ASNR Meet Our Members: Alex Benedetto

Alex Benedetto received his Bachelor of Science degree in biology from Pennsylvania State University, and he is currently a PhD Candidate in Neuroscience at Northwestern University. He joined ASNR in March of this year to take advantage of the excellent networking opportunities the Society provides within the neurorehabilitation scientific research community.

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

I made the decision to return to school after suffering from a spinal cord injury in 2014, with an initial plan to study environmental science. However, as I progressed with my studies, I found I was more interested in learning about biology and neuroscience. My own personal journey with movement rehabilitation heavily influenced my decision to pursue a research career in that field after graduating in 2020. To gain more neuroscience research experience, I applied and was selected to be an National Institutes of Health Postbaccalaureate Research Education Program (NIH PREP) scholar at Northwestern University. I spent the following year doing research under the guidance of Dr. Matt Tresch and was introduced to the incredible Neuroscience and Movement and Rehabilitation Science departments at Northwestern. I was inspired by the collaborative nature of the departments and felt so at home that I decided to continue my education and pursue my doctorate in neuroscience at Northwestern. I spent my first year in the PhD program rotating in different labs, and I found a valuable co-advisement opportunity with Dr. Monica Perez and Dr. CJ Heckman that enabled me to forge a novel research path that merged my interests in cellular physiology and movement rehabilitation.

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

The primary focus of my research is to understand how the behavior of spinal motor neurons changes following a spinal cord injury. I accomplish this through the utilization of high-density surface electromyography (EMG) recording arrays and signal decomposition algorithms to characterize the firing behaviors of motor units (MUs) during isometric muscle contractions. I am currently concluding a study that is comparing biceps and triceps MUs in individuals with a cervical level spinal cord injury. With these techniques, I can measure the amount of firing rate modulation across increasing contraction intensities and estimate the amount of intrinsic brainstem neuromodulation to the motoneuron pool by quantifying the magnitude of persistent inward currents (PICs). My preliminary analysis is revealing a lack of firing rate modulation in the individuals with spinal cord injury and a pattern of increased neuromodulation associated with higher maximal voluntary contractions. Both of these findings contrast with what I am

observing in non-injured control population. I am also working on two additional studies looking at these properties in lower limb muscles and how they may relate to spasticity and clonus.

3) How have you benefited from your membership in ASNR and receipt of the Diversity Fellowship Award?

Receiving the Diversity Fellowship Award enabled me to travel to the Annual Meeting that was held in San Antonio, an event that I otherwise would not have been able to attend. I am looking forward to being able to participate over the next two years, thanks to the generous financial support from the fellowship.

4) What are your longer term career goals?

I believe there is a tremendous amount of potential for surface electromyography (EMG) recording arrays and signal decomposition algorithms to be further utilized in the field of neurorehabilitation to help us better understand how movement is altered at a fundamental level. After my PhD studies, I plan to pursue a post-doctoral fellowship position and continue research on spinal cord injury movement rehabilitation. The characterization and analysis of motor unit properties provides a great opportunity to understand the physiological changes occurring at the level of the spinal cord. As such, this is a valuable tool that can be used to understand the natural changes after a spinal cord injury, as well as how therapeutic interventions to improve motor function are affecting motoneuron behavior.

You can get connected to Alex by email at alex.benedetto@northwestern.edu.