Christopher P. Eckersley

PhD, PE

Senior Consultant

Dr. Christopher Eckersley is a biomedical and mechanical engineer at ESi with related expertise in traumatic brain injury (mTBI, concussion, and severe traumatic brain injury), injury analysis, neck injury, and the evaluation of use and non-use of personal safety eq. His projects span a range of areas, including motor vehicle accidents, slip-and-falls, pediatric injuries, and product liability claims. He also has specialized expertise in blast injury and blast biomechanics and has analyzed blast injuries in both military and civilian environments.

Prior to joining ESi, in 2021, Dr. Eckersley earned a Ph.D. in Biomedical Engineering from Duke University, where he worked in the injury Biomechanics Laboratory. For his dissertation research, Dr. Eckersley investigated traumatic brain injury in both blunt impact and blast environments. He has also conducted extensive research into areas such as cervical spine injury due to head supported mass, personal protective equipment effectiveness in blunt impact and blast loading environments, and environmental influences on blunt impact head kinematics. techniques.

Dr. Eckersley has presented his engineering research at international conferences, and is published in peer-reviewed journals, including the *Journal of Biomechanical Engineering* and the *Journal of Science and Medicine in Sport*.

Education

PhD, Biomedical Engineering. Duke University. 2021

MS, Biomedical Engineering. Duke University. 2018

BSE, Biomedical and Mechanical Engineering. Duke University. 2016.

Licenses & Certifications

- State of North Carolina P.E. License 056649
- State of Texas P.E. License 155172
- National Council of Examiners for Engineering and Surveying (NCEES) ID: 1644690

Contact Information

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ESi North Carolina

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Charlotte, NC 28217

Areas of Specialization

- Impact Biomechanics
- Blast and Thermal Biomechanics
- Head Impact and Injury
- Traumatic Brain Injury
- Concussion
- Cervical Spine Injury
- Injury Causation
- Slips, Trips, and Falls
- Workplace Injuries
- Personal Safety Equipment
- Experimental Testing
- Computational Modeling
- Biomedical Instrumentation
- Injury Tolerance
- Recreational Products
- Sports and Exercise Equipment

Positions Held

Engineering Systems Inc., Charlotte, North Carolina

- Senior Consultant, 2026 - Present
- Senior Staff Consultant, 2024 – 2026
- Staff Consultant, 2021 – 2024

Duke University, Durham, North Carolina

- Graduate Research Engineer, Injury Biomechanics Laboratory, 2016 – 2021
- Technical Mentor, Pratt School of Engineering, 2019 – 2021
- Teaching Assistant, Department of Biomedical Engineering, 2016 – 2018
- Master's Student Advisor, Department of Biomedical Engineering, 2018– 2019
- Undergraduate Research Engineer, Materials Laboratory, 2016
- Undergraduate Research Assistant, Injury Biomechanics Laboratory, 2014 – 2026

Zimmer-Biomet Orthopedics, Warsaw, Indiana

- Post Market Engineering Intern, 2014

Continuing Education

- **Walkway Audit Certificate Holder (WACH)** – National Floor Safety Institute (NFSI), 2022
- **English XL Tribometrist** – Excel Tribometers CXLT Certification Program, 2022
- **Crash Reconstruction for Traffic Engineers** – Northwestern University Center for Public Safety, 2022
- **Simcenter MADYMO Introductory Training** – Siemens, 2022

Professional Affiliations/Honors

American Society for Testing and Materials (ASTM) ASM International

- Committee F08 on Sports Equipment, Playing Surfaces, and Facilities, Member
- Committee E58 on Forensic Engineering, Member

Biomedical Engineering Society (BMES)

- Member since 2015

American Society of Mechanical Engineers (ASME)

- Member since 2021

Sports Health, Reviewer

PloS One, Reviewer

James H. McElhaney Fellowship in Biomedical Engineering

Tau Beta Pi Honor Society

Pi Tau Sigma Honor Society

Graduation with Departmental Distinction, Duke University

National Football League Engineering Symposium Student Grant

Helmholtz Award - best undergraduate senior Biomedical Engineering research thesis

Project Experience

Selected Technical Investigations

- Consumer product blast/explosion injuries
- Industrial workplace blast/explosion injuries
- Thermal Injuries
- Industrial and farming equipment injuries
- Crash helmet use vs. non-use
- Military protective equipment testing
- Railroad accident injuries
- Seatbelt use vs. non-use in passenger vehicles
- Self-defense biomechanics
- Ballistic/sharp object biomechanics
- Specialty vehicle safety system analysis
- Pediatric abuse injury
- Domestic abuse injury
- Ladders, stairways, and falls from heights
- Slips, trips, missteps, and falls
- Sports and fitness equipment
- Low-speed passenger vehicle biomechanics

Selected Research Experience

- Dr. Eckersley conducted testing investigating the relative blast protective capabilities of military helmets from WWI to modern military helmets, resulting in a peer-reviewed publication. The study determined that despite the difference in era, the blast protection capabilities of WWI helmets are comparable to those of modern military helmets.
- Dr. Eckersley conducted animal surrogate testing, investigating the tissue dynamics of behind armor blunt trauma from wearing ballistic protection systems. The animal surrogate tests were used to validate a novel finite element model for behind armor blunt trauma to aid the development of ballistic protection.
- Dr. Eckersley conducted animal surrogate testing that resulted in a peer-reviewed publication investigating novel mechanisms of blunt mild traumatic brain injury, or concussion, and blast neurotrauma. An animal surrogate was exposed to either a blunt impact or a blast pressure wave, while acoustic sensors were used to listen for cavitation, a phenomenon where bubbles can form in the fluid of the head, resulting in tissue damage.
- Dr. Eckersley conducted a finite element model investigation of cervical spine intervertebral stresses that occur when activities are performed with additional mass, such as night vision goggles, on top of the head. The current cervical spine injury criterion was applied to novel intervertebral stress scenarios to reveal that performing actions with certain levels of head supported mass can have implications for chronic neck injury.
- Dr. Eckersley conducted testing on the retention capabilities of motorcycle helmet strap systems with a D-ring clasp. It was found that the connection of the strap to the helmet failed before the strap and the clasp while leaving little evidence of loading on the strap.

Classroom Teaching Experience

Blast and Ballistics
Biomechanics of Neurotrauma
Biomechanical Vehicle Safety
Dynamics

Publications

1. **Eckersley CP**, Op't Eynde J, Abrams MZ, Bass CR. Using Wavelet Analysis to Distinguish Cavitation Acoustic Emissions from Blunt Impact Noise. *Journal of Biomechanical Engineering*, 2021.
2. Op't Eynde J, Yu AW, **Eckersley CP**, Bass CR. Primary Blast Wave Protection in Combat Helmet Design: A Historical Comparison Between Present Day and World War I. *PLOS One*, 2020 Vol. 15(2).
3. **Eckersley CP**, Nightingale RW, Luck JF, Bass CR. The Role of Cervical Muscles in Mitigating Concussion. *Journal of Science and Medicine in Sport*, 2019 Vol. 22(6).
4. **Eckersley CP**, White TR, Cutcliffe HC, Shridharani JK, Wood GW, Bass CR. Comparing Foul Tip Impact Attenuation of Baseball Catcher Masks Using Head Impact Metrics. *PLOS One*, 2018 Vol. 13(6).

5. Ortiz-Paparoni M, Op't Eynde J, **Eckersley CP**, Morino C, Abrams M, Pang D, Kait J, Pintar F, Yoganandan N, Moore J, Barnes D, Loftis K, Bass CR. Expanded Combined Loading Injury Criterion for the Human Lumbar Spine Under Dynamic Compression. Annals of Biomedical Engineering, 2024.
6. **Eckersley CP,** Brickman DB, Knox EH, Rewerts LE. Novel Accident Reconstruction Methodologies: A Collaborative Human Factors Approach. *Special Issue: Proceedings of the 69th HFES International Annual Meeting,* 2025.

Refereed Conference Publications

7. **Eckersley CP**, Op't Eynde J, Abrams MZ, Yu AW, Li M, Yao J, Bass CR. Acoustic Detection of Blunt Induced Cavitation in the Head. *International Research Council on Biomechanics of Injury Proceedings 2020*.
8. Op't Eynde J, **Eckersley CP**, Salzar RS, Stemper BD, Shender BS, Bentley TB, Bass CR. Behind Armor Blunt Trauma (BABT) Indentor Simulating High-Velocity Impacts from Rifle Rounds on Hard Body Armor. *Personal Armour Systems Symposium 2020 Proceedings*.
9. Op't Eynde J, **Eckersley CP**, Bass CR. High-Rate Viscoelastic Shear Model of Porcine Skin, Lung and Liver Tissue. *International Research Council on Biomechanics of Injury Proceedings 2019*.
10. **Eckersley CP**, Cox CA, Ortiz-Paparoni MA, Lutz RH, Sell TC, Bass CR. A Real Pain in the Neck: Design Limits on Magnitude and Location of Head Supported Mass. *Personal Armour Systems Symposium 2018 Proceedings*.
11. Cox CA, Ortiz-Paparoni MA, Schmidt AL, Shridharani Jk, Salzar RS, **Eckersley CP**, Bass CR. Men and Women and Helmets and Necks. *Personal Armour Systems Symposium 2018 Proceedings*.
12. Op't Eynde J, Yu AW, **Eckersley CP**, Bass CR. The Lessons of History: Helmets and Primary Blast. *Personal Armour Systems Symposium 2018 Proceedings*.
13. **Eckersley CP**, Nightingale RW, Luck JF, Bass CR. Effect of Neck Musculature on Head Kinematic Response Following Blunt Impact. *International Research Council on Biomechanics of Injury Proceedings*, 2017.

Conference Presentations and Abstracts

14. Rubango K, Nightingale RW, **Eckersley CP**, Luck JF. (2018) The Effect of Thickness and Continuity of Motorcycle Helmet Shells on Performance. *8th World Congress of Biomechanics*, Dublin, Ireland.
15. Lutz RH, **Eckersley CP**, Sell TC, Bass CR. (2018) The Role of Head Supported Mass in Cervical Spine Kinematics. *American Medical Society for Sports Medicine Annual Meeting*, Orlando, FL. 3. Cox CA, Ortiz-Paparoni MA, Schmidt AL, Shridharani Jk, Salzar RS, **Eckersley CP**, Bass CR. (2018) Men and Women and Helmets and Necks. *Personal Armour Systems Symposium*, Washington, D.C.
16. Op't Eynde J, Yu AW, **Eckersley CP**, Bass CR. (2018) The Lessons of History: Helmets and Primary Blast. *Personal Armour Systems Symposium*, Washington D.C.

17. Op't Eynde J, Yu AW, **Eckersley CP**, Bass CR. (2018) Blast Wave Protection in Combat Helmet Design: A Historical Perspective. *Injury Biomechanics Symposium*, Columbus, OH. 6. **Eckersley CP**, Nightingale RW, Luck JF, Bass CR. (2018) The Role of Cervical Muscle Strength and Activation in Concussion Mitigation. *8th World Congress of Biomechanics*, Dublin, Ireland.
18. **Eckersley CP**, Cox CA, Ortiz-Paparoni MA, Lutz RH, Sell TC, Bass CR. (2018) A Real Pain in the Neck: Design Limits on Magnitude and Location of Head Supported Mass. *Personal Armour Systems Symposium*, Washington D.C.
19. **Eckersley CP**, Lutz RH, Sell TC, Cox CA, Bass CR. (2018) A Pain in the Neck: A Modeling Analysis for Design Limitations of Head Supported Mass. *Injury Biomechanics Symposium*, Columbus, OH.
20. **Eckersley CP**, Nightingale RW, Luck JF, Bass CR. (2017) Effect of Neck Musculature on Head Kinematic Response Following Blunt Impact. *International Research Council on Biomechanics of Injury*, Antwerp, Belgium.
21. O'Connell DJ, Luck JF, Gade A, Lake IV, Cutcliffe HC, Shah KP, Ginalis EE, Lambert CM, **Eckersley CP**, Yu AW, Kait JR, Christian N, Bass CR. (2017) Age Related Differences on a Smooth Pursuit Task in High School and Youth Football Participants – Implications for Baseline Concussion Assessments. *Human Movement Science Symposium*, Chapel Hill, NC.
22. Cocks FH, Simmons WN, Tan TY, **Eckersley CP**, Lim ET, Rosenberg DT, Sobb KM. (2016) α-Rhombohedral Boron Based Solid State Neutron Detector. *Domestic Nuclear Detection Office Academic Research Initiative Annual Meeting*, Atlanta, GA.
23. **Eckersley CP**, White TR, Cutcliffe HC, Shridharani JK, Bass CR. (2016) Foul Tip Impact Attenuation of Baseball Catcher Masks Using Head Impact Metrics. *American Society of Mechanical Engineers Summer Biomechanics, Bioengineering, and Bio-transport Conference*, National Harbor, MD.
24. **Eckersley CP**, White TR, Cutcliffe HC, Shridharani JK, Bass CR. (2016) Foul Tip Attenuation of Baseball Catcher Masks. *Human Movement Science Symposium*, Chapel Hill, NC.
25. **Eckersley CP**, White TR, Cutcliffe HC, Shridharani JK, Bass CR. (2015) Foul Tip Impact Attenuation Analysis of Varying Catcher Masks Using Head Impact Metrics. *National Biomedical Engineering Society Conference*, Tampa Bay, FL.
26. **Eckersley CP,** Brickman DB, Knox EH, Rewerts LE. (2025) Novel Accident Reconstruction Methodologies: A Collaborative Human Factors Approach. *69th HFES International Annual Meeting,* Chicago, IL.

Presentations and Invited Lectures

Eckersley CP. "Cavitation in Blast Neurotrauma." *BME 535 – Blast and Ballistics,* Duke University, Durham, North Carolina, March 4, 2022.

Eckersley CP. "Can Neck Strength Prevent Concussions?" *BME – 590 Biomechanics of Neurotrauma,* Duke University, North Carolina, September 28, 2022.

Loyd AM, **Eckersley CP**. “The Value of Biomechanics to Your Criminal Case.” Wisconsin State Public Defender’s 2022 Annual Criminal Defense Conference, Milwaukee, Wisconsin, November 3, 2022.

Eckersley CP. “Cavitation in Blast Neurotrauma.” *BME 535 – Blast and Ballistics,* Duke University, Durham, North Carolina, March 3, 2023.

Stern AL, **Eckersley CP**. “Biomechanics: Understanding Its Use in Claims and Litigation.” MGC Charlotte Seminar, Charlotte, North Carolina, June 22, 2023.

Hejzlar Z, **Eckersley CP**, Caballer KB. "Relationship between Code Requirements and Human Factors/Biomechanics Aspects of Slip and Trip Incidents." NFSI International Symposium, Hurst, Texas, September 25, 2023.”

Stern AL, **Eckersley CP**. “Biomechanics: Understanding Its Use in Claims and Litigation.” North Carolina Association of Defense Attorneys, Fall Seminar, Greensboro, North Carolina, October 6, 2023.

Eckersley CP, Nara J. “The Missing Piece: Biomechanics and Pathology in Criminal Investigations.” National Association of Criminal Defense Lawyers, Forensic Science Seminar, Las Vegas, Nevada, April 20, 2024.

Eckersley CP, Nara J. “The Missing Piece: Biomechanics and Pathology in Criminal Investigations.” Florida Tenth Judicial Circuit Public Defender’s Teaching Seminar, Charlotte, North Carolina, April 17, 2024.

Eckersley CP. "What a Blast: Pressure Induced Injuries in Civil Litigation." North Carolina Association of Defense Attorneys Webinar, Charlotte, North Carolina, July 31, 2024.

Stern AL, **Eckersley CP**. "Biomechanics: Its Use in Claims and Litigation." Nick Schnyder Law Firm Webinar, Charlotte, North Carolina, October 28, 2024.

Eckersley CP. "What a Blast: Pressure Induced Injuries in Civil Litigation." CenterPoint Training Day, Houston, Texas, May 1, 2025.

Eckersley CP. "Design in Question: A Biomechanical Perspective on Product Liability." North Carolina Association of Defense Attorneys, 48th Annual Meeting, Wilmington, North Carolina, June 13, 2025.

Eckersley CP, Chalmers K, Miller A. "Utilizing Biomechanics to Understand Your Case." Colorado Office of the State Public Defenders Conference, Golden, Colorado, September 15, 2025.

Eckersley CP, Dill TC. "How Biomechanics and Firearm Experts Can Collaborate on Forensic Investigations." National Association of Criminal Defense Lawyers, Forensic Science Seminar, Las Vegas, Nevada, April 24, 2026.