professor in the School of Rehabilitation Science and Assistant Dean of the Speech-Language Pathology Program at McMaster University in Ontario Canada. She collaborates with both MRRI researchers and MossRehab clinicians on multiple research and clinical translation projects to improve the care of patients with acquired brain injury.

Publications Fiscal 2020

Bikson, M., Esmaeilpour, Z., Adair, D., Kronberg, G., Tyler, W.J., Antal, A., Datta, A., Sabel, B.A., Nitsche, M.A., Loo, C., & **Edwards, D.,** et al. (2019) Transcranial electrical stimulation nomenclature. *Brain Stimulation,* 12(6):1349-1366 doi: 10.1016/j.brs.2019.07.010.

Buxbaum, L.J., Kalenine, S. (2020) Limb apraxia: A disorder at the cognitive-motor interface. In Gazzaniga, M., Mangun, R., Poeppel, D. *The Cognitive Neurosciences (6th Ed).* MIT Press: May.

Buxbaum, L.J., Varghese, R., Stoll, H., Winstein, C.J. (2020) Predictors of arm nonuse in chronic stroke: A preliminary investigation. *Neurorehabilitation and Neural Repair,* 34(6):512-522 doi: 10.1177/1545968320913554. Epub 2020 Jun 1 PMID: 32476616.

Garcea, F., **Buxbaum, L.J.** (2019) Gesturing tool use and tool transport actions modulates inferior parietal functional connectivity with the dorsal and ventral object processing pathways. *Human Brain Mapping*, Jul;40(10):2867-288.

Gardner, R.C., Cheng, J., Ferguson, A.R., Boylan, R., Boscardin, W.J., Zafonte, R.D., Manley, G.T., Bagiella, E., Ansel, B.M., Novack, T.A., Friedewald, W.T., Hesdorffer, D.C., Timmons, S., Jallo, J., Eisenberg, H., **Hart, T.**, Ricker, J.H., Diaz-Arrastia, R., Merchant, R., Temkin, N.R., Melton, S., Dikmen, S., & Okonkwo, D.O. (2019) Divergent 6-month functional recovery trajectories and predictors after traumatic brain injury: Novel insights from the COBRIT study. *Journal of Neurotrauma,* 36:2521-2532.

Giacino JT, **Whyte J,** Nakase-Richardson R, Katz DI, Aciniegas DB, Blum S, Day K, Greenwald BD, Hammond FM, Pape TB, Rosenbaum A, Seel RT, Weintraub A, Yablon S, Zafonte RD, Zasler N. Minimum competency recommendations for programs that provide rehabilitation services for persons with disorders of consciousness: A position statement of the American Congress of Rehabilitation Medicine and the National Institute on Disability, Independent Living and Rehabilitation Research Traumatic Brain Injury Model Systems. Archives of Physical Medicine and Rehabilitation, 101(6(:1072-1089 doi:10.16/j.apmr.2020.01.013 PMID: 32087109.

Hammond, F.M., Corrigan, J.D., Ketchum, J.M., Malec, J.F., Dams-O'Connor, K., **Hart, T.**, Novack, T.A., Bogner, J., Dahdah, M.N., & Whiteneck, G.G. (2019) Prevalence of medical and psychiatric comorbidities following traumatic brain injury. *Journal of Head Trauma Rehabilitation*, 34(4):E1-E10.

Hammond, F., Giacino, J., Nakase-Richardson, R., Sherer, M., Zafonte, R., **Whyte, J.,** Arciniegas, D., & Tang, X. (2019) Disorders of consciousness due to traumatic brain injury: Functional status ten years post-injury. *Journal of Neurotrauma*, 36(7):1136-1146.

Hart, T., Rabinowitz, A., Vaccaro, M., Chervoneva, I., & Wilson, J. (2019) Behavioral activation augmented with mobile technology for depression/ anxiety in chronic moderate-severe traumatic brain injury: Protocol for a randomized controlled trial. *Archives of Rehabilitation Research and Clinical Translation*, 1:100027.

Hart, T., **Rabinowitz, A.R, Whyte, J.,** & Kim, J. (2019) Pre-injury assessment of everyday executive function in moderate to severe traumatic brain injury. *Neuropsychological Rehabilitation*, 29:1085-1094.

Hart, T., Ketchum, J.M., O'Neil-Pirozzi, T.M., Novack, T.A., & Johnson-Greene, D. (2019) Neurocognitive status and return to work after moderate to severe traumatic brain injury. *Rehabilitation Psychology*, 64:435-444.

Hart, T. (2019) Self-Management Training: A tool for the long-term management of TBI? *Brain Injury Professional*, 16(3):18-20.

Hart, T., Vaccaro, M.J., Fann, J.R., Maiuro, R.D., Neuberger, S., & Sinfield, S. (2020) Psychoeducational

interventions for problematic anger in chronic, moderate to severe traumatic brain injury: A study of treatment enactment. *Journal of the International Neuropsychological Society,* 26:119-129.

Jayaraman, A., Brien, M.K., Madhavan, S., Oikawa, K., Endo, Y., **Kantak, S.,** Stinear, J., Hornby, T.G., & Rymer, W.Z. (2019) Immediate adaptations to post-stroke walking performance using a wearable robotic exoskeleton. *Archives of Physical Medicine and Rehabilitation,* Sep 10. pii: S0003- 9993(19)31058-5. doi: 10.1016/j.apmr.2019.08.473.

Juengst, S.B., **Hart, T.,** Sander, A.M., Nalder, E.J., & Pappadis, M.R. (2019) Mobile health interventions for traumatic brain injuries. *Current Physical Medicine and Rehabilitation Reports*, 7(4):341-356.

Kantak, S., & Luchmee, D. (2020) Contralesional motor cortex is casually engaged during more dexterous actions of the paretic hand after stroke-A preliminary report. *Neuroscience Letters*, Jan 10; 720: 134751 doi: 0.1016/j.neulet.2020.134751. [Epub ahead of print]

Lancaster, K., **Venkatesan, U.M.,** Lengenfelder, J., & Genova, H.M. (2019) Default mode network connectivity predicts emotion recognition and social integration after traumatic brain injury. *Frontiers in Neurology,* doi: 10.3389/fneur.2019.00825.

Malec, J.F., Ketchum, J.M., Hammond, F.M., Corrigan, J.D., Dams-O'Connor, K., **Hart, T.,** Novack, T., Whiteneck, G.G., Dahdah, M., & Bogner. J. (2019) Longitudinal effects of medical comorbidities on functional outcome and life satisfaction after traumatic brain injury: An individual growth curve analysis of NIDILIRR Traumatic Brain Injury Model System data. *Journal of Head Trauma Rehabilitation*, 34:E24-E25.

Malone, C., Erler, K., Giacino, J.T., Hammond, F.M., Juengst, S.B., Locascio, J.J., Nakase-Richardson, R, Verduzco-Gutierrez, M., **Whyte, J.,** Zasler, N., & Bodien, Y.B. (2019) Participation following inpatient rehabilitation for traumatic disorders of consciousness: A TBI Model Systems Study. *Frontiers in Neurology,* 18 December 2019 https://doi.org/10.3389/fneur.2019.01314.

Merritt, V.C., Greenberg, L.S., Guty, E., Bradson, M.L., **Rabinowitz, A.R.,** & Arnett, P.A. (2019) Beyond measures of central tendency: Novel methods to examine sex differences in neuropsychological performance following sports-related concussion in collegiate athletes. *Journal of the International Neuropsychological Society*, *25*(10):1094-1100.

Middleton, E.L., Rawson, K.A., & Verkuilen, J. (2019) Retrieval practice and spacing effects in multi-session treatment of naming impairment in aphasia. *Cortex,* 119:386-400.

Middleton, E.L., Schuchard, J., & Rawson, K.A. (2020) A review of the application of distributed practice principles to naming treatment in aphasia. Topics in Language Disorders, 40(1):36–53. https://doi.org/10.1097/TLD.0000000000000202.

Murray, G., **Hart, T.**, Doyle, A., Bohrman, C., & Toth, C. (2019) There's no cure for brain injury: Work-related stress in brain injury rehabilitation professionals. *Brain Injury,* 33:1442-1448.

Nakase-Richardson, R., Schwartz, D.J., Drasher-Phillips, L., Ketchum, J.M., Calero, K., Dahdah, M.N., Monden, K.R., Bell, K., Magalang, U., Hoffman, J., **Whyte, J.**, Bogner, J., & Zeitzer J. (2019) Comparative effectiveness of sleep apnea screening instruments during inpatient rehabilitation following moderate to severe TBI. *Archives of Physical Medicine and Rehabilitation,* 101(6):283-296 doi: 10.1016/j.apmr.2019.09.019. [Epub ahead of print]. PMID:31705855.

Nascimento, D.C., Depetri, G., Stefano, L.H., Anacleto, O., Leite, J.P., **Edwards, D.J.,** Santos, T.E.G., & Neto, F.L. (2019) Entropy analysis of high-definition transcranial electric stimulation effects on EEG dynamics. *Brain Science*, 9:208 doi:10.3390/brainsci9080208.

Nascimento, D.C., Pimentel, B., Souza, R., Leite, J.P., **Edwards, D.J.,** Santos, T.E.G., & Louzada, F. (2019) Dynamic time series smoothing for symbolic interval data applied to neuroscience. *Information Sciences,* 517:415-426.

O'Donnell, J., Browne, K., Kilbaugh, T., Chen, H.I., **Whyte, J.,** & Cullen, D.K. (2019) Challenges and demand for modeling disorders of consciousness following traumatic brain injury. *Neuroscience Biobehavioral Review*, 98:336-346.

Park, C., Joshua, Y.H., Park, M.O., Dohle, C., Biale, A., **Edwards, D.,** & Krebs, H.I. (2020) Effects of innovative hip-knee-ankle interlimb coordinated robot training on ambulation, cardiopulmonary function, depression, and fall confidence in acute hemiplegia. *NeuroRehabilitation*, 46(4):577-587.

Rabinowitz, A.R., Griesbach, G.S., Pinto, S.M., & Hawley, L.A. (2019) Resilience and chronic brain injury outcomes: Behavioral and social pathways for promoting well-being. *Brain Injury Professional*, 16(3):12-15.

Rabinowitz, A.R., & Fisher, A.J. (2020) Person-specific methods for characterizing the course and temporal dynamics of concussion symptomatology: A pilot study*. Scientific Reports,* 10(1): 1248.

Rabinowitz, A.R., & Watanabe, T.K. (2020) Pharmacotherapy for treatment of cognitive and neuropsychiatric symptoms after mTBI. *The Journal of Head Trauma Rehabilitation*, 35(1):76-83.

Santos, T.E.G., Baggio, J.A.O., Rondinoni, C., Machado, L., Weber, K.T., Stefano, L.H., Santos, A.C., Pontes-Neto, O.M., Leite, J.P., & **Edwards, D.J.** (2019) Fractional anisotropy of thalamic nuclei is associated with verticality misperception after extra-thalamic stroke. *Frontiers in Neurology,* 10:697 doi: 10.3389/fneur.2019.00697.

Schuchard, J., Rawson, K.A., & **Middleton, E.L.** (2020) Effects of distributed practice and criterion level on word retrieval in aphasia. *Cognition,* doi: 10.1016/j.cognition.2020.104216.

Silverstein, J., Cortes, M., Tsagaris, K. Z., Climent, A., Gerber, L.M., Oromendia, C., Fonzetti, P., Ratan, R.R., Kitago, T., Iacoboni, M., Wu, A., Dobkin, B.H., & **Edwards, D.J.** (2019) Paired associative stimulation as a tool to assess plasticity enhancers in chronic stroke. *Frontiers in Neuroscience*, 13:792.

Stoll, H., De Witt, M., **Middleton, E.M., & Buxbaum, L.J.** (2020) Treating limb apraxia via action semantics: A preliminary study. *Neuropsychological Rehabilitation*, https://doi.org/10.1080/09602011.2020.1762672.

Tozlu, C., **Edwards, D.,** Boes, A., Labor, D., Tsagaris, K.Z., Silverstein, J., Lane, H.P., Sabuneu, M.R., Li, C., & Kuceyeski, A. (2020) Machine learning methods predict individual upper-limb motor impairment following therapy in chronic stroke. *Neurorehabilitation and Neural Repair,* 34(5):428-439 doi: 10.1177/1545968320909796.

Venkatesan, U.M., Lancaster, K., Lengenfelder, J.L., & Genova, H.M. (2020) Independent contributions of social cognition and depression to functional status after moderate or severe traumatic brain injury. *Neuropsychological Rehabilitation*, doi: 10.1080/09602011.2020.1749675.

Venkatesan, U.M., Margolis, S.A., Tremont, G., Festa, E.K., & Heindel, W.C. (2020) Forward to the past: Revisiting the role of immediate recognition in the assessment of episodic memory. *Journal of Clinical and Experimental Neuropsychology*, 42(2):160-170 doi: 10.1080/13803395.2019.1697210.

Whyte, J., Poulsen, I., Ni, P., Eskildsen, M., & Guldager, R. (2020) Development of a measure of nociception for patients with severe brain injury. *Clinical Journal of Pain,* 36(4):281-288.

Wong, A.L., & Krakauer, J.W. (2019) Why are sequence representations in primary motor cortex so elusive? *Neuron,* 25;103(6):956-958 https://doi.org/10.1016/j.neuron.2019.09.011.

Wuennemann, M., Lane, H.P., Peltz, A., Kitago, T., & **Edwards, D.** (2019) Dose and staffing ratio comparison study of Armeo® Spring Device–Assisted Therapy. *American Journal of Occupational Therapy*, Vol. 73, 7311515315 https://doi.org/10.5014/ajot.2019.73S1-PO6043.

Wuennemann, M.J., Mackenziea, S.W., Lanea, H.P., Peltza, A.R., Mac, X., Gerber, L.M., **Edwards, D.J.,** & Kitago, T. (2020) Dose and staffing comparison study of upper limb device-assisted therapy. *NeuroRehabilitation,* 46(3):287-297 doi:10.3233/NRE-192993.

Zumbansen, A., Black, S. E., Chen, J. L., **Edwards, D. J.,** Hartmann, A.E., Heiss, W.D., Lanthier, S., Lesperance, P., Mochizuki, G., Paquette, C., Rochon, E.A., Rubi-Fessen, I., Valles, J., Vogt, H., Wortman-Jutt, S., & Thiel, A.(2020) Comparing the effectiveness of rTMS and tDCS for aphasia recovery after stroke. *Clinical Neurophysiology*, 131(4):e153-e154.

Zumbansen, A., Black, S., Chen, J., **Edwards, D.,** Hartmann, A., Heiss, W. D., Lanthier, S., Lespérance, P., Mochizuki, G., Paquette, C., Rochon, E., Rubi-Fessen, I., Valles, J., Kneifel, H., Wortman-Jutt, S., & Thiel, A.. (2020) Non-invasive brain stimulation as add-on therapy for subacute post-stroke aphasia: A randomized trial (NORTHSTAR). *European Stroke Journal,* https://doi.org/10.1177/2396987320934935.

Presentations Fiscal 2020

Ambron, E., **Buxbaum, L.J.,** Kuchenbecker, K., Mille, A., & Coslett, H.B. *Virtual reality treatment for phantom limb pain.* American Society of Neurorehabilitation, Chicago, IL (October 2019)

Antonucci, S. *From ephemeral to empirical: Turning a clinical idea for animal-assisted treatment into an experimental research study.* Shrier Topics in Rehabilitation Science Lecture Series, MossRehab, Elkins Park, PA (February 2020)

Arciniegas, D., Ketchum, J., Sander, A., Almeida, E., Bogaards, J., Giacino, J., Hammond, F., Harrison-Felix, C., **Hart, T.,** Mellick, D., Sherer, M., **Whyte, J.,** & Zafonte, R. *Multicenter Evaluation of Memory Remediation in Traumatic Brain Injury with Donepezil (the MEMRI-TBI-D Study): A randomized controlled trial* (abstract accepted and published) (April 2020)

Bernier, R.A., **Venkatesan, U.M.**, Rabinowitz, A.R., Soto, J.A., & Hillary, F.G. *Greater level of perceived discrimination is associated with worse cerebrovascular health in older adults with moderate/severe TBI.* Poster presented at the annual Rehabilitation Psychology conference, San Diego, CA. (February 2020)

Buxbaum, L.J. *Developing an elevator pitch.* Invited Mentoring Session Presenter, American Society of Neurorehabilitation, Chicago, IL (October 2019)

Buxbaum, L.J. *Virtual reality treatment of phantom limb pain.* Shrier Family Topics in Rehabilitation Science Lecture Series, MossRehab, Elkins Park, PA (November 2019)

Buxbaum, L.J. *Beyond hemiparesis: Deficits in action representation and selection in stroke.* Invited speaker, Shirley Ryan Ability Lab (formerly Rehabilitation Institute of Chicago) Chicago, IL (November 2019)

Buxbaum, L.J. *Representation and selection of object-related actions.* Invited talk, Cognitive Science Colloquium Series, Villanova University, Villanova, PA. (December 2019)

Buxbaum, L.J. *Representation and selection of tool actions: Evidence from stroke.* Invited Symposium Talk, Juelich Research Center, Juelich, Germany (January 2020)

Buxbaum, L.J. *Tool use and related deficits in stroke patients.* Invited Plenary Talk, European Workshop on Cognitive Neuropsychology, Bressanone, Italy (January 2020)

Buxbaum, L.J. *Virtual reality treatment of phantom limb pain.* Presented to MossRehab clinicians working with patients with amputation, Elkins Park, PA (April 2020)

Edwards, D.J. *Combinatorial approaches with rehabilitation robotics.* Symposium on Robotics, MossRehab, Elkins Park, PA (August 2019)

Edwards, D.J. *Update on combinatorial therapies.* Intensive Course in Transcranial Magnetic Stimulation, Harvard Medical School, Boston, MA (October 2019)

Edwards, D.J., Kantak, S., & Wong, A. *Robotics in rehabilitation and rehabilitation research.* T32 Institute Forum, Moss Rehabilitation Research Institute, Elkins Park, PA (November 2019)

Edwards, D.J. *Non-Invasive brain stimulation and behavioral therapy.* Intensive Course in Transcranial Magnetic Stimulation, Harvard Medical School, Boston, MA (November 2019)

Edwards, D.J. *Non-Invasive brain stimulation and behavioral therapy.* Intensive Course in Transcranial Magnetic Stimulation, Harvard Medical School, Boston, MA (February 2020)

Yu, S., Perez, H., Barkas, J., Mohamed, M., Eldaly, M., Huang, T-H., Yang, X., Su, H., del mar Cortes, M., & **Edwards, D.J.** *A soft high force hand exoskeleton for rehabilitation and assistance of spinal cord injury and stroke individuals* (DMD2019-3268) In addition to the poster presentation, been chosen to compete in the Three-in-Five Competition. (April 2020)

Garcea, F.E., Greene, C., Grafton, S., & **Buxbaum, L.J.** *Connectivity of the tool action network: Lesion- and connectome-based symptom mapping of limb apraxia after left hemisphere cerebrovascular accident.* Society for Neuroscience Annual Meeting, Chicago, IL (October 2019)

Hillary, F., & **Rabinowitz, A.**, Dams-O'Connor, K., & Wilde, E. *Precision in prediction: Advancing the understanding of moderate and severe TBI and risk for neurodegeneration.* Symposium presented at the 48th Annual Meeting of the International Neuropsychological Society, Denver, CO (February 2020)

Isaacs, M., **Buxbaum, L.J., & Wong, A.L.** *How are action goals represented during imitation?* Poster presentation, Society for Neuroscience Conference, Chicago, IL (October 2019)

Kantak, S. *Contralesional motor cortex is causally engaged during more dexterous tasks of the weaker arm after stroke.* Annual conference of the North American Society for the Psychology of Sport and Physical Activity (NASPSPA) Baltimore, MD (July 2019)

Kantak, S. *Differential effects of internal versus external focus of attention on goal directed action performance in patients with right and left hemisphere stroke.* Poster presentation, American Society for Neurorehabilitation (ASNR) Conference, Chicago, IL (October 2019)

Ketchum, J., **Hart, T.**, O'Neil-Pirozzi, T.M., Johnson-Greene, D., Novack, T., & Dams-O'Connor, K. *Telephone assessment of cognitive function adds to return to work prediction following traumatic brain injury.* Presented at the Annual Conference of the American Congress of Physical Medicine and Rehabilitation, Chicago, IL (November, 2019)

Mailend, M.L., Vigliocco, G., Schwartz, M., & **Buxbaum, L.J.** *Sensorimotor processing in language production: Evidence from audiovisual speech entrainment in people with aphasia.* Poster presentation, Society for the Neurobiology of Language, Helsinki, Finland (August 2019)

Matheson, H.E., Garcea, F.E., & **Buxbaum, L.J.** *Scene context realigns category representations during tool processing.* Presented at the Cognitive Neuroscience Society Annual Meeting, San Francisco, CA (March 2020)

Middleton, E.L. *Experimental designs for neuropsychological populations.* T32 Institute Forum, Moss Rehabilitation Research Institute, Elkins Park, PA (December 2019)

Nelson, L., **Hart, T.**, **Rabinowitz, A.,** Ferraro, M., & Turkstra, L. *Evaluation of staff communication before and after implementation of a training protocol for inpatients with memory impairments.* (abstract accepted and published) (April 2020)

Patra, A., Traut, H., Stabile, M., & **Middleton, E.L.** *Delayed effects of semantic blocking on picture naming: Testing the effortful retrieval hypothesis.* Poster presentation, 60th Annual meeting, Psychonomic Society, Montreal, Quebec Canada (November 2019)

Patra, A., Traut, H., Stabile, M., & **Middleton, E. L.** *Delayed effects of semantic blocking on picture naming: testing the effortful retrieval hypothesis.* Poster presentation, Einstein Research Recognition Week, Philadelphia, PA (May, 2020).

Rabinowitz, A. *Behavioral phenotypes of aging with chronic traumatic brain injury.* Invited talk, Philadelphia Neuropsychological Society, Philadelphia, PA. (February 2020)

Ramanathan-Elion, D.M., & **Venkatesan, U.M.** *Building psychological resilience and health literacy in military mild traumatic brain injury.* Podium presentation at the annual Rehabilitation Psychology conference, San Diego, CA. (February 2020)

Sevigny, M., Ketchum, J., **Hart, T.**, Callender, L., Dreer, L., Sander, A.M., Juengst, S.B., Bergquist, T.F., Bogner, J.A., & Whiteneck, G.G. *The association between community participation and social Internet use among adults with traumatic brain injury.* Presented at the Annual Conference of the American Congress of Physical Medicine and Rehabilitation, Chicago, IL (November 2019)

Therrien, A.S. *Rehabilitation robotics to assess human behavior.* Symposium on Robotics, Elkins Park, PA (August 2019)

Therrien, A.S. *Cerebellar contributions to sensorimotor function and learning.* PT/OT Key Note speaker, 40th Annual Neurorehabilitation Conference of Encompass Health Rehabilitation Hospital of Braintree, Cambridge, MA (November 2019)

Venkatesan, U. *An elusive thorn-in-the-side: Persistent memory impairment after traumatic brain injury.* Shrier FamilyTopics in Rehabilitation Science Lecture Series, MossRehab, Elkins Park, PA (May 2020)

Venkatesan, U.M. *From systems neuroscience to clinical sequelae of human TBI.* Virtual lecture at the TBI Seminar Series, National Neurotrauma Society. (June 2020)

Whyte, J. & Turkstra, L. *The rehabilitation treatment specification system: Identifying the active ingredients of Aphasia therapy.* Saffran Conference, Temple University, Philadelphia, PA (September 2019)

Whyte, J. *Rehabilitation treatment specification system part 1-defining rehab treatments systematically.* American Congress of Rehabilitation Medicine 96th Annual Conference, Chicago, IL (November 2019)

Whyte, J. *Rehabilitation treatment specification system part 2-initial use in education, clinic and research.* American Congress of Rehabilitation Medicine 96th Annual Conference, Chicago, IL (November 2019)

Whyte, J. *Introduction to the RMSTP & identifying a scientific domain.* Rehabilitation Medicine Scientist Training Program Workshop, Orlando, FL (March 2020)

Whyte, J., & Field-Fote, E. *Developing a budget/ staffing a project.* Rehabilitation Medicine Scientist Training Program Workshop, Orlando, FL (March 2020)

Whyte, J., & Segal, R. *Overview of a career development application.* Rehabilitation Medicine Scientist Training Program Workshop, Orlando, FL (March 2020)

Wlotko, E. *The impact of cognitive control on language comprehension in aphasia and other types of communication impairments.* Shrier Family Topics in Rehabilitation Science Lecture Series, MossRehab, Elkins Park, PA (September 2019)

Wong, A.L. *Rigor, reproducibility and replicability.* Moss Rehabilitation Research Institute T32 Session, Elkins Park, PA (February 2020)

Wong, A.L. *Learning movement patterns: A tale of two (motor) sequences.* Shrier Family Topics in Rehabilitation Science Lecture Series, MossRehab, Elkins Park, PA (March 2020)

Shrier Family Topics in Rehabilitation Science Lecture Series

Shrier Family Topics in Rehabilitation Science Lecture Series is a series of informal colloquia that bridge the clinical and research worlds. The goal is to inform MossRehab and Moss Rehabilitation Research Institute staff about ongoing projects of institute staff and adjunct scientists in an atmosphere that encourages discussion about methodological issues related to the research projects. Presentations focus on data and analysis from presenters' recent and ongoing studies, rather than syntheses and literature reviews. The hour-long colloquia are presented at noon on the third Wednesday of the month from September through June.

Date	Speaker	Title of Talk
9/18/19	Edward Wlotko, PhD	The impact of cognitive control on language comprehension in aphasia and other types of communication impairments
10/16/19	Durga Roy, MD	Diagnosis and treatment of neuropsychiatric symptoms in the subacute phase after traumatic brain injury
11/20/19	Laurel Buxbaum, PsyD	Virtual reality treatment of phantom limb pain
12/18/19	Frank Garcea, PhD	Toward a translational cognitive neuroscience utilizing functional neuroimaging to improve patient outcomes
1/15/19	Michael Saulino, MD, PhD	Peripheral nerve stimulation for pain management
2/19/20	Sharon Antonucci, PhD, CCC-SLP	From ephemeral to empirical: Turning a clinical idea for animal-assisted treatment into an experimental research study
3/18/20	Aaron Wong, PhD	Learning movement patterns: A tale of two (motor) sequences
4/15/20	Abhijeet, Patra, PhD	Application of effortful retrieval practice principles to naming treatment of aphasia
5/27/20	Umesh Venkatesan, PhD	An elusive thorn-in-the-side: Persistent memory impairment after traumatic brain injury
6/17/20	Jill Campbell Stewart, PT, PhD	Engagement of the action selection network during arm training after stroke

Peer Review Committee

Moss Rehabilitation Research Institute has at its disposal, seed money earmarked for internal research projects conducted by principal investigators at MossRehab and Moss Rehabilitation Research Institute. Research projects are typically preliminary studies intended to lead to extramural funding or clinical program development.

The Peer Review Committee is comprised of scientists from MRRI and clinicians from MossRehab. The Committee reviews research applications for scientific merit, institutional impact and budget projections. Consideration by the Peer Review Committee does not guarantee funding support.

Projects funded are usually considered promising, innovative, feasible and consistent with the interests of the research institute and MossRehab. The proposed project should demonstrate:

- clearly defined goals that are feasible given anticipated resources;
- a realistic plan and budget that describe activities appropriate to meet project goals
- potential for significant impact or possible extramural funding.

Annual Distributions for FY 2020:

Two projects were awarded during FY 2020

- Effort costs and reward values in Parkinson's Disease
- Improving left visual field attention in right hemispheric stroke patients

Scientific Advisory Board

Kathleen R. Bell, MD
Chair, Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, Kimberly-Clark Distinguished Chair in Mobility Research.

Pablo A. Celnik, MD
Director, Department of Physical Medicine and Rehabilitation; Professor of Physical Medicine and Rehabilitation, Johns Hopkins School of Medicine.

Leslie J. Gonzalez-Rothi, PhD
Professor Emeritus, Department of Neurology, University of Florida.

Argye Beth Hillis, MD
Director, Cerebrovascular Division of Neurology, Johns Hopkins School of Medicine; Professor of Neurology, Johns Hopkins School of Medicine.

Kenneth Pugh, PhD
President and Director of Research, Haskins Laboratory; Associate Professor, Department of Linguistics, Yale University


Eric L. Shipp, PhD, MBA
Associate Director, Finance and Administration, Glenn Biggs Institute for Alzheimer's and Neurodegenerative Diseases, University of Texas Health Science Center at San Antonio

Grants and Contracts Fiscal 2020

Title of Project	Source of Funds
Measurement of outcomes from participation in a life-participation approach aphasia center	NIH thru Temple
Understanding action selection in the tool use network	NIH / NINDS
TRANSPORT 2	NIH thru MUSC
Improving left visual field attention in right hemispheric stroke patients	PRC
Coordinating two arms for function: contribution of task goals	NIH / NICHD
Perceptual motor interaction to improve bimanual coordination after stroke	NIH / NICHD
Priming brain stimulation with aerobic exercise: physiological and behavior effects	PA Dept of Health
Audio-visual speech entrainment in people with Aphasia	PRC
Conceptual Combination	NIH thru Penn
Retrieval practice principles: A theory of learning for aphasia rehabilitation	NIH / NIDCD
TMS for Aphasia: Efficacy and Neural basis	NIH thru Penn
Cognitive control and sentence processing in aphasia	NIH thru George Washington
An electrophysiological investigation of speech error monitoring in individuals with aphasia	AES
Moss Traumatic Brain Injury Model System	NIDILRR
PACT: PA Consortium in TBI	Pa DoH thru Penn
Temporal patterns of participation restrictions and depression symptomology after TBI	NIH / NICHD
Examining elderly traumatic brain injury and risk for neurodegeneration	Pa DoH thru Penn State
REaDI Wash	DOD thru Lockhead Martin

Development of a chatbot for augmenting TBI rehabilitation	Einstein Society
TBIMS National Data and Statistical Center	NIDILRR thru Craig Hospital
Positive Personality Attributes in TBI	NIDILRR thru Craig Hospital
Characterization and Treatment of Chronic Pain after severe traumatic brain injury	NIDILRR thru Craig Hospital
RERC on ICT access for Mobile Rehabilitation (mRehab)	NIDILRR thru Shepard Center
Improving transition from acute to post-acute care following TBI	PCORI thru Uwash
Postdoctoral training in translational neurorehabilitation research	NIH / NICHD
TBI endpoints development	DOD thru UCSF
Rehabilitation Medicine Scientist Training Program	NIH thru Univ of Pittsburgh
Comparison of sleep apnea assessment strategies to maximize TBI rehabilitation participation and outcomes	PCORI thru Tampa VA
Effort Costs and reward values in Parkinson's disease	PRC
Pathways sub-serving the imitation of actions	Einstein Society

Proportion of Funding Sources
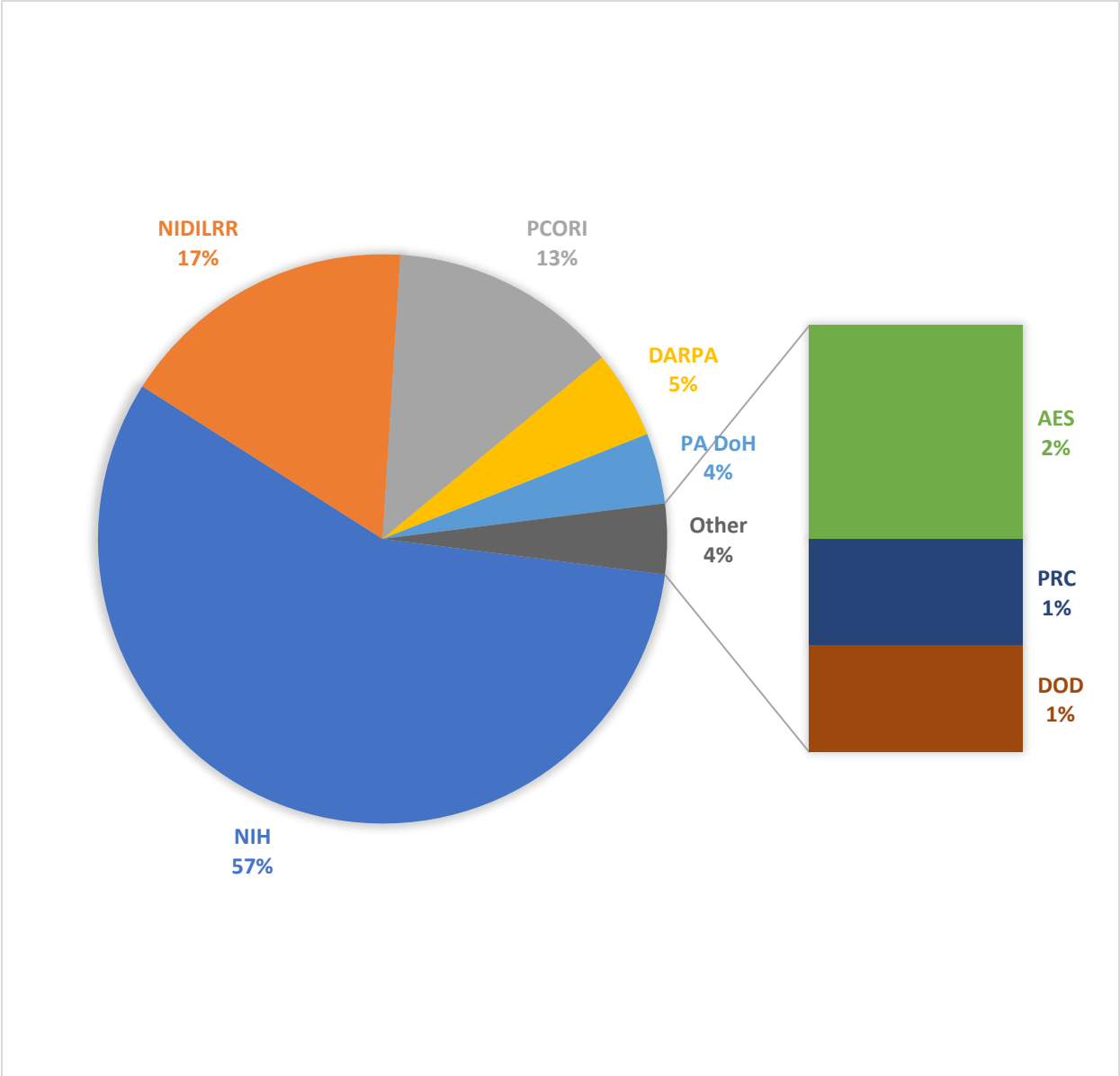
NIH National Institutes of Health
NIDILRR National Institute on Disability, Independent Living, and Rehabilitation Research
PCORI Patient-Centered Outcomes Research Institute
DARPA Defense Advanced Research Projects Agency
PA DoH Pennsylvania Department of Health
AES Albert Einstein Society
PRC Peer Review Committee
DOD Department of Defense