KYLEE SCHAFFER, Ph.D.

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Schaffer earned Bachelor of Science degrees in both Biomedical Engineering and Mechanical Engineering from Robert Morris University. She went on to obtain her Ph.D. in Biomedical Engineering and Physiology from the Mayo Clinic Graduate School of Biomedical Sciences, with a concentration in Biomechanics. Dr. Schaffer's scientific research focused on the biomechanics of reaching tasks in able-bodied adults and adults with spinal cord injury. She measured trunk and lower extremity joint kinematics, center of pressure motion, and muscle activity to examine how these metrics relate to reaching ability and to evaluate functional limitations of reaching, as well as potential improvements with the application of spinal cord stimulation, in adults with spinal cord injury.

Dr. Schaffer's work has specialized in human biomechanics, with a particular emphasis on normative movement patterns and movement limitations and compensations in the presence of pathology. In combination with her background in human anatomy, physics, and biomedical and mechanical engineering principles, this work provided a foundational knowledge in healthy and pathological human function. She applies this knowledge to her current work in the analysis of kinematics, kinetics, and injury mechanisms present for individuals involved in potentially injurious incidents.

SUMMARY OF EXPERIENCE

- Designed and performed a scientific investigation involving human volunteers to assess the biomechanics of seated and standing reaching tasks.
- Conducted scientific analyses to describe reach performance in adults without spinal cord injury.
- Conducted scientific analyses to understand functional limitations in reach performance in adults with spinal cord injury.
- Conducted scientific analyses to assess potential improvements in reach performance with the application of spinal cord stimulation in adults with spinal cord injury.

AREAS OF SPECIALTY

- Injury Causation Biomechanics
- Trauma / impact biomechanics
- Human Kinematics and Kinetics
- Human Motion Capture Data Collection and Analysis
- Joint Biomechanics
- Spinal Biomechanics
- Human Electromyography Data Collection and Analysis
- Human Injury Mechanisms
- Human Tolerance Thresholds
- Vehicular Accident Reconstruction

EDUCATION

- Ph.D., Biomedical Engineering and Physiology, Mayo Clinic Graduate School of Biomedical Sciences, June 2024
  - Concentration: Biomechanics
- B.S., Engineering (ABET Accredited), Robert Morris University, May 2018
  - Concentration: Biomedical Engineering
  - Minor: University Honors Program
  - Honors: *summa cum laude* (3.98), Engineering Biomedical Concentration Award
- B.S., Engineering (ABET Accredited), Robert Morris University, May 2018
  - Concentration: Mechanical Engineering

PROFESSIONAL EXPERIENCE

November 2024 – Present | ARCCA, LLC | Senior Biomechanist

- Integrates knowledge of biomechanics, anatomy, and physics to analyze injury causation in various events.
- References results from the study of human volunteers and anthropometric test devices to evaluate human tolerance and response to an event.
- Leverages forensic evidence, vehicle/site inspections, computational modeling, and component testing to reconstruct events and assess resultant human kinematics and kinetics.

November 2024 – Present Epic Sports Biomechanics, LLC | Consulting Technician

- Develops assessment protocols to measure an athlete's sport-specific skill performance and injury risk.
- Analyzes biomechanical data and designs training programs that address identified areas for improvement.
- Utilizes a variety of analysis methods, including motion capture, inertial measurement units, and high-speed video, to evaluate athletic movement patterns.

July 2018 – June 2024 | Mayo Clinic Graduate School of Biomedical Sciences | Predoctoral Researcher

- Extensive experience with collection, processing, and analysis of motion capture, wired surface EMG, and pressure mapping data.
- Set-up and troubleshooting of equipment used for data collection.
- Performed data processing and analysis and statistical analysis.
- Performed literature review to identify potential areas for contribution to biomechanics and spinal cord injury research fields.
- Conceived thesis aims, then designed and led a study including 40 participants to address those aims.
- Prepared and submitted NIH F31 grant.
- Audited shoulder biomechanics data in The MotionMonitor.
- Used Matlab to correct data discontinuities and prepare data for analysis.
- Completed data analysis and statistical analysis.
- Created figures and synthesized results for publication.
- Prepared cadaveric knee ligaments for tensile testing and taught this process to postdoctoral lab personnel.

September 2017 – April 2018 | Robert Morris University | Research Intern

- Created Matlab code to visualize and compare previously collected gait datasets.
- First author on abstract titled "The Gait Pattern Changes Associated with Age and Walking Conditions in Healthy Young and Old Korean Adults" presented as a poster at the BMES 2018 Annual Meeting.

February 2017 – June 2017 | UMC Utrecht | Exchange Student Researcher

- Quickly became independent with fluorescence staining and imaging; histological staining; GAG/DNA analysis; DMA testing; generating code to create 3D-printed PCL scaffolds; and passaging, collecting, and seeding MCSs.

- Enhanced analytical skills and independence and gained perspective by living and traveling in a global environment.

May 2016 – July 2016 | East Carolina University | Research Intern

- Created a speckle tracking algorithm in Matlab to track muscle tendon displacement in two dimensions through a range of joint motion.
- Learned how to operate an ultrasound machine and practiced taking ultrasound images.

ACADEMIC CAREER DEVELOPMENT

- Entrepreneurial Leader Launch, January 2022-March 2022
- Writing and Publishing High-Impact Research Manuscripts, March 2020

PROFESSIONAL AFFILIATIONS

- American Society of Biomechanics, 2019-present
- Mayo Graduate School Initiative for Maximizing Student Development (IMSD), 2018-2020
- Mayo Graduate School Graduate Student Association, IMSD Representative, 2018-2019

PUBLICATIONS

Kylee M. Schaffer. (2024). Biomechanics of Reaching in Able-Bodied Adults and Adults with Spinal Cord Injury. Doctoral Dissertation. Mayo Clinic Graduate School of Biomedical Sciences.

Kylee M. Schaffer, Stefan I. Madansingh, PhD, Emma Fortune, PhD, Melissa M. Morrow, PhD, Kristin D. Zhao, PhD, Beth A. Cloud-Biebl, PT, DPT, PhD. (2024). Impact of reach height on estimated rotator cuff compression risk in manual wheelchair users with spinal cord injury. *Journal of Applied Biomechanics*.

"Wheelchair orientation affects estimated rotator cuff compression risk during reaching: A pilot study"
Beth A. Cloud-Biebl, PT, DPT, PhD, Stefan I. Madansingh, PhD, **Kylee M. Schaffer**, Emma Fortune, PhD, Melissa M. Morrow, PhD, Kristin D. Zhao, PhD
Manuscript, *in review*

"Biomechanics of Reaching in Able-Bodied Adults"
Mayo Clinic Graduate School of Biomedical Sciences Student Research Symposium
Poster, September 2023

"Impact of Reach Height on Estimated Rotator Cuff Compression Risk in Manual Wheelchair Users"
Mayo Clinic Graduate School of Biomedical Sciences Student Research Symposium
Poster, September 2022

"Impact of Reach Height on Estimated Supraspinatus Risk in Manual Wheelchair Users"
Virtual 45th Meeting of the American Society of Biomechanics
Thematic poster, August 2021

OUTREACH

Volunteer - Educational Outreach

- Participated in RMU Science Bowl: assisted with running a team quiz game for middle school students, May 2018.
- Participated in RMU STEM Speed Dating: answered questions for high school students interested in studying engineering, March 2017 & November 2016.
- Participated in an RMU panel discussion to answer questions for students interested in applying to fellowships, October 2017.
- Participated in RMU Family STEM Night: helped children learn about STEM by teaching them about DNA through an interactive activity, March 2016.

SKILLS

Technical

- Software: Vicon Nexus, The MotionMonitor, LabChart, Tekscan F-Scan, BodiTrak FSA, Matlab, SPSS, Microsoft Office.
- Exposure to wireless surface EMG (Delsys), IMUs (APDM), isokinetic dynamometer (Humac Norm), and ultrasound operation.
- Experimental setup, including application of EMG electrodes and motion capture reflective markers and interaction with participants.

Project and Data Management

- Led thesis project, including background research, study design, data collection, analysis, and reporting.
- Utilized current literature to develop data collection and analysis protocols.
- Completed documents for submission to the Institutional Review Board for study approval.
- Recruited and scheduled participants for data collection sessions and communicated informed consent.
- Organized a large dataset consisting of multiple participants.
- Managed project timeline and delivered progress reports to mentors.

Dissemination

- Prepared data for presentation at conferences and research symposia.
- Author on a dissertation and two manuscripts to publish results.
- Teaching assistant for biomechanics and biomedical engineering seminar courses.