



BACKGROUND

Dr. Urbanczyk received a Bachelor of Science in Bioengineering from the University of California, San Diego and a Master of Science in Biomedical Engineering from Duke University. She went on to obtain a Doctorate of Philosophy in Bioengineering from Imperial College London. Her research has included human volunteer studies, 3-D motion analyses, and computational modelling to assess injury mechanisms and design intervention strategies to reduce injury risk.

Dr. Urbanczyk has years of academic and professional experience in trauma biomechanics. She has implemented various imaging modalities and designed medical devices to investigate human kinematics and kinetics that influence injury causation. She specializes in understanding the unique biomechanical attributes of the human body that effect response to external forces, such as occur in potentially injurious scenarios including impacts, automotive collision, slips, and falls. Dr. Urbanczyk has served in advisory roles on scientific programs focused on injury prevention, for national and international organizations.

SUMMARY OF EXPERIENCE

- Applies expertise in bioengineering principles, anatomy, and physiology to analyze human kinematics, kinetics, and injury causation during adverse events.
- Investigated spine and shoulder biomechanics during activities using 3-D motion analysis, electromyography, and computational modeling.
- Examined injury causation mechanics during blast and blunt impact loading using diagnostic imaging methodologies in neurological and musculoskeletal applications.
- Performs destructive and non-destructive mechanical testing of safety equipment under external loading conditions.
- Developed training programs to minimize injury and improve performance, in the context of biomechanical attributes.
- Designed medical device delivery solutions and implemented imaging modalities in orthopaedic environments.

AREAS OF SPECIALTY

- Injury Causation Biomechanics
- Shoulder & Spine Biomechanics
- Brain Injury Mechanics
- Accident Reconstruction
- Slip/Trip/Fall Kinematics
- Tolerance & Failure Analysis
- Sports Biomechanics

EDUCATION

- Doctor of Philosophy in Bioengineering, Imperial College London, 2021
 - *Dissertation: "Using Biomechanics to Define the Role of the Upper Extremity in Rowing Performance"*
 - *Certification: Associate Fellow of the Higher Education Academy, 2019*
- Master of Science in Biomedical Engineering, Duke University, 2015
 - *Thesis: "Material Characterization of In Vivo and In Vitro Porcine Brain Using Shear Wave Elasticity"*
- Bachelor of Science in Bioengineering, University of California San Diego, 2009

PROFESSIONAL EXPERIENCE

September 2021 – Present | ARCCA, Incorporated | Senior Biomechanist

- Applies the principles of engineering to human anatomy and physiology to explore the nature and severity of injuries.
- Utilizes expertise in biomechanics to examine injury causation in automotive collisions, sporting incidents, or slip, trip and fall events.
- Communicates findings on injury causation based on scientific analysis, including component testing, site/vehicle inspections, and computational modeling.

October 2017 – September 2021 | Imperial College London – Bioengineering, Surgery & Cancer | Doctoral Research Fellow

- Developed and lead sport performance research in 3-D motion analysis and computational modeling of rowing within the Musculoskeletal Biomechanics Lab.
- Analyzed links between human kinematics, biomechanics, injury prevention, and performance optimization.
- Served as a consultant in performance and injury prevention, to national sports organizations including British Rowing.
- Managed relationships with and deliverables to external stakeholders and collaborators.
- Supervised Bioengineering masters and undergraduate thesis projects.

June 2016 – August 2017 | United States Patent and Trademark Office - Biomedical Engineering Art Unit | Patent Examiner

- Reviewed patent applications for legal compliance, technical specifications, drawings, and claims for novelty and inventive step compared to state of the art.
- Acted as technical expert to communicate findings on patentability to inventors and offer strategic advice to patent law practitioners.

August 2010 – December 2015 | Duke University – Biomedical Engineering, Orthopaedic Surgery | Graduate Research Staff

- Refined project process on high speed biplanar X-ray system for analysis of human shoulder dynamic overhead motion. Analyzed bone/cartilage MRI segmentation for 3-D model registration and reconstruction.
- Refined ultrasound imaging methodologies for analyzing shock wave propagation in brain during blast and blunt impact loading and for characterizing brain and spinal cord mechanical properties *in vivo*.
- Oversaw tutorials and laboratory coursework for Medical students and Biomedical Engineering undergraduates.

June 2009 – July 2010 | University of California San Diego – Bioengineering, Orthopaedic Surgery | Associate Research Staff

- Examined active and passive mechanical properties of skeletal muscle using biomechanical testing and histological techniques.

PROFESSIONAL ASSOCIATIONS

Society of Automotive Engineers (SAE)
 Royal Society of Medicine (RSM)
 Institute for Physics and Engineering in Medicine (IPEM)
 International Society of Biomechanics (ISB)
 International Society of Biomechanics in Sports (ISBS)
 European Society of Biomechanics (ESB)
 European College of Sports Science (ECSS)
 Society of Women in Engineering (SWE)

AWARDS & HONORS

2019 New Investigator Award Finalist – International Society of Biomechanics in Sports
 2019 International Society of Biomechanics in Sport – Research Award
 2019 City & Guilds Old Centralians’ Trust – Research Award
 2017 Imperial College London – President’s PhD Scholarship
 2015 National Neurotrauma Society – Research Award
 2013 IEEE – International Ultrasonics Symposium - Research Award
 2005 University of California, San Diego - Women’s Rowing Athletic Scholarship

SELECTED PUBLICATIONS & PROCEEDINGS

Urbanczyk, CA., (2021). Using Biomechanics to Define the Role of the Upper Extremity in Rowing Performance. Doctoral Dissertation. Imperial College London.

Urbanczyk CA., Bonfiglio, A., McGregor AH., Bull AMJ. (2021). Comparing Optical and Electromagnetic Tracking Systems to Facilitate Compatibility in Sports Kinematics Data. *International Biomechanics*. 8(1), 75-84.

Urbanczyk, CA., Prinold, JAI., Reilly, P., Bull AMJ. (2020). Avoiding High Risk Rotator Cuff Loading: Muscle Force During Three Pull-Up Techniques. *Scandinavian Journal of Medicine and Science in Sports*. 30(11), 2205-2214.

Taborri, J., Keogh, J., Kos, A., Santuz, A., Umek, A., **Urbanczyk, CA.**, van der Kruk, E. and Rossi, S. (2020). Sport Biomechanics Applications Using Inertial, Force, and EMG Sensors: A Literature Overview. *Applied Bionics and Biomechanics*.

Urbanczyk, CA., McGregor AH, Bull AMJ. (2020). Fatigue Leads to Altered Spinal Kinematics During High Performance Ergometer Rowing. *ISBS Proceedings Archive*. 38(1), 256-259.

Urbanczyk, CA., McGregor AH, Bull AMJ. (2019). Modelling Scapular Biomechanics to Enhance Interpretation of Kinematics and Performance Data in Rowing. *ISBS Proceedings Archive*. 37(1), 133-136.

Urbanczyk, CA., Palmeri, ML., Bass CR. (2015). Material Characterization of in Vivo and in Vitro Porcine Brain Using Shear Wave Elasticity. *Ultrasound in Medicine & Biology*. 41(3), 713-723.

McCarty WJ., Sundaramurthy P., **Urbanczyk CA.**, Patel A., Hahr J., Sah RL., Sotoudeh M., Ratcliffe A. (2011). Apparatus and Method for Assessing Condition of Articular Cartilage. *United States Patent Application Publication: US 2011/0082389*.



McCarty WJ., Luan A., Sundaramurthy P., **Urbanczyk CA.**, Patel A., Hahr J., Sotoudeh M., Ratcliffe A., Sah RL. (2011). An Arthroscopic Device to Assess Articular Cartilage Defects and Treatment with a Hydrogel. *Annals of Biomedical Engineering*. 39(4), 1306-12

VOLUNTEER POSITIONS & DEPARTMENTAL SERVICES

- President, University of California San Diego Alumni UK (2019 - 2022)
- PhD Representative, Department of Bioengineering, Imperial College London (2018 - 2020)
- Vice President, Raleigh Rowing Center (2013-2016)
- Women's Novice Coach - Triangle Juniors Rowing Club (2016)
- Men's Novice Coach - Duke University Crew Team (2010 – 2012)