



Alyssa DeMarco

MS PEng

Senior Biomechanical Engineer

contact

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📍 Vancouver

expertise

Injury Biomechanics

areas of specialization

Injury mechanics/causation

Injury potential

Motor vehicle collision injury

Seat belt investigations

Helmet investigations

Sport injuries

Ms. Alyssa DeMarco is a senior biomechanical engineer in MEA Forensic's Vancouver office. She works in the firm's Injury Biomechanics Group. Over her 20-years at MEA, she has investigated the injury risk of over 1500 events including automobile collisions, sports and occupational activities.

Determining the injury risk of an automobile collision is a multi-step process. "First, we understand how the vehicle moved during the collision, then we determine how occupants would move and the forces they would be exposed to," says Alyssa. Then, using injury tolerance data from the scientific literature and taking relevant factors such as medical history into account, the risk of injury can be estimated. "Each case is unique," notes Alyssa.

Alyssa has a Bachelor's degree in Mechanical Engineering from Michigan Technological University and a Master's degree in Bioengineering from the University of Utah. During her Master's research she tested cadaveric hips to evaluate clinical fracture treatments. Alyssa is registered as a professional engineer in British Columbia and Ontario and testifies as an expert witness in court.

Since joining MEA, Alyssa has published peer-reviewed studies on various biomechanical topics including seat belts, child seats, and helmets. She has also tested mouthguard and helmet sensors that measure head impact severity for football players. She relies on her research experience when she is asked to investigate whether an injury would have been mitigated by one of these safety devices. Alyssa's helmet research has made her a leading expert in their benefits and limitations. Many of her research questions come from integrating her biomechanical knowledge with her real-world experiences snowboarding and cycling. She has tested thousands of helmets, impacting them at different locations and at different severities, to measure the protection they provide.

In both her research and her casework, Alyssa is committed to finding the truth. "I'm inquisitive, honest and never willing to compromise my integrity," she notes. "These are also the core values of MEA."

education

Master of Science, Bioengineering, University of Utah, 2000

Bachelor of Science, Mechanical Engineering, Michigan Technological University, 1998

professional status

Registered Professional Engineer

Association of Professional Engineers and Geoscientists of British Columbia, Registration No. 30935.

Professional Engineers Ontario, License No. 100192042.

professional associations

Association for the Advancement of Automotive Medicine (AAAM), since 2013.

International Society of Biomechanics (ISB), since 2019.

professional experience

MEA Forensic Engineers & Scientists

Senior Biomechanical Engineer, 2000 to present

Conducts technical investigations for biomechanical analyses of injury-producing events. Biomechanical analyses include assessments of the injury mechanics, the loads applied to the body, and the relationship between the applied loads and the injury. Performs seat belt effectiveness and helmet effectiveness analyses. Conducts research on the biomechanics of injury, occupant kinematics in motor vehicle collisions and helmet performance. Qualified as an Expert Witness in the Supreme Court of British Columbia.

University of Utah, Orthopedic Bioengineering Research Laboratory, Salt Lake City, UT

Research Associate, 1998 to 2000

Performed orthopedic research focused on the evaluation of several clinical treatments for hip fractures. Investigated the accuracy of contact pressure measurement systems used in orthopedic research. Conducted all phases of testing including design and development of testing equipment, data acquisition, and statistical analysis. Also contributed to the writing of grants and scientific manuscripts.

General Motors Corporation, Delphi Energy and Engine Management Systems, Flint, MI

Summer Intern, Summers 1994 to 1998

Involved in test engineering for fuel pumps and accelerator pedal modules. Contributed to industrial engineering projects for modular fuel level senders and product/process engineering projects for exhaust manifolds and spark plugs. Participated in quality engineering for spark plugs.

research activities

Lead investigator for a study investigating the impact performance of helmets at, above and below the test line specified in certification standards.

Lead investigator for a study investigating the impact performance of new, old and used helmets.

Lead investigator for a study investigating child seat effectiveness in injury mitigation and prevention.

Lead investigator for a study comparing the impact performance of various types of bicycle helmets.

Lead investigator for studies comparing the impact performance and damage sustained by various types of motorcycle helmets.

Lead investigator for a study assessing the effect of seat belt usage during airbag deployment on the risk for brain injury in frontal collisions.

publications

Density Variation in the Expanded Polystyrene Foam of Bicycle Helmets and Its Influence on Impact Performance

Impact Performance of Certified Bicycle Helmets Below, On and Above the Test Line

Substandard impact performance of common bicycle helmets

Age has a minimal effect on the impact performance of field-used bicycle helmets

Laboratory validation of two wearable sensor systems for measuring head impact severity in football players

The impact response of traditional and BMX-style bicycle helmets at different impact severities

Age does not affect the material properties of expanded polystyrene liners in field-used bicycle helmets

lectures & presentations

March 16, 2017 – Substandard impact performance of common bicycle helmets. Brain Injury Across the Age Spectrum: Improving Outcomes for Children and Adults Conference, The North American Brain Injury Society and the National Collaborative on Children's Brain Injury, Houston, TX.

May 10, 2017 – The impact response of bicycle helmets on, above, and below the test line. Shirtsleeves Technical Meeting, ASTM F08.53 Headgear Subcommittee, Toronto, ON.

May 20, 2015 – The effect of an age on bicycle helmet impact attenuation. Shirtsleeves Technical Meeting, ASTM F08.53 Headgear Subcommittee, Anaheim, CA.

June 8, 2012 – Booster seats and upper neck tension in children. Canadian Society of Biomechanics 17th Biannual Meeting, Vancouver, BC.

November 17, 2011 – Bicycle helmet impact responses. Shirtsleeves Technical Meeting, ASTM F08.53 Headgear Subcommittee, Tampa, FL.

November 17, 2011 – Motorcycle helmet impact responses. Shirtsleeves Technical Meeting, ASTM F08.53 Headgear Subcommittee, Tampa, FL.

October 28, 2007 – Predicting motorcycle helmet impact severity from residual crush damage. 35th International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

November 5, 2006 – Motorcycle helmet impact response: Comparison of helmet type and impact severity. 34th International Workshop on Human Subjects for Biomechanical Research, Dearborn, MI.

June 23, 2006 – Brain injuries and airbags: the effect of a seat belt. American Society of Mechanical Engineers 2006 Summer Bioengineering Conference, Amelia Island, FL.

August 6, 2002 – A biomechanical analysis of internal fixation of transverse acetabular fractures. Fourth World Congress of

Biomechanics, Calgary, AB.

Numerous presentations to law firms and insurance companies. These presentations involve various topics related to injury biomechanics.

training and professional development

July 31 – August 3, 2019 – 27th Congress of the International Society of Biomechanics and 43rd Annual Meeting of the American Society of Biomechanics, Calgary, AB.

October 7-10, 2018 – AAAM 62nd Annual Scientific Conference, Nashville, TN.

October 7, 2018 – Understanding AIS: Practical Information for Analyzing Injuries using AIS Codes, AAAM Workshop, Nashville, TN.

March 27, 2018 – Designing for Diversity? Challenges in Automobile Occupant Protection for a Diverse Population, Association for the Advancement of Automotive Medicine, Webinar.

March 16, 2018 – Brain Injury Across the Age Spectrum: Improving Outcomes for Children and Adults Conference, The North American Brain Injury Society and the National Collaborative on Children's Brain Injury, Houston, TX.

February 2, 2018 – AIS Analysis Tips and Tricks for Proper Use, Association for the Advancement of Automotive Medicine, Webinar.

June 6-8, 2017 – 25th International Technical Conference on the Enhanced Safety of Vehicles (ESV), Detroit, MI.

May 10, 2017 – ASTM International Technical Committee Meeting, F08 on Sports Equipment and Facilities, Toronto, ON.

September 17-21, 2016 – AAAM 60th Annual Scientific Conference, Waikoloa Village, HI.

July 6, 2015 – Ontario Building Code Part 9: An Overview, Ontario Society of Professional Engineers, Webinar.

May 20, 2015 – ASTM International Technical Committee Meeting, F08 on Sports Equipment and Facilities, Anaheim, CA.

July 6-11, 2014 – 7th World Congress of Biomechanics, Boston, MA.

September 22-25, 2013 – AAAM 57th Annual Scientific Conference, Quebec City, Quebec.

November 14-16, 2012 – ASTM International Technical Committee Meeting, F08 on Sports Equipment and Facilities, Atlanta, GA.

November 13, 2012 – ASTM International Symposium on the Mechanism of Concussion in Sports, Atlanta, GA.

July 12, 2012 – The Pathophysiology of Traumatic Brain Injury Conference, Vancouver, BC.

June 7-9, 2012 – Canadian Society of Biomechanics 17th Biannual Meeting, Vancouver, BC.

November 16-18, 2011 – ASTM International Technical Committee Meeting, F08 on Sports Equipment and Facilities, Tampa, FL.

November 2-4, 2009 – 53rd Stapp Car Crash Conference, Savannah, GA.

November 1, 2009 – 37th International Workshop on Human Subjects for Biomechanical Research, Savannah, GA.

October 29-31, 2007 – 51st Stapp Car Crash Conference, San Diego, CA.

October 28, 2007 – 35th International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

November 6-8, 2006 – 50th Stapp Car Crash Conference, Dearborn, MI.

November 5, 2006 – 34th International Workshop on Human Subjects for Biomechanical Research, Dearborn, MI.

June 21-25, 2006 – American Society of Mechanical Engineers Summer Bioengineering Conference, Amelia Island, FL.

October 27-29, 2003 – 47th Stapp Car Crash Conference, San Diego, CA.

October 26, 2003 – 31st International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

August 4-9, 2002 – 4th World Congress of Biomechanics, Calgary, AB.

November 6-8, 2000 – 44th Stapp Car Crash Conference, Atlanta, GA.

November 5, 2000 – 28th International Workshop on Human Subjects for Biomechanical Research, Atlanta, GA.

August 2000 – PC-Crash Workshop. Vancouver, BC.

March 12-15, 2000 – 46th Annual Meeting of the Orthopedic Research Society, Orlando, FL.
