



Julia de Lange, M.A.Sc., Ph.D., E.I.T.

(she/her)

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EXPERT SUMMARY

Dr. Julia de Lange is an Associate with the Biomechanics & Personal Injury group, specializing in high-rate injury causation. Her Ph.D. research focused on upper extremity injuries for ballistic trauma applications. She also has biomechanics experience investigating the injury tolerance thresholds for the human foot/ankle complex under combined ankle rotations for vehicle collisions. She has taught biomedical engineering courses at McMaster University and is a member of the Professional Engineers of Ontario (PEO).

SPECIALIZED PROFESSIONAL COMPETENCIES

- Injury Biomechanics
- Biomechanical Modelling of Human Movement
- Occupant Motion during Motor Vehicle Collisions
- Seatbelt Use and Effectiveness
- Helmet Effectiveness
- Pedestrian Collisions
- Extremity Injuries
- High-rate Injuries
- Safety Standards

ACADEMIC BACKGROUND

Ph.D., Biomedical Engineering, McMaster University, Hamilton, ON, 2023

Ph.D. Thesis: Injury Risk to the Upper Extremity Resulting from Behind-Shield Blunt Trauma

M.A.Sc., Biomedical Engineering, McMaster University, Hamilton, ON, 2019

M.A.Sc. Thesis: Biomechanical Tools for Assessing Foot and Ankle Injury Risk in Frontal Automotive Collisions

B.Eng., Biomedical Engineering, University of Guelph, Guelph, ON, 2016

GRADUATE LEVEL COURSES

McMaster University:

- BIOMED 715 – Biomechanics of Injury and Prevention, School of Biomedical Engineering
- BIOMED 705 – Biomedical Engineering II, School of Biomedical Engineering



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- BIOMED 707 – Biomedical Engineering I, School of Biomedical Engineering
- MECHENG 717 – Current Topics in Orthopaedic Biomechanics, Mechanical Engineering Department
- MEDSCI 771 – Research Methods in Basic Health Sciences, Medical Sciences Department

RESEARCH ACTIVITIES

Quantifying Injury Limits of the Forearm, Ph.D. Thesis, 2023

- Develop injury risk curves for discrete locations in the forearm for evaluating risk of behind-armor blunt trauma, conducted in partnership with Defence Research and Development Canada (DRDC)
- Based upon experimental data obtained, evaluated a finite element model of the upper extremity

Instrumented Boot to Detect Fracture Risk at Alternate Ankle Postures, M.A.Sc. Thesis, 2019

- Optimized a previously developed and calibrated instrumented boot for foot injury risk prediction in frontal automotive collisions through a new calibration protocol
- Impacted cadaver lower leg specimens to assess fracture tolerance in combined ankle postures and compare these results to forces obtained through crash test dummies under similar impact conditions, in order to develop injury risk curves and assess the biofidelity of two commonly used dummies

PROFESSIONAL EXPERIENCE

30 Forensic Engineering

Associate, Biomechanics & Personal Injury Group
2020 – Present, Toronto, ON

- Conducting technical investigations involving the determination of the mechanics of injury and performance of restraint systems and protective devices

McMaster University, Integrated Biomedical Engineering & Health Sciences (iBioMed)

Sessional Instructor, 3P04 Health Solutions Design Projects III
2023, Hamilton, ON

- Instructed over 150 third-year biomedical engineering students on current biomechanics trends and challenges

Hastings, Boulding, Correia Consulting Engineers & Scientists

Biomechanics Consultant
2018, Hamilton, ON

- Assisted with forensics cases as a biomechanics consultant to perform assessments of injury mechanisms based upon the medical documentation provided, and the circumstances in which the injuries occurred



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McMaster University, Mechanical Engineering Department

Graduate Teaching Assistant
2019, Hamilton, ON

- Relevant courses:
 - MECH ENG 3M03
- Hand selected for this course to instruct mechanical engineering students from a variety of disciplines on the use of machinery equipment

McMaster University, Electrical Engineering Department

Graduate Teaching Assistant
2017 – 2018, Hamilton, ON

- Relevant courses:
 - ENG 2MM3, Electrical Circuits and Power
 - EE 2C15, Introduction to Electrical Engineering
- Instructed 130 second- and third-year undergraduate engineering students from a variety of disciplines on electrical circuit theory
- Provided leadership during tutorials and office hours by guiding students through their coursework to ensure a thorough understanding of the material being instructed
- Evaluated and graded coursework, provided constructive feedback to students, and invigilated midterms to clarify test material when required

PROFESSIONAL SOCIETIES AND ASSOCIATIONS

- International Society of Biomechanics
- Canadian Society of Biomechanics
- Ontario Society of Professional Engineers
- Professional Engineers Ontario

VOLUNTEER / COMMITTEE PARTICIPATION

- Engineering Graduate Society, 2017 – 2020
- Engineering Travel Awards Selection Committee, 2017 – 2020
- McMaster Graduate Council, 2019 – 2020
- Women in Engineering, 2018 – 2020
- Faculty of Engineering Council, 2019 – 2020

**SPEAKING ENGAGEMENTS**

Academic Meetings

- International Research Council on the Biomechanics of Injury (IRCOBI), 2022. Porto, Portugal
 - Presentation: Characterising the Backface Deformation (BFD) of Ballistic Shields using an Augmented WorldSID Upper Limb
 - Awarded best presentation in the 'High Energy Trauma' session
- North American Congress on Biomechanics (NACOB), 2022. Ottawa, Canada
 - Presentation: Elbow Loading due to Back Face Deformation of Ballistic Shields
- Biomedical Engineering Symposium, 2022. Hamilton, Ontario
 - Presentation: Upper Extremity Loading due to Backface Deformation of Ballistic Shields
 - Awarded second place presentation award
- McMaster Engineering Technology, Research and Innovation Conference (METRIC), 2021. (presented online)
 - Presentation: Quantifying Behind Shield Blunt Trauma using a Modified Crash Test Dummy Arm
- International Society of Biomechanics (ISB), 2021. (presented online)
 - Presentation: Quantification of Loading to the Upper Limb Behind a Ballistic Shield Using a Novel Modified ATD Arm
- Canadian Biomaterials Society – Southwestern Ontario Student Chapter Research Symposium, 2021(presented online)
 - Presentation: The cadaveric foot impact response in comparison to an ATD foot
- Injury Biomechanics Research Symposium, 2021 (presented online)
 - Presentation: Investigation of the Biofidelity of the MIL-Lx Foot
- International Research Council on the Biomechanics of Injury (IRCOBI), 2020 (presented online)
 - Presentation: Investigation of the Biofidelity of the MIL-Lx Foot
- Current Research in Engineering, Science and Technology Meeting (CREST). Hamilton, Ontario. (COVID cancelled)
 - Presentation: Investigation of a Crash Test Dummy Foot Response
- International Research Council of Biomechanics of Injury (IRCOBI), Florence, Italy, 2019
 - Presentation: Evaluation on the Distribution of Forces on the Foot Under Axial Impact Loading to Assess Variations Among Altered Ankle Postures between Two ATD Models
- Ohio Injury Biomechanics Symposium, Columbus, Ohio, 2019
 - Presentation: Influence of Ankle Posture and ATD Model on the Distribution of Forces on the Foot Under Impact Loading
- Biomedical Engineering Symposium, Hamilton, Ontario, 2019
 - Presentation: Influence of Ankle Posture and Dummy Model on the Distribution of Forces on the Foot under Impact Loading



Other Speaking Engagements

- Stieber Berlach Seminar, Toronto, Ontario, 2023
 - Presentation: Current Science in Concussion and Head Injury
- Guest Lecturer: Laurentian University, ENGR-3566EL Biomechanics of Living Tissues, Online, 2023
 - Presentation: Injury Biomechanics Research: Developing Ballistic Shield Standards for Preventing Upper Extremity Injuries
- Guest Speaker: McMaster Medical Engineering Design Team (MED-T) Workshop, McMaster University, 2023
 - Presentation: Injury Biomechanics Research: Developing Standards for Ballistic Shields
- Judge: McMaster Design League CAD Designathon. McMaster University, 2023
- Guest Lecturer: University of Waterloo, ME 598 Engineering Biomechanics, Online, 2022
 - Presentation: Injury Biomechanics in Industry
- Guest Lecturer: McMaster University, MECHENG 4CC3 Experimental and Computational Biomechanics, 2022
 - Presentation: Injury Biomechanics II
- Guest Lecturer: University of Waterloo, KIN 326 Forensic Biomechanics, Online, 2022
 - Presentation: Injury Biomechanics
- Panelist: Professional Development Seminar, University of Guelph, Online, 2022
- 4th Motor Vehicle Litigation Summit, Online, 2021
 - Presentation: Biomechanical Analysis in Motor Vehicle Collision Cases
- Guest Lecturer: University of Waterloo, KIN 326 Forensic Biomechanics, Online, 2021
 - Presentation: Injury Biomechanics
- Undergraduate Summer Research Engineers, McMaster University, Online, 2020
 - Presentation: How to Create and Present a Research Poster
- Panelist: Preparing for Graduate School, McMaster University, Online, 2020
- Undergraduate Summer Research Engineers, McMaster University, Hamilton, Ontario, 2019.
 - Presentation: How to Create and Present a Research Poster
- Panelist: Exploring Pathways in STEM, Women in STEM, Hamilton, Ontario, 2019

AWARDS AND ACHIEVEMENTS

- Liburdi Engineering Doctoral Scholarship, 2023
- CSB-SCB Travel Grant, 2022
- School of Biomedical Engineering Travel Award Grant, 2022
- Queen Elizabeth II Graduate Scholarship in Science and Technology, 2019, 2020, 2021

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- Clifton W. Sherman Scholarship, 2019
- International Research Council on the Biomechanics of Injury Travel Grant, 2019, 2020, 2022
- Engineering Graduate Society Travel Grant, 2019
- McMaster University – Biomedical Engineering PhD Scholarship, 2019 – 2023
- BME Symposium Presentation Award Winner, 2019
- Engineering Graduate Society Travel Grant, 2018
- McMaster University – Biomedical Engineering M.A.Sc. Scholarship, 2017 – 2018

PUBLICATIONS AND ACADEMIC SPEAKING ENGAGEMENTS

Peer-Reviewed Research Publications

- Brewer, C., Shakib, A., de Lange, J.E., Quenneville, C.E. (2023). Estimation of injury limits at vulnerable impact locations along the forearm via THUMS AM50 finite element model at airbag loading rates. *Submitted to Accident Analysis and Prevention.*
- de Lange, J.E., Burrows, L.J., Quenneville, C.E. (2023). Injury Risk Functions for the Midsized Male Wrist and Elbow as a Result of Behind Shield Blunt Trauma. *Submitted to the Journal of Biomechanical Engineering.*
- de Lange, J.E., Burrows, L.J., Wadera, A., Quenneville, C.E. (2023). Injury Risk for the Hand and Forearm Under Shield Behind Armour Blunt Trauma Loading. *Under Revision at Annals of Biomedical Engineering.*
- de Lange, J.E., Burrows, L.J., Binette, J.-S., Quenneville, C.E. (2023). Behind Shield Blunt Trauma: Characterizing the Back-Face Deformation of Shields with a Focus on Upper Limb Loading. *Annals of Biomedical Engineering*, 1-12.
- Steinmann, N., de Lange, J.E., Binette, J.-S., Quenneville, C.E. (2022). Quantification of Behind Shield Blunt Impacts Using a Modified Upper Extremity Anthropomorphic Test Device. *Journal of Biomechanical Engineering*, 144(9), 091010.
- de Lange, J.E., Quenneville, C.E. (2021). The Axial Impact Response and Plantar Load Distribution of the Hybrid III and Military Lower Extremity Under Altered Ankle Postures. *Journal of Biomechanical Engineering*, 144(1), 011003.
- Acharya, I., Van Tuyl, J.T., de Lange, J., Quenneville, C.E. (2019). A Force-Sensing Insole to Quantify Impact Loading to the Foot. *Journal of Biomechanical Engineering*, 141(2), 024501.

Peer-Reviewed Conference Proceedings

- Burrows, L., de Lange, J., Quenneville, C.E. (2023). The Injury Tolerance of the Upper Extremity from Behind-Shield Blunt Trauma Mechanisms. *IRCOBI Conference Proceedings*. (No. IRC-23-72).
- de Lange, J.E., Burrows, L.J., Binette, J.-S., Quenneville, C.E. (2022). Characterizing the Back-face Deformation of Ballistic Shields using an Augmented WorldSID Upper Limb. *IRCOBI Conference Proceedings*. (No. IRC-22-65).
- de Lange, J., Quenneville, C.E. (2020). Investigation of the Biofidelity of the MIL-Lx Foot. *IRCOBI Conference Proceedings*. (No. IRC-20-77).



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- Steinmann, N.D., de Lange J., Quenneville, C.E. (2020). Quantification of Loading to the Upper Limb Behind a Ballistic Shield Using a Novel Modified ATD Arm. *IRCOBI Conference Proceedings, Short Communication*. (No. IRC-20-81).
- de Lange, J., Quenneville, C.E. (2019). Influence of Ankle Posture and ATD Model on the Distribution of Forces on the Foot Under Impact Loading. *IRCOBI Conference Proceedings* (No. IRC-19-100).

Other Conference Proceedings

- de Lange, J., Quenneville, C.E. (2021). Investigation of the Biofidelity of the MIL-Lx Foot. *16th Annual Injury Biomechanics Symposium*. Columbus, OH.
- de Lange, J., Quenneville, C.E. (2019). Influence of Ankle Posture and ATD Model on the Distribution of Forces on the Foot Under Impact Loading. *15th Annual Injury Biomechanics Symposium*. Columbus, OH.

Contributions to Highly Qualified Personnel

- Burley, Emily. Undergraduate Thesis (2023). Thesis Title – Feet and ankle injuries in automobile collisions.
- Yang, Olivia, Undergraduate Summer Researcher (2022).
- Wong, Lindsey, Undergraduate Thesis (2020). Thesis Title – The effects of ankle posture on foot impact response for frontal automotive collision applications.