ASNR Meet Our Members: Akhil Mohan

Dr. Akhil Mohan is a Postdoctoral Fellow in Dr. Ela Plow's lab in the Lerner Research Institute at the Cleveland Clinic. He became an ASNR member in 2022 to expand his professional network, gain valuable mentorship, and contribute to the advancement of the field of neurorehabilitation. You can learn more about Dr. Mohan and his exciting research in our interview below.

1) How did you get interested in science, and what steps did you take to get to your current role?

In my early career, I became interested in developing medical technologies to measure biological signals that offer insight into the underlying physiology of the human heart. During my post-baccalaureate training at Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, a premier medical academic institute in India, I developed a virtual instrumentation (VI) system for pulsatile testing of artificial heart valves. The goal was to develop a VI system that could measure the dynamic characteristics of the artificial heart valves. This work inspired me to pursue graduate research in biomedical engineering.

I joined the graduate program at Christian Medical College, Vellore, India, another premier hospital and academic medical institution. There, I developed an interest in upper extremity (UE) stroke rehabilitation. I designed a sensorized glove and instrumented ball to monitor hand function in stroke survivors. The system could measure individual finger flexion, forearm rotation, and grasp force in neurologically intact participants. I sought to improve the reliability of the sensorized hand rehabilitation system for evaluation in persons with stroke, and therefore, I applied for a Ph.D. program with a focus on post-stroke UE rehabilitation.

I was selected to enroll in a Ph.D. program at the Indian Institute of Technology (IIT) Madras, the highest-ranked academic institute for engineering in India. The focus of my Ph.D. was the design, development, and clinical testing of a portable UE rehabilitation system (called *HandREPS*) for monitoring hand function post-stroke. The *HandREPS* system consists of an instrumented glove for monitoring hand movement, an instrumented object for measuring grip strength, and an adaptive virtual reality computer game for providing sensorimotor engagement for people with stroke. My Ph.D. project drove my interest towards understanding the neural basis of UE motor recovery after stroke. In that pursuit, I joined Dr. Ela Plow's lab at the Lerner Research Institute of the Cleveland Clinic to gain greater experience in clinical research for stroke rehabilitation.

2) What is the focus of your current research, and what are some of your findings?

I am the lead postdoctoral researcher on two large randomized controlled trials (RCTs) aimed at improving the rehabilitation outcomes for individuals who have suffered a stroke. One RCT is investigating the efficacy of a non-invasive brain stimulation treatment combined with stimulation-based hand device therapy for severe upper extremity hemiplegia following stroke (N=72, NIH R01HD098073), while the other is investigating the efficacy of stimulation-based hand device therapy for persons with stroke in a multi-site design (N=129, N=22 at Cleveland Clinic, NIH R01HD092351).

During my postdoctoral training, I was awarded the NINDS StrokeNet Clinical Research Training Fellowship. Through this work, I identified and validated an objective method to analyze uncrossed pathway potentials from the undamaged hemisphere of the brain in stroke (N=32). Using this objective method, I also investigated how uncrossed pathway physiology varies across the stroke severity spectrum (N=89). Initial results from our study indicate that uncrossed pathways support paretic limb movement depending on the stroke severity, with individuals with mild impairment exhibiting greater excitability in uncrossed pathways compared to those with moderate to severe impairment. These findings can inform the development of novel, targeted upper extremity rehabilitation interventions for persons with stroke.

3) What are your longer-term career goals?

I have a strong background in biomedical engineering and have received training in sensor-based device development for neurorehabilitation, non-invasive neurophysiology, and clinical trial design and management. My goal is to pursue a career in stroke rehabilitation research, with a focus on developing innovative biomedical technologies that can activate neural pathways and promote functional motor gains. My approach will combine neuromodulatory techniques with task-oriented rehabilitation to tailor interventions to the available neural resources of the patient. Additionally, I will leverage my experience in rehabilitation device technologies to create biomedical technologies for monitoring motor recovery after stroke. Specifically, my focus is on the recovery of arm and hand movement as well as gait kinematics. Through this work, I aspire to gain a deeper understanding of the difficulties faced by those with stroke and ultimately contribute to improving their quality of life.

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