

Locomotor Learning & Rehabilitation

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Dr. James Finley is an Associate Professor in the Division of Biokinesiology and Physical Therapy, and the Director of the Locomotor Control Laboratory at USC. His academic journey began as an undergraduate student at Florida A&M University, where he studied Mechanical Engineering due to his interest in automotive engineering and control systems. During his undergraduate years, Dr. Finley had the opportunity to intern at a medical device company in Minnesota, working in their Cardiac Surgery Technologies Division. His exposure to the medical field shifted his career goals and encouraged him to consider ways to combine both engineering and health. Dr. Finley began to pursue his passion in biomedical engineering and states that one of the things that excited him the most about the field is, "...how the brain and nervous system, interacts with our muscular skeletal system to produce movement." He wanted to understand how it all worked and apply engineering principles to that process since there are lots of parallels between biological systems. The ultimate goal for him was to use that knowledge to improve rehabilitation.

During his doctoral degree in Biomedical Engineering from Northwestern University, Dr. Finley learned how to read literature, ask scientific questions, and think critically about the advantages and limitations of different approaches to answer the questions he had

about his field. It was there where he began to learn more about how to communicate science both in a professional setting, and to a broader audience in a way that people could understand.

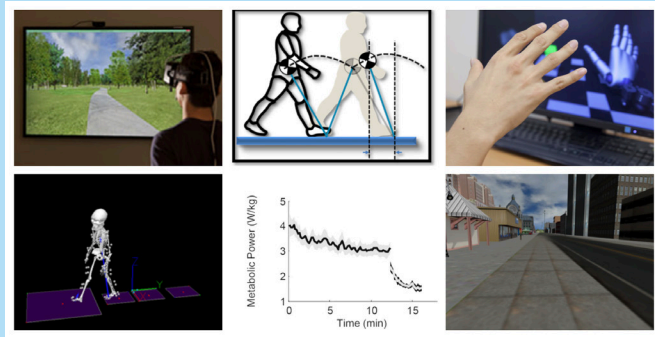
As a postdoctoral student in Neuroscience at Johns Hopkins University, Dr. Finley had the opportunity to work with other passionate individuals within his field who helped him gain experience in running a laboratory and learn ways to build community within that space in order to excite students about their projects. During his time at Johns Hopkins, Dr. Finley knew that he wanted to become a faculty member and start his own laboratory.

In August of 2013, Dr. Finley joined USC and his first major accomplishment was building his Locomotor Control Laboratory in 2015. At the time of completion of his laboratory, Dr. Finley had a list of projects that he wanted to begin. He recruited students and began executing projects that were assigned to him, while also working on new projects that were developing through conversations and collaborations with other passionate researchers at USC.

Dr. Finley and his Locomotor Control Laboratory examine the ways in which movement is controlled and adapted in both the healthy and injured neuromuscular system. A lot of the work conducted in the lab focuses on the development of theoretical models and experiments based on principles of neuroscience, biomechanics, and exercise physiology. The goal of his work is to assist populations with damage to the nervous system by designing novel and effective interventions to improve their mobility.

Dr. Finley's favorite part of research is meeting with his students, discussing new ideas for future projects, and working on the process of designing and experimenting a new project. Meeting with his students

to discuss and analyze data is the part that excites him the most because it is the core of their research; making measurements about how people move, what they do, and what their decisions are. They take this data to infer new knowledge that they were unaware of before, which is then used in the development of their research.



A new project sponsored by the National Science Foundation is in the works for Dr. Finley and his laboratory. They will study the ways in which people *trade-off* risk and effort during walking by examining the decision-making process of individuals when they are faced with a situation that requires them to move their body somewhere safely. For instance, imagine that you are on a hike and need to cross a stream to continue onto the trail. There are two paths that you can take, one of them is short but the rocks are slippery, and you would risk slipping and falling but you could get to the trail quickly. Your second option is a path where the water is shallow and wider, but it will require more time and effort to cross. Hypothetically, which path would you take to cross the stream safely? This is the concept that Dr. Finley is fascinated with because these are the types of decisions we consider when making movements with our body. This idea also comes up in the context of pathology, especially when observing the movement of individuals who have had a stroke and have lost some form of mobility in their body. They may choose to walk with a more effortful strategy that may not look optimal to an able-bodied individual, however, it may be optimal for them given that they are willing to spend more effort to minimize the chances of them falling.

This project is one example of a much broader set of work in the world of what Dr. Finley and his lab call *motor control* and *motor learning*, in order to

understand why people move the way they do. The project also applies principles from a field referred to as *behavioral economics*. This approach will allow them to design new experiments and integrate their virtual reality related work that focuses on the ways people respond to trips and slips when walking.

When asked what advice he would give to students who are thinking about getting involved in research, Dr. Finley suggests that students to commit a year at a laboratory in order to obtain a meaningful experience. A year of work at a laboratory is sufficient for a student to learn new skills and make an original and independent contribution to research. That time will also be beneficial in understanding how the research process works, given that the experiences in a laboratory are unlike the experiences one will have in their educational courses.



Dr. Finley encourages undergraduate and graduate students who are involved in research to think about their work and how it can translate into a publication. He encourages students to talk to their advisors in order to receive guidance in relation to their own goals and long-term career. Dr. Finley states, "If you want to do research over the long run, I personally think that research should be something that excites you." Dr. Finley considers research a challenging career, but in order to get over those challenges and stay motivated, one needs to be passionate about the questions that they are asking. Although it may seem at times that undergraduate and graduate students have limitations as to what they can do, he encourages them to keep moving towards the direction of doing work that inspires them and motivates them to do all the things necessary to conduct their experiments, debug, start over, and move forward.