

Dominic Willoughby

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EDUCATION

University of North Carolina at Chapel Hill, HMSC Chapel Hill, NC
August, 2022

- Pursuing PhD in Human Movement Science
- Member of STARHeel Laboratory under mentorship of Dr. Adam Kiefer

Elon University, Exercise Science Department Elon, NC
May 2019

- B.S. in Exercise Science
- Graduated Magna Cum Laude
- Minors in Psychology and Neuroscience

RESEARCH EXPERIENCE

Children's National Hospital, Department of Pediatric Neuropsychology Rockville, MD
Clinical Research Assistant with Dr. Gerard Gioia and Dr. Chris Vaughan 2021-Present
Coordinated operation of NINDS-funded U54 study identifying biomarkers indicating high probability of developing persistent post-concussive symptoms in children aged 11 to 17. Assisted in IRB approval, data collection, and data management. Maintained existing database for 4 Corners Youth Concussion Registry.

- Developed proficiency in REDCap database software
- Learned specific experimental procedures, such as focused neurological examinations, pupillometry, autonomic testing, and neuropsychological test administration
- Participated in critical administrative tasks, such as IRB submission, revision, and amendments, study logo development, writing assent/consent documents, purchasing MRI equipment, and site coordination and scheduling
- Played crucial role in participant recruitment, retention, and consenting/assenting
- Ran all-day research visits and maintained data records

Elon University Department of Physical Therapy Elon, NC
Biomechanics Lab Manager 2019
Self-driven position intended to organize, coordinate, and assist all ongoing research projects. Manages lab space, equipment, and software, and guides physical therapy graduate students through research projects. Assists with data collection, extraction, analysis, and manuscript drafting.

- Improved project management and organization skills
- Gained confidence in troubleshooting problems that appear in various programs, including Delsys EMGWorks Acquisition and Analysis, Qualisys Task Manager, Visual3D, etc.
- Learned basic MATLAB coding skills
- Improved ability to extract and use available tools to analyze data

Elon University Department of Physical Therapy Elon, NC
Research Assistant with Dr. Shefali Christopher 2019
Assists in management and operation of study identifying injury profile for postpartum runners compared to pre-pregnant women. Using a 3D motion capture system while doing

treadmill and over ground running, body kinematics and kinetics are measured to better understand injury risk and sources of pain in postpartum women.

- Assisted with data collection, extraction, and analysis
- Used tools such as Qualisys Task Manager, Visual 3D, MATLAB, Delsys EMG,
- Present for all troubleshooting needs – solved problems ranging from QTM errors to hardware malfunctions
- Provided 3D analysis of running gait to participants
- Used MATLAB codes to analyze data

Elon University Department of Physical Therapy

Elon, NC

Research Assistant with Dr. Vallabhajosula

2019

Due to prior research showing individuals with Multiple Sclerosis fatigue due to thermal exhaustion, this study aims to identify the use efficacy of using a cooling vest to improve performance of patients with MS. Using dual-tasks measures in which patients have to perform both physical and cognitive tasks, functional performance is measured with and without a cooling vest intervention.

- Present for pre- and post-testing, and treatment visits
- Assisted in overseeing undergraduate help
- Ensured participant safety and positive experience during all visits
- Troubleshooting technical difficulties that arise

Elon University Department of Physical Therapy

Elon, NC

Research Assistant with Dr. Shefali Christopher

2019

Aided in the collection and organization of Athletics Testing project. This project aimed to identify how athletes performed on the collegiate level before and after injuries. Athletes' injuries are tracked and retested to determine changes in performance, hoping to identify specific injury profiles to better target treatment.

- Coordinated nine separate stations for data collection
- Managed flow of 15+ participants through stations
- Extracted/processed data collected using MATLAB
- Organized collected data in organized ways for presentation to coaches

Elon University Department of Exercise Science

Elon, NC

Research Assistant with Dr. Matthew Wittstein

2018 - 2019

Independent project clarifying the biomechanical mechanism behind the relationship increased risk of lower extremity musculoskeletal injuries following return to sport after a concussion. Using valgus torque on load acceptance and cutting, muscular activation pattern, and torso sway as analogs for ACL injury risk, this study hopes to identify altered motion patterns that may indicate increased injury risk following a concussion.

- Independently developed research question, created research design, attained IRB approval, collected and analyzed all data, and troubleshooted all pipeline issues.
- Learned 3D motion capture and analysis programs Qualisys Task Manager and Visual3D.
- Became confident with electromyography (EMG) placement and data analysis.
- Attend Journal Club to read, discuss, and keep updated on current research on the topic of concussions.
- Project intended to serve as a proof-of-concept for NSF Graduate Research Fellowship grant proposal.

Stanford University Department of Engineering and Medicine

Stanford, CA

Research Intern with Dr. Scott Delp

Summer 2018

As part of an ongoing investigation aiming to reduce the effects of knee osteoarthritis, this study assessed the effect of foot placement angle during normal gait and chronic pain in aging osteoarthritic patients. Using 3D motion capture, patients received real time feedback to assist learning a new foot placement angle to reduce knee adduction moment, and ultimately reduce pain from condition.

- Assisted with MATLAB coding for data management.
- Aided in manuscript revision.
- Attended Journal Club meetings to discuss current research and provide constructive feedback on project happening within the lab.
- Worked with Cortex and OpenSim for motion data collection and analysis.
- Contributing author on Osteoarthritis Research Society International presentation and future publication.

Elon University Department of Psychology

Elon, NC

Research Assistant with Dr. Rachel Force

February – December, 2017

This project aimed to evaluate the neuromodulatory potential of tDCS (transcranial direct current stimulation). Using electrical stimulation during skill acquisition has previously been shown to improve speed of learning. To further clarify this effect, tDCS was administered to participants learning new balance-based skills. Participants were then assessed on their ability to maintain posture using Biodex Balance System and Y-Bar Balance Test.

- Administered low-current tDCS on participants primary motor cortex and dorsolateral prefrontal cortex.
- Independently designed and implemented motor control dimension of project and led participants through a brief bout of physical activity during tDCS treatment.
- Practiced methods for collecting neurophysiological data, such as electroencephalography, galvanic skin response, and behavioral task data.
- Attended Journal Club to discuss updates in neuromodulatory research.

PUBLICATIONS**A SWOT Analysis of Portable and Low-Cost Markerless Motion Capture Systems to Assess Lower-Limb Musculoskeletal Kinematics in Sport**

2021

- Co-authorship with Dr. Courtney Armitano-Lago and Dr. Adam Kiefer on systematic review paper intended for publication in *Frontiers in Sports and Active Living*. Article discusses strengths, weakness, opportunities, and threats to current utility of various markerless motion capture systems.

LABORATORY SKILLS and TECHNIQUES

- 3D motion capture collection and analysis, including Qualisys Task Manager, Coretex, Visual 3D, and OpenSim
- Proficient with troubleshooting errors in motion capture and analysis
- Experienced with Delsys Legacy sensors and managing arising issues
- Comfortable with APDM Opal sensors, Moveo Explorer, and Mobility Lab
- Familiarity with tools, including Zeno Walkway, GaitRite, BioDex Dynamometry, NordBoard, and LoadSol loaded shoe inserts
- Able to extract data such as reactive strength index, dynamic postural stability index, and many biomechanical measures from collected data
- Electromyography sensor placement and analysis

- Electroencephalography 68-electrode cap placement and collection
- Electrocardiography 12-lead collection and analysis
- Proficient with a number of health assessments, including $VO_{2\text{Max}}$ tests, Wingate test, Queens/Forestry step test, submaximal aerobic tests, anthropometric measurements, BioDex strength testing, and more
- REDCap survey development and database management
- NeurOptics Pupilometry collection and analysis
- BIOPAC CNAP autonomic testing apparatus data collection
- Neurological and neuropsychological testing

OTHER EXPERIENCE

UNC - Chapel Hill Anatomy Teacher Assistant 2022

- Offered office hours to students seeking additional support
- Generated test questions and additional study materials for students
- Taught section of course material on muscles

Elon University Biomechanics Teacher Assistant and Tutor 2017-2019

- Attended all Biomechanics lab meetings and assisted students with comprehension of linear and angular kinematics and kinetics, and basic fluid dynamics.
- Prepared lab materials, answered questions, graded assignments, and assisted the professor with developing course material and setting up in-lab activities.
- Remained available outside lab times for tutoring: reviewed material, homework assignments, answered curriculum-related questions, and revised papers with students.

Elon University Student Athletic Trainer 2015-2019

- Support professional training staff during home and away games and practices
- Assists in treatment of injured patients, overall health of athletes, and first response care as necessary

Elon University Practicum January 2018

Program within Elon University Exercise Science Department intended to teach students about potential occupations following graduating with a B.S. in exercise science through hands on experience.

- Collective 80 hours of internship with Elon Athletic Training, Stewart Physical Therapy, and Cone Health Sports Therapy Clinic.
- Learned about pain, pain management, and methods to treat injuries.
- Improved patient-clinician relationship skills.

Stanford University Physical Therapy Summer 2017

- 64 hours shadowing therapists, learning about the physical therapy field.
- Maintained upkeep of facility and material stocks.
- Assisted with treatment of varsity athletes from numerous sports.

Elon University Club Fencing 2015-2019

- Started Elon University's first club fencing team.
- Secured interest, support, and funding to ensure club's success.

- Acted as president and coach for the first 3 years.
- Transitioned leadership and coaching to ensure longevity of the club.

AWARDS and ACHIEVEMENTS

Elon University 2018 President’s List Fall 2018
 Awarded for achieving no grade below A- during Fall Semester.

Elon University 2015-2017 Dean’s List Fall 2015 – Spring 2018
 Awarded for achieving no grade below B+ during seven consecutive semesters.

Elon University Exercise Science Major of the Year Award Spring 2019
 Awarded to one graduating senior who achieves exemplary performance over their time in the Exercise Science department.

Kappa Omicron Nu Exercise Science Honors Society Chapter President 2018- 2019
 Inducted into KON society for achieving performance in the top 10% of Elon’s Exercise Science department, voted president by peers.

Psi Chi Psychology Honors Society Member Spring 2019

National Honors Society of Sports Medicine Inductee Spring 2015

US Fencing Academic All-American 2015

Relevant Course Work

Biomechanics (with lab)	Theory of Practical Strength and Conditioning
Physiology of Exercise (with lab)	Sensation and Perception
Human Anatomy (with lab)	Abnormal Psychology
Human Physiology (with lab)	Exercise Psychophysiology
Neuromotor Control of Human Movement	Sport Psychology
Behavioral Neuroscience	Cell Biology (with lab)
Bioenergetics of Physical Activity	Therapeutic Approach to Exercise
General Chemistry 1& 2 (with lab)	Research Methods in Exercise Science
Cognitive Psychology	