



The 21st Annual
INJURY BIOMECHANICS
SYMPOSIUM



Wednesday, May 20th

5:30 PM **Welcome Reception & Cornhole Tournament** | Sponsored by _____

- Food and drinks provided
- Cornhole tournament will begin at 6:30 PM
- Transportation between the hotel and Kardinal Hall will be provided
 - 5:30 PM bus pick up from hotel



Kardinal Hall

722 Preston Ave #101, Charlottesville, VA 22903

<https://kardinalhall.com>

AWARDING PARTNER:



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Wednesday, May 20 - 1



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Thursday, May 21st



Insurance Institute for Highway Safety
988 Dairy Road, Ruckersville, Virginia, 22968

- 7:30 AM** Depart hotel for IIHS Vehicle Research Center
- 8:00 AM** **Registration & Continental Breakfast (IIHS Lobby)** | Sponsored by _____
- 8:45 AM** **Opening Remarks and Welcome**
Jason Forman, PhD | Associate Professor – University of Virginia
- 8:55 AM** **Scientific Agenda**
Becky Mueller | Senior Research Engineer – IIHS
- 9:00 AM** **Keynote: IIHS Crash Avoidance Testing**
David Aylor | Vice President of Active Safety – IIHS

ORAL SESSION I: PMHS Testing for Vulnerable Populations

Moderators – Name | Affiliation
Name | Affiliation

- 9:45 AM** **Preliminary Impact and Injury Response of Varied Anthropometry PMHS in Frontal Sled Tests**
Mary Gallaher, John-Paul Donlon, Isabella Nazari, Logan Mann, Reagan Hollar, Sara Sochor, Junior Noss, Jason Forman
Center for Applied Biomechanics, University of Virginia, USA

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10:15 AM Thoracic Biomechanical Responses of Small Female PMHS in a Simplified Side Impact Condition

Srinivas Anantharamakrishnan¹, Andrew Kemper², Gretchen Baker¹, Allison Guettler¹, Heather Rhule², Yun-Seok Kang¹, Amanda Agnew¹

¹ Injury Biomechanics Research Center, The Ohio State University, USA

² Vehicle Research and Test Center, National Highway Traffic Safety Administration, USA

IIHS TOUR

10:45 AM Crash Test Tour
Becky Mueller | Senior Research Engineer – IIHS

11:30 AM Live Crash Test Viewing
Group photos and student presenter photos

12:00 PM LUNCH (IIHS Lobby) | Sponsored by _____

ORAL SESSION II: TESTING AND VALIDATION

Moderators – Name | Affiliation
Name | Affiliation

1:00 PM Vehicle Front-End Architecture as a Driving Factor in Occupant Injury Risk During Vehicle-Guardrail Impacts: A Hybrid III Dummy-Based Numerical Study

Maheep Bubna¹, Elijah Buckland¹, Luke Riexinger², Costin Untaroiu³

¹Department of Mechanical Engineering, Virginia Tech, USA

²Insurance Institute for Highway Safety, USA

³Department of Biomedical Engineering, Virginia Tech, USA

1:30 PM Comparison of Pelvis Injury Patterns and Loading Mechanisms in PMHS Tests and Real-World Side Impact Collisions

Isabella Nazari, Jaehyuk Heo, Bronislaw Gepner, Jason Forman

Center for Applied Biomechanics, University of Virginia, USA

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POSTER SESSION I

Moderators – Name | Affiliation
Name | Affiliation

2:00 PM Oral Descriptions of Posters in Session I

Assessment of Layered Seat Cushion Configurations for Underbody Blast Protection

Katerena Sirhan¹, Mark Shafer², Cameron ‘Dale’ Bass¹

¹Biomedical Engineering Department, Wayne State University, USA

²Occupant Protection Team, Ground Vehicle Survivability and Protection, USA

Quantifying Head Impact Exposure in Collegiate 15s Rugby and Relationship to Clinical Measures

Lauren A. Duma¹, Nicole Stark², Steve Rowson²

¹School of Neuroscience, Virginia Tech, USA

²Department of Biomedical Engineering, Virginia Tech, USA

Elderly Fatality in CIREN Cases: A Matched Case Review

Logan Mann, Mary Gallaher, Jason Forman

Center for Applied Biomechanics, University of Virginia, USA

The Relationship Between Injury Risk for Child, Teen, and Adult Pedestrians in Collisions Preceded by PAEB Activation and PAEB Pulse Characteristics

Maitland Witmer^{1,2}, David Kidd³, Valentina Graci^{1,2}

¹Department of Biomedical Engineering, Sciences and Health Professions, Drexel University, USA

²Children’s Hospital of Philadelphia, Center for Injury Research and Prevention, USA

³Insurance Institute for Highway Safety, USA

Quantifying Kinematic and Vibrational Responses in Hockey-Style Catcher’s Mask

Richard A. Gillespie¹, Eric J. Shunk¹, Mark Begonia², Nicole Stark¹, Steve Rowson¹

¹Department of Biomedical Engineering, Virginia Tech, USA

²Institute for Critical Technology and Applied Science, Virginia Tech, USA

**2:30 PM BREAK | Posters from Session I on display
SNACK | Sponsored by SAE Virginia Chapter**

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ORAL SESSION III: Lower Extremities

Moderators – Name | Affiliation
Name | Affiliation

3:00 PM *Associations between Vehicle Safety Systems and Pilon Fracture Severity are Revealed by Using a Novel Objective Quantitative Fracture Energy Metric*

L. Garrett Bangert¹, Samuel Northrup¹, William Armstrong², Joel D. Stitzel², R. Shayn Martin², Kevin Dibbern³, Donald D. Anderson⁴, Ashley A. Weaver², Caitlyn J. Collins¹

¹Department of Biomedical Engineering, Virginia Tech, USA

²Biomedical Engineering, Wake Forest University School of Medicine, USA

³Department of Pediatrics, University of Nebraska Medical Center, USA

⁴Department of Orthopedics and Rehabilitation, University of Iowa, USA

3:30 PM *Failure Tolerance of Male and Female Lower Extremities Under Pure Bending and Combined Loading Modes*

Maria Carbon, Isabella Nazari, Timothy Edinger, Jeessoo Shin, Connor Hanggi, Jason Kerrigan, Jason Forman

Center for Applied Biomechanics, University of Virginia, USA

4:00 PM *Sex and Age Effects on Tibia Biomechanical Properties in Dynamic Four-Point Bending*

Jonathon Spangler¹, Amanda Agnew¹, Yun-Seok Kang¹, Andrew Kemper², Gretchen Baker¹, Allison Guettler¹, Angela Harden¹

¹Injury Biomechanics Research Center, The Ohio State University, USA

²Vehicle Research and Test Center, National Highway Traffic Safety Administration, USA

4:30 PM *Closing Remarks*

Jason Forman, PhD | Associate Professor – University of Virginia

4:45 PM *Shuttle Back to Hotel*

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BANQUET | Sponsored by DTS



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BREWING COMPANY | CHARLOTTESVILLE, VA

520 2nd St SE, Charlottesville, VA 22902, USA

<https://threenotchdbrewing.com/pages/cville>

- 6:15 PM** Bus to banquet available
- 6:30 PM** Banquet dinner and drinks
- 8:00 PM** Team Trivia
- 9:30 PM** Shuttles available to return participants to the hotel

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Thursday, May 21 - 5



The 21st Annual
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Friday, May 22nd



Rice Hall (RICE 130)
85 Engineer's Way, Charlottesville, Virginia, 22903

8:00 AM Continental Breakfast | Sponsored by _____

8:45 AM **Keynote: NHTSA Crash Injury Research Update**
Matthew Craig | Acting Director of Vehicle Crashworthiness – National Highway Traffic Safety Administration (NHTSA)

POSTER SESSION II

9:30 AM **Oral Descriptions of Posters in Session II**

Moderators – Name | Affiliation
Name | Affiliation

Incorporating Cortical Bone Property Variability into Simulations of Isolated Ribs under Anterior-Posterior Bending

Cristian Saenz-Betancourt^{1,2}, Dustin Draper¹, Philipp Wernicke¹, Yun-Seok Kang³, Steffen Peldschus², Amanda Agnew³

¹BMW Group, Germany

²Ludwig-Maximilians-Universität München, Germany

³Injury Biomechanics Research Center, The Ohio State University, USA

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Lacrosse Ball Impacts on Women's Headgear

Katie Metrey, Nicole Stark, Steve Rowson
Department of Biomedical Engineering, Virginia Tech, USA

Mechanical Characterization of the Liver and Kidney: A Systematic Review

Anna Morris^{1,2}, Junior Noss², Jason Forman²
¹Department of Physics and Engineering, Washington and Lee University, USA
²Center for Applied Biomechanics, University of Virginia, USA

Quantifying Changes in Mouthguard–Dentition Fit to Support Head Impact Measurement Validity

Daniel Chong, Daniel Kye, Elizabeth Dimbath, Mitchell Z. Abrams, Jason F. Luck
Department of Biomedical Engineering, Injury Biomechanics Laboratory, Duke University, USA

Whole-Body MRI to Assess Perfusion Success and Soft Tissue Injuries in PMHS Subjected to High-Rate Loading

Dori Watts^{1,2}, Wajahat Mohammed³, Yongsheng Chen⁴, Karin Rafaels⁵, Cynthia Bir²
¹Explico Inc, USA
²Biomedical Engineering, Wayne State University, USA
³Detroit Medical Center/Wayne State University, USA
⁴Neurology, Biomedical Engineering, MR Core Research Facility, Wayne State University, USA
⁵US Army Combat Capabilities Development Command Army Research Laboratory, USA

10:00 AM BREAK | Posters from Session II on display

ORAL SESSION IV: Combat Helmets

Moderators – Name | Affiliation
Name | Affiliation

10:30 AM Behind Helmet Blunt Trauma Deformation Geometry under Different Helmet Materials

Derek Pang¹, Robert Salzar², Brian Boggess³, Cameron 'Dale' Bass¹
¹Department of Biomedical Engineering, Wayne State University, USA
²University of Virginia, USA
³S-E-A Limited, USA

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11:00 AM ***Influence of Blast Directionality, Intensity, and Combat Helmet Use on Head Surface Pressure Responses***

Allison Nelson¹, Ethan Burt¹, Joseph Hamilton², Kenny Espinoza², Joseph Magallanes², Pamela VandeVord^{1,3}

¹Department of Biomedical Engineering, Virginia Tech, USA

²Karagozian & Case Inc., USA

³Veterans Affairs Medical Center, USA

11:30 AM **LUNCH (Rice Commons) | Sponsored by _____**

ORAL SESSION V: Head Impacts

Moderators – Name | Affiliation
Name | Affiliation

12:30 PM ***Deriving Representative Head Impact Profiles in Contact Sports: A Shape-Based Clustering Approach***

Eleni Koumantou¹, Emily Yik Kwan Chan¹, Chris M. Jones^{2,3}, Kieran Austin³, Mike Loosemore^{2,3}, Mazdak Ghajari¹

¹Dyson School of Design Engineering, Imperial College London, UK

²The Institute of Sport, Exercise and Health, UK

³Sports and Wellbeing Analytics, UK

1:00 PM ***Influence of Helmet Surface Protrusions on Youth Bicycle Helmet Impact Performance***

Caitlyn Jung, Nicole Stark, Steve Rowson

Department of Biomedical Engineering, Virginia Tech, USA

POSTER SESSION III

1:30 PM **Oral Descriptions of Posters in Session III**

Quantitative CT and MRI-based Modeling Assessment of Spine Injury Risk Following Long-Duration Spaceflight

Talia E. Busquets¹, Karan S. Devane¹, Joel D. Stitzel^{1,2}, Jaehyeon Park^{1,3}, Diana A. Madrid¹, Luis F. Poveda¹, Drew D. DiSerafino², Ashley A. Weaver¹

¹Biomedical Engineering, Wake Forest University School of Medicine, USA

²Elemance, LLC, USA

³Department of Mechanical Engineering, The Cooper Union for the Advancement of Science and Art, USA

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An Investigation of Local Accelerator Pedal Geometry Effects on Ankle Motion

Stacey Webb, Junior Noss, Jason Forman

Center for Applied Biomechanics, University of Virginia, USA

How Do Different Human Body Models Affect Occupant Impact Responses and Restraint Design Optimizations in Frontal Crashes?

Yatin Shankar Narayanan^{1,2}, Sumukha Shrouthy^{1,2}, Kyle Boyle¹, Renuka Jagadish⁴,
Tushar Arora⁴, Jingwen Hu^{1,2,3}

¹University of Michigan Transportation Research Institute, USA

²Department of Mechanical Engineering, University of Michigan, USA

³Department of Industrial and Operations Engineering, University of Michigan, USA

⁴Humanetics, USA

The Potential Effects of Youth Hockey Helmet Shell Add-Ons

Andrew Calis, Nicole Stark, Steve Rowson

Department of Biomedical Engineering, Virginia Tech, USA

Evaluation of Surrogate Soft Tissue Candidates for Biofidelity and Durability

Morgan Pluim¹, Georgia Campbell^{2,3}, Grace Kemper⁴, Cheryl E. Quenneville^{1,3}

¹School of Biomedical Engineering, McMaster University, Canada

²Integrated Biomedical Engineering, McMaster University, Canada

³Department of Mechanical Engineering, McMaster University, Canada

⁴Health Sciences, McMaster University, Canada

2:00 PM BREAK | Posters from Session III on display

2:30 PM Awards & Closing Remarks
Jason Forman, PhD | Associate Professor – University of Virginia
Becky Mueller | Senior Research Engineer – IIHS

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