Meet Our Members: Maria Bandres

Maria is a PhD Candidate at Washington University in St. Louis, working in the Plasticity, Monoamines and Recovery of Function (PMRF) Laboratory directed by Dr. Jacob McPherson. She joined ASNR in 2021 to expand her knowledge and network within the clinical rehabilitation field. Maria was also very interested in ASNR's professional development opportunities for trainees and how our Annual Meetings are optimally sized to allow attendees to make one-on-one connections with others in the field. We were excited to award her the 2023 Presidential Abstract Award, and she was also selected as a member of our 2021 cohort of Diversity Fellows. Maria shares more about herself and her research below.

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

First, I would say that from a very young age I have always been curious and have loved learning new things. I was fortunate to be part of a family that prioritized education and to have a fantastic role model in my mom, an extremely accomplished woman who is constantly learning new skills. As a teenager, I was fascinated by the "science of everyday life", specially by the complexity of the processes required to make objects we use daily. This fascination made me pursue a bachelor's degree in Materials Engineering. This degree allowed to learn the basis of materials science and the main families of materials (i.e., metals, polymers, and ceramics). My exposure to science in college made me realized that scientific research would give me the opportunity to make learning my career.

Secondly, I have a deep sense of duty for supporting the development of our communities and society. This sense of duty comes from my college years. I was in college during a very unstable political and social time in my country (Venezuela) in which one felt that everything was falling into pieces. However, the university I attended (Universidad Simon Bolivar) was a parallel reality in which we (Venezuelans) figured things out, made it work, and while not perfect, we all relentlessly tried our best to preserve it and make it better. Most of this environment was due to the university's values and a strong sense of community that made you feel part of something precious and bigger that yourself. The existence of this 'parallel reality' gave me hope that my country could also be like that one day and showed me the crucial role of science and education for materializing that reality. Thus, my interest in science became more than my love for learning and transformed into an avenue that allows me to contribute to the improvement of our communities and society.

I decided to pursue a PhD in Biomedical Engineering (BME) because I wanted to do research that would improve people's health and quality of life. I joined the BME department at Florida International University, Miami, FL in fall of 2017. An interesting fact about my trajectory is that I never planned to do neuroscience/neurorehabilitation research. During my first semester in graduate school I had to find a new lab for my PhD training due to adverse circumstances. At the time, Dr. Jacob McPherson, the director of a neurophysiology and neurorehabilitation lab was looking for graduate students. I was terrified because I had zero background in those fields. I do not exaggerate when I say that I barely knew what a neuron was back then, but for reasons beyond my understanding, Dr. McPherson took a chance on me. Joining his lab was the beginning of my neuroscience journey, and after more than five years working together, transferring institutions in fall of 2019 (to Washington University in St. Louis, St. Louis, MO), navigating several one-time-in-a-generation events, and an incredible amount of learning, I can confidently say that I could not imagine a better mentor and advisor for my PhD training. Currently, I am in the final stages of my PhD, and I am actively looking for a lab and mentor for my postdoctoral research.

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

The main goal of my PhD research it to improve electrical spinal stimulation therapies that can induce multi-modal benefits (i.e., therapies that address more than one impairment at the same time). We focus on restoring proper movement and reducing neuropathic pain after spinal cord injury (neuropathic chronic pain affects most people living with spinal cord injury). This work originates from the observation that most injuries to the central nervous system often result in motor impairments and changes in pain perception. Yet, while most electrical stimulation-based therapies intended to target movement impairments also impact pain perception (and vice versa), these interventions are developed and evaluated primarily through the lens of either movement or pain alone.

To accomplish this research goal, we conduct basic neuroscience research and applied neuroscience research (both in rodent models). This means that we use the current knowledge we have of spinal neural networks to optimize and find new ways to use therapies for spinal cord injury rehabilitation while also seeking and gaining new knowledge about these networks. Results from our applied neuroscience experiments indicate that electrical spinal stimulation could drive multi-modal benefits after spinal cord injury by simultaneously enhancing proper motor output while reducing activity in spinal pain pathways. In addition, our basic neuroscience research has showed that 'spontaneous' neural transmission in the spinal cord (i.e., spinal neural activity in the absence of sensory inputs or motor outputs) may represent (at least partially) a 'replay' or 'memory' of past experiences and a default state of readiness to execute behaviors during unconsciousness. This research may potentially contribute to our understanding of the transition from perception to action and experience-dependent modification of behavior (i.e., neural learning/plasticity), and it could be relevant for rehabilitation purposes (e.g., a biomarker for neuronal function).

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

I have had many benefits from my ASNR membership since I joined in 2020. First, I have taken advantage of the many training resources that come with it. For instance, I have watched most of their seminars and workshops (available online on demand to active members), and these have been very useful for my professional development. Second, I had the opportunity to become a member of the ASNR Membership Committee, where I have learned more about the logistics and work that is required to make ASNR function while also getting the opportunity to work with and learn from amazing scholars. I highly appreciate that ASNR allows trainees to apply to be part of these committees and gain such a valuable knowledge. Thirdly, I presented my research for three consecutive years at ASNR's annual meetings and was honored to be the recipient of the Presidential Abstract Award to the best basic science poster presented by a student, resident, post-doctoral fellow, or a clinician within five years of training at the 2023 Annual Meeting. During these meetings I can listen to great science and meet and interact with fantastic scientist from all career stages. A particular aspect of ASNR's annual meetings that I highly enjoy is the size because it allows for more one-on-one conversations and networking.

On the other hand, I was also fortunate to be part of the first cohort of the Diversity Fellowship Award in 2020. In addition to financially supporting my attendance at the Annual meetings, this Fellowship also helped me become a member of a vibrant network of colleges with incredible scientific skills and fascinating life stories.

In summary, I have greatly benefited from joining ASNR and from receiving the Diversity Fellowship, and I hope to keep contributing to ASNR's mission in the future.

4) What are your longer term career goals?

After completing my doctoral and postdoctoral training, I aim to become a principal investigator that focusses on the integration of somatic and autonomic neural control. My main interest is pelvic floor neurorehabilitation, and more specifically, neural mechanisms of pelvic floor function and dysfunction. I plan to investigate and leverage these mechanisms to develop and optimize rehabilitation therapies for people living with spinal cord injury, as regaining pelvic floor function (e.g., bladder, bowel, and sexual function; and pelvic pain) remains an unmet challenge for this population. Likewise, I plan to explore the intersection of these two systems to understand the impact of pregnancy on the neural control of the pelvic floor and the development of neuropathic pelvic pain. These scientific inquiries originate from my curiosity in the crosstalk between the autonomic and somatic nervous systems. I believe a deeper understanding of these connections will enable the design of better therapies for spinal cord injury rehabilitation, enhance the treatment of postpartum pelvic floor issues, and facilitate the elucidation of potential treatments for pelvic pain syndromes.

Get connected with Maria on LinkedIn, or follow her on Twitter to learn more.