# Letters from the Institute

JEFFERSON MOSS REHABILITATION RESEARCH INSTITUTE

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- 1 Message from the Director
- 1 Letter from a Research Volunteer and Aphasia Center Member
- 2 Movement Science
- 3 Language and Communication
- 4 Research Collaboration Spotlight
- 5 Cognition, Behavior, and Emotion
- 5 Our Research Registry
- 6 2024 Accomplishment Highlights
- 7 Donor Spotlight



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## Message from the Director



As we progress through 2025, Jefferson Moss Rehabilitation Research Institute looks forward to continued growth, new collaborations, exciting discoveries, and further disseminating our research that spans the translational continuum in neuroscience and neurorehabilitation.

The past year has seen our Institute rapidly integrating with the Jefferson Enterprise, and we are proud to see how the Institute and our individual Faculty are adapting and leveraging the opportunities offered by this position. We are delighted to

celebrate the many recent accomplishments of our scientists, and the Institute is bustling with activity to advance ongoing research and begin new projects.

We truly appreciate the support of our donors, scientists, staff, trainees, collaborators, clinical colleagues, and all others who help enable our ground-breaking work towards our mission. Wishing the entire Institute community and beyond happiness, safety, and productivity in the months ahead.

Sincerely,

**Dylan J. Edwards, PhD** Nancy Wachtel Shrier Director, Jefferson Moss Rehabilitation Research Institute Professor, Rehabilitation Medicine, Thomas Jefferson University

## Letter from a Research Volunteer and Aphasia Center Member

I was first introduced to the Virtual Reta's Games Group during the COVID-19 pandemic. As horrible as COVID was, there was also a bright side for me, because I was brought together with wonderful people and given the opportunity to meet virtually. When I learned about the Reta's Games Group, I was very excited. Everyone is very welcoming. The host Roberta Brooks, every person with aphasia, and specifically the facilitator Nikki Benson-Watlington who brings her happiness and support to others with her warmhearted, consideration, and positivity. The group covers a variety of topics weekly including games, movie discussions, music, recipes, photo memories. Everything is always fun with a lot of laughing, and it is amusing.



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I've been involved with research for years and have always been fascinated with it. When I had the opportunity to participate in research at the Institute, I was excited to be a part of bringing information to people about aphasia. Not only is it stimulating and exciting for me, but it helps to keep me sharp and keep learning. It is a great honor to be involved in research with the top-notch Aphasia Center. Most recently, I was involved in the study, Assessing an animal-assisted treatment program for adults with aphasia: The persons with aphasia training dogs

program. My dog, Lola was part of the study, and we both benefited from it. It helped me practice training with my dog and learn spoken commands. I really loved the study, I felt proud when I was able to complete it.

Sincerely,



## **Movement Science**

Research From the Sensorimotor Learning Lab Aims to Predict Residual Motor Learning Capacity After Cerebellar Damage

Damage to a brain structure called the cerebellum causes Ataxia, which is marked by poor movement coordination. Stroke, multiple sclerosis, traumatic brain injury, and a host of genetic conditions can cause damage to the cerebellum, and the individuals affected often have disabling Ataxias that impair balance, walking, arm movements, and speech.

There are no medications to treat Ataxia, leaving rehabilitation therapies as the only option to manage symptoms. However, rehabilitation outcomes are mixed, with many individuals not benefiting. One reason for mixed outcomes could be related to the cerebellum. Many rehabilitation interventions try to train the brain to move the body in different ways to help compensate for neurologic conditions, and often, these approaches use the learning mechanism that depends on the cerebellum.

Research by Amanda Therrien, PhD, investigated whether a new training technique using binary reinforcement could help people with Ataxia improve their movement control. Using a combination of virtual reality and motion capture technology,

binary reinforcement training leverages a brain mechanism for learning new movements that does not depend as heavily on the cerebellum. While most individuals with Ataxia were able to learn with binary reinforcement in Dr. Therrien's prior studies, a small percentage did not benefit from the training. In 2023, Dr. Therrien's lab published a new study that tested how functioning of the cerebellum may explain these learning differences across individuals.

Movement perception relies heavily on a sense called proprioception, which is how your brain knows where your body is in space when vision is absent. Proprioception plays a key role in binary reinforcement training, which limits visual feedback to reduce reliance on cerebellum-dependent learning. Individual differences in how cerebellar damage affects perception of voluntary movement-like responses to the training-are not well explained by Ataxia type or severity.

Dr. Therrien's 2023 study showed a strong relationship in which a greater impairment in the perception of voluntary movement

relative to the perception of passive movement was associated with a reduced response to binary reinforcement training. Replicating prior findings, no other variables tested were related to the training outcome. These findings suggest that proprioceptive tests could help predict which individuals with Ataxia may benefit from binary reinforcement training. This line of research is critical for better understanding motor learning and developing more effective personalized treatment approaches for people with Ataxia.

## Language and Communication

#### Dr. Erica Middleton Continues NIH-Funded Study of Retrieval Practice in Aphasia Rehabilitation

Erica Middleton, PhD, received a five-year continuation of her R01 grant from the National Institute On Deafness And Other Communication Disorders of the National Institutes of Health to continue her research developing a theory of learning for aphasia rehabilitation that leverages retrieval practice.

Aphasia is a language disorder that commonly occurs after stroke for an item. or other brain injury. It can impact a person's ability to produce or comprehend spoken, written, or gestured communication. Dr. Middleton and her team are examining different parameters Maximizing the efficiency and effectiveness of rehabilitation is to optimize a criterion learning-based treatment for aphasia critical, and Dr. Middleton is working to improve our understanding rehabilitation, including the number of training sessions needed of how people with aphasia respond to different learning and whether grouping related items is beneficial. Her research experiences to inform future treatment approaches. In particular, studies will also preliminarily evaluate the efficacy of the criterion she is applying learning principles of retrieval practice to develop learning-based treatment in development, shed light on a theory of how people with aphasia relearn lost language skills underlying neural mechanisms that may underlie differences (such as word retrieval) during rehabilitation. in responses to treatment, and investigate whether the benefits of this approach extend beyond word retrieval to word Dr. Middleton began this NIH-funded project in 2017, and her work comprehension as well. The studies funded by this grant has thus far identified important parameters of interventions that will provide valuable information that will help researchers and clinicians develop the best treatments possible for people Dr. Middleton and her team have identified that word retrieval who are living with aphasia.

result in greater improvements in performance. For example, problems in people with aphasia are improved more when treatment involves retrieval practice-based naming (where they attempted to name an object and received feedback), compared to errorless learning (where they were provided with the name of the object and repeated the name). Further, greater improvements occurred with correct retrievals during retrieval practice (versus incorrect retrievals) and when the spacing between an item's trials was greater.





Dr. Middleton is focusing on a retrieval practice-based naming treatment termed criterion learning. With criterion learning, an item must be correctly retrieved a certain number of times in a training session to be removed from the item gueue. This is an inherently efficient approach that incorporates the learning benefits of correct retrievals and spaced out retrieval practice



## **Research Collaboration Spotlight**

#### Language Research Collaborations Between the Institute and University College London Continue to Grow

Aphasia, a communication disorder which affects how we understand and use language, affects millions of individuals worldwide, with around one in three people experiencing some degree of aphasia following a stroke. The impact of aphasia on quality of life can be devastating, and the need for innovative, evidence-based and effective therapies is growing. An ongoing collaboration between the laboratories of University College London Professor of Psychology and Institute Scientist in Residence Gabriella Vigliocco, PhD, and Institute Faculty Laurel Buxbaum, PsyD, has been exploring how linguistic communication that is enhanced with gestures and other visual cues may benefit the language comprehension and production of people with aphasia (PWA). One ongoing project being run at both sites employs a unique paradigm with interactive card games to capture 'real life' communication of PWA. In August, UCL PhD student Isobel Chick, MSc, and Professor Vigliocco visited the Institute's Cognition and Action Laboratory to discuss the latest updates from the study with Dr. Buxbaum and postdoctoral fellow Amy Lebkuecher, PhD.

The core focus of the collaborative project is to investigate how PWA understand and use hand gestures in everyday communication, and whether it varies in predictable ways based on individual differences. Individual differences may include variations in semantic processing abilities or the ability to plan and execute gestures. Using this information, the team ultimately aims to develop personalized treatment pathways to enhance speech production and auditory comprehension in PWA. By pooling multinational UK and US datasets, the researchers hope their findings will be relevant to a wider population of PWA.

Looking ahead, the next steps for the project involve finalizing analyses and developing a structured aphasia treatment trial for PWA. Initial findings from the study were presented at the Academy of Aphasia and Society for the Neurobiology of Language conferences last fall, providing a platform for sharing insights and garnering feedback from the wider scientific community. Ms. Chick shared her excitement about the collaboration, stating, "It was really wonderful to be able to meet our Institute colleagues in person and generate new ideas for our project. Active collaboration with international colleagues gives us access to such a rich and varied dataset, and I'm excited to see how our work together develops."

Aphasia research is a global endeavor, and international collaborations such as this are essential for making significant strides in understanding and treating this communication disorder. With the ongoing relationship between UCL and Jefferson Moss Rehabilitation Research Institute, the collaboration will continue well into the future.



# **Cognition, Behavior, and Emotion**

#### Collaborative Research Explores Emotional Dysfunction After Traumatic Brain Injury

After traumatic brain injury (TBI), individuals often struggle with emotion and behavior regulation, leading to anger and aggression that can strain relationships and hinder social participation. Currently, evidence-based treatments addressing these emotional challenges are lacking. A collaborative study funded by The National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) is exploring this topic to better understand why events in everyday life trigger anger and aggression for some people living TBI. Led by Flora Hammond, MD, at Indiana University, and Dawn Neumann, PhD, at the University of South Florida, the Reactions Events Appraisals and Context in TBI (REACT) Study spans five Traumatic Brain Injury Model Systems Sites (Indiana University School of Medicine, Jefferson Moss Rehabilitation Research Institute, TIRR Memorial, Spaulding Rehabilitation, and Craig Hospital).

At Jefferson, Amanda Rabinowitz, PhD, serves as the site PI for the REACT Study. She brings extensive experience with mobile technology for assessing and treating individuals with TBI particularly through ecological momentary assessment (EMA)a method of real-time data collection that reduces recall bias. Dr. Rabinowitz has led multiple EMA studies and is currently investigating the temporal dynamics of chronic postconcussion symptoms.

In the REACT Study, researchers use a mobile app to capture the daily thoughts, emotions, and experiences of people with TBI. Over two weeks, participants report on frustrating events and their emotional and behavioral responses. The study aims to explore how these responses relate to situational context, individual characteristics, emotion regulation strategies, and appraisals of real-life events.

## **Our Research Registry**

Jefferson Moss Rehabilitation Research Institute is devoted to improving the lives of individuals with neurological disabilities through basic, translational, and clinical research. The Research Registry allows patients and members of the community to learn about research opportunities at the Institute and help Institute researchers find participants to volunteer for their studies. Participation in each research opportunity is completely voluntary.

The Research Registry is directed by Sharon M. Antonucci, PhD, CCC-SLP, and it is an exceptional resource for Institute Faculty and collaborators.

For more information about the Institute's Research Registry and how to get involved, please visit the Research Registry webpage at RehabilitationResearch.Jefferson.edu/Research-Opportunities.html.



Gaining insight into why people with TBI experience anger and aggression will help scientists and clinicians improve care in multiple ways – by developing better educational approaches for patients and their families, refining screening methods to identify patients at risk, and informing targeted treatments to improve outcomes. "By leveraging valuable collaborations through the TBI Model Systems, this project will bring us closer to developing effective evidence-based interventions to help people with TBI better manage their emotions in real-world situations," Dr. Rabinowitz remarked.







# **2024 Accomplishment Highlights**

**Dr. Sharon M. Antonucci** presented findings on an NIH-funded clinical trial on animal-assisted treatment for aphasia evaluating The Persons with Aphasia Training Dogs Program at the biannual International Aphasia Rehabilitation Conference, which led to a collaboration with Boston University to pilot implementation of PATD in the aphasia groups.

Dr. Laurel Buxbaum received a Visiting Professor Award from Sapienza University, Rome, and delivered an invited lecture there. She also delivered invited lectures at Georgetown University, University of Pittsburgh, University of Coimbra, Princeton University, University of Wisconsin, and University of Rochester. She chaired a session titled "Cutting-edge topics in stroke neurorehabilitation" at the American Heart Association Stroke Conference and participated in an invited symposium at Psychonomic Society.

Dr. Dylan J. Edwards was an invited plenary speaker at the 76th Annual Meeting of the American Academy of Neurology, and he was also an invited speaker in four sessions at the Villa Beretta Rehabilitation Research Innovation Institute and Politecnico di Milano in Italy as part of a meeting on Rehabilitation Medicine Research and Innovation: Science, Healthcare Industry, Philanthropy (SHIP): The Alliance. He co-authored a study published in Science Translational Medicine that represents a significant advancement in the translation of a potential noninvasive treatment approach to promote motor recovery after spinal cord injury.

Dr. Marja-Liisa Mailend continued her research on an NIH-funded project that investigates the efficacy of speech entrainment practice for people with aphasia and, in collaboration with Dr. Erica Middleton, continued with an Albert Einstein Society funded project, which investigates generalization of single-word training to connected speech. The work of Dr. Mailend and collaborators was published in the American Journal of Speech-Language Pathology and presented at several international meetings.

Dr. Erica Middleton and collaborators published several research articles in journals including Brain Communications, Cortex, and Journal of Speech, Language, and Hearing Research. Dr. Middleton secured an additional five years of NIH funding to continue her work examining the application of fundamental principles of human learning to enhance treatment efficacy and efficiency in aphasia, a disorder in language processing after stroke.

Dr. Amanda Rabinowitz received the 2024 Joshua B. Cantor Scholar Award from the American Congress of Rehabilitation Medicine's (ACRM) Brain Injury Interdisciplinary Special Interest Group (BI-ISIG) in recognition of her outstanding research contributions to brain injury rehabilitation. She was also nominated to chair the BI-ISIG Task Force on Mild Traumatic Brain Injury, reflecting her leadership and longstanding involvement in the organization.

Dr. John Whyte published several new papers and invited commentaries in collaboration with colleagues in other fields, exploring the contributions of the Rehabilitation Treatment Specification System to research in cognitive rehabilitation, voice therapy, and pediatric neurorehabilitation. He also continued to collaborate with colleagues on the development of improved outcome measures in brain injury and disorders of consciousness.

**Dr. Aaron Wong** was invited to present his work at Texas A&M University and Johns Hopkins University, and was recognized by the American Physiological Society as a Star Reviewer. The Cognitive-Motor Learning Laboratory also welcomed a new Postdoctoral Fellow to investigate movement impairments in Parkinson's Disease, and a new Research Assistant to support ongoing NIH-funded research on limb apraxia following lefthemisphere stroke.

In Fall of 2024, the NIH awarded a large-scale five year grant to support a pivotal multi-site clinical trial investigating telerehabilitation therapy after stroke (TR-2 Trial). The trial will be led by Dr. Steven C. Cramer (UCLA School of Medicine & California Rehabilitation Hospital) and Dr. Dylan Edwards (Jefferson Moss Rehabilitation Research Institute and Thomas Jefferson University).

In collaboration with former Institute Postdoctoral Fellow Dr. Solene Kalenine, Drs. Buxbaum and Middleton were awarded a grant through the Peer Review Committee to examine the impact of a motor-enhanced protocol on word (re)learning in people with stroke. Dr. Kalenine visited the Institute as a Fulbright Fellow.

# **Donor Spotlight: A Beacon of Hope and Healing** Honoring the Enduring Legacy of Nancy Wachtel Shrier

Moreover, Nancy's support was instrumental in developing In the serene surroundings of Elkins Park, Jefferson Moss-Magee Rehabilitation stands as more than a medical facility; it is a programs that emphasized the importance of art and sports in symbol of hope and healing, profoundly influenced by the rehabilitation. Her enthusiasm for All About Moss Through the Arts compassionate spirit of Nancy Wachtel Shrier. Her connection to and the wheelchair tennis tournament at Penn reflected her this institution was not just philanthropic-it was a vital part of belief in the resilience and capabilities of individuals, regardless her very being, a manifestation of her unwavering commitment of their physical challenges. to bettering the lives of others. This tribute, drawn from the rich The legacy of Nancy within the walls of Jefferson Moss-Magee tapestry of memories shared by her family, including her husband, Rehabilitation – Elkins Park and Jefferson Moss Rehabilitation Marc, and children, Peter Shrier and Lee Yonish, celebrates a woman whose empathy and dedication have indelibly shaped of the Directorship in her name stands as a poignant homage the essence of these institutions.

Marc Shrier's voice softens with affection as he recalls his wife's deep involvement with the institution. "Nancy was a whirlwind of as a beacon, guiding future innovations in the field. activity, always looking for ways to contribute more meaningfully," he Her children reflect on the enduring impact of these tributes. says. This passion wasn't solitary; it enveloped Marc, transforming Lee observes, "The Directorship in our mother's name is more him from a patient to an ardent supporter. Their collaborative than an honor; it's a continuation of her life's work, inspiring efforts, notably their substantial contributions to Jefferson Moss others to follow in her footsteps." Peter adds, "It's a living Rehabilitation Research Institute and the Shrier Family Topics in testament to her dedication and passion." Rehabilitation Science Lecture Series, are now cornerstones of Additionally, the staff and patients of the hospital often speak the institution.

Their children paint a vivid picture of a life exemplified by generosity and empathy. "Our parents cared deeply about a range of causes, but it was always done with so much love," Lee reflects. Peter adds, "They have giant hearts, and that was evident in everything they did." For them, Nancy was not just a mother but an exemplar of kindness, her life a lesson in the

Nancy's story is not just one of personal achievement but a narrative power of giving. of unwavering compassion and philanthropy. Her profound Nancy's commitment to the Institute and Jefferson Moss-Magee dedication to Jefferson Moss-Magee Rehabilitation – Elkins Park Rehabilitation – Elkins Park was characterized by her visionary and Jefferson Moss Rehabilitation Research Institute has set approach and tireless dedication. The pinnacle of her a benchmark for future rehabilitation philanthropy. Her legacy, contributions was the establishment of the Directorship in echoed in the corridors of these institutions and in the hearts her name, a testament to her profound impact on the field of of those she touched, serves as a powerful reminder of the rehabilitation science. Dylan J. Edwards, PhD, the inaugural holder transformative impact one individual can have. Nancy's memory, of this directorship, exemplifies the values and vision Nancy defined by purpose and generosity, continues to inspire, and cherished, particularly in advancing rehabilitation research. guide us in our efforts to support and uplift those in need.

Her involvement went far beyond financial support; Nancy was a catalyst for innovation and growth. The Shrier Family Topics in Rehabilitation Science Lecture Series, an initiative she spearheaded, has become a tool for disseminating knowledge and fostering collaboration among experts worldwide. This series, along with her other endeavors, has significantly propelled the Institute's standing in the global rehabilitation community.



Research Institute is both profound and enduring. The establishment to her relentless pursuit of progress in rehabilitation science. This directorship not only honors her memory but also serves

of Nancy's influence. Rejoice Jula, the Director of Development, reminisces about Nancy's readiness to assist in any capacity, underlining her indomitable spirit and dedication to service. These tributes collectively paint a picture of a woman whose life was defined by generosity, innovation, and an unwavering commitment to help others.





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