Meet Our Members: Anisha Kanukolanu

Anisha Kanukolanu is an undergraduate student majoring in neuroscience at the Georgia Institute of Technology (Class of 2023), and she is currently an undergraduate researcher in the Neural Plasticity Research Lab at Emory University led by Dr. Michael Borich. She joined ASNR this year to learn more about the current innovation and work in the neurorehabilitation space. Anisha discusses her scientific career and research in this interview below.

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

Growing up, I had always wanted to understand the brain. Being raised by two highly introspective parents, I was constantly challenged to question the why and the how of my thoughts, emotions, and perceptions. As I tried to understand my abstract contemplations through the lens of the underlying interactions of biology and behavior, I found myself ceaselessly amazed by the complexity of our nervous system. Thus, by middle school, I knew I wanted to study neuroscience. However, it wasn't until I joined the Neural Plasticity Research Lab (NPRL) that I realized my passion for neuroscientific research and discovery. I initially applied to the NPRL to pursue a grant opportunity I had been offered, but I was quickly captivated by the freedom to answer original scientific questions and to critique established knowledge that is unique to neuroscience research. Under the guidance of my advisors, Dr. Michael Borich and Yasmine Bassil, I was encouraged to learn novel methods and develop new perspectives on the material in my neuroscience coursework at Georgia Tech. While I am just beginning my journey as a researcher, I am enthused to see what the future holds.

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

Holistically, my projects in the NPRL focus on studying the behavioral and biological correlates of aging-related impairments in spatial navigation. With the encouragement of my advisors, I have pursued this through the development of a novel virtual reality (VR) maze task (referred to as “NavCity”) that I developed during my time in the NPRL. This VR maze provides an immersive simulation, mimicking human navigation in the natural world. Over the years, I have also been very fortunate to contribute to various other studies and projects within the lab.

My most recent work, presented as a poster at the 2023 ASNR annual meeting, measured aging-related effects on the use of allocentric reference frames during navigation. An allocentric reference frame refers to representations through which landmarks are coded relative to each

other, in a viewer-independent manner. In this study, we paired our previously validated VR city-like navigation maze (NavCity) with a novel cognitive map construction assessment (CMCA) to measure individual ability to encode and recall allocentric information during navigation. We hypothesized that, compared to younger adults, older adults would exhibit decreased navigation ability in NavCity that would be correlated with lower allocentric reference frame utilization from CMARA. Our findings strongly supported prior work, demonstrating older adults have lower navigation performance than younger adults and suggesting that lower performance may be related to reduced utilization of allocentric reference frame information while navigating novel, naturalistic, VR environments. Pairing CMARA with VR-based navigation may provide simple, easy-to-administer indicators of allocentric processing that could help identify individuals who could benefit from intervention to delay the progression of aging-related cognitive decline.

Currently, I am working on my independent thesis project, in which I am studying the effects of aging on task-based functional connectivity in spatial navigation networks using fMRI. In this project, I aim to investigate the neural correlates underlying aging-related navigational deficits, measuring differences in task-based functional connectivity between the retrosplenial cortex and hippocampus in younger and older adults. My thesis research will work towards characterizing the relevance of connections between these brain regions for reference frame utilization during navigation, which may serve as a potential early biomarker of the onset and progression of aging-related cognitive decline.

3) What are your longer term career goals?

As a neuroscience student, my long-term research goal is to leverage global perspectives in developing individualized neurorehabilitative treatments and diagnostics for aging-related cognitive decline and neurodegeneration. Following my graduation, I intend to pursue a joint MD/PhD so that I may leverage my role as a physician scientist to innovate both in the clinic and in the lab and bring cutting edge techniques and methods to best serve my patients and subsequently my research. I aim to develop easily accessible and reliable diagnostic testing to improve early detection of neurodegenerative disease and provide novel individualized neurorehabilitation treatments to improve quality of life for patients experiencing aging-related neurodegeneration. Additionally, I hope to bridge international knowledge to learn from and collaborate with labs around the world to tackle this global challenge.

To learn more, you can connect with Anisha on Twitter and LinkedIn.