



CHRISTOPHER P. ECKERSLEY, Ph.D., P.E.
SENIOR STAFF CONSULTANT

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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, 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.

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*.

Areas of Specialization

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|------------------------|---------------------------|-------------------------------|
| Impact Biomechanics | Cervical Spine Injury | Computational Modeling |
| Blast Biomechanics | Injury Causation | Biomedical Instrumentation |
| Head Impact and Injury | Personal Safety Equipment | Injury Tolerance |
| Traumatic Brain Injury | Experimental Testing | Recreational Products |
| Concussion | Statistical Analysis | Sports and Exercise Equipment |

Education

- Ph.D., Biomedical Engineering, Duke University, 2021
- M.S., Biomedical Engineering, Duke University, 2018
- B.S.E., Biomedical and Mechanical Engineering, Duke University, 2016

Licensed Professional Engineer (P.E.)

State of North Carolina License Number: 056649 Expiration Date: December 31, 2024
National Council of Examiners for Engineering and Surveying (NCEES) (ID: 1644690)

Positions Held

Engineering Systems Inc., Charlotte, North Carolina

Senior Staff Consultant, 2024 – Present
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 – 2016

Zimmer-Biomet Orthopedics, Warsaw, Indiana

Post Market Engineering Intern, 2014

Professional Affiliations

American Society for Testing and Materials (ASTM)
Committee F08 on Sports Equipment, Playing Surfaces, and Facilities, Member
Committee E58 on Forensic Engineering, Member
Biomedical Engineering Society (BMES), Member
American Society of Mechanical Engineers (ASME), Member
Sports Health, Reviewer
PloS One, Reviewer

Honors and Awards

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

Continued Education

Walkway Audit Certificate Holder (WACH) (2022)
National Floor Safety Institute (NFSI), Southlake, Texas
English XL Tribometrist - Excel Tribometers CXL Certification Program (2022)
Excel Tribometers, LLC, Chesapeake, Virginia
Crash Reconstruction for Traffic Engineers (2022)
Northwestern University Center for Public Safety, Evanston, Illinois
Simcenter MADYMO Introductory Training (2022)
Siemens, Livonia, Michigan

Selected Technical Investigations

Consumer product blast/explosion injuries
Industrial workplace blast/explosion 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
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 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. Current cervical spine injury criterion was applied to novel intervertebral stress scenarios to reveal 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/Presentations

Journal 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).

Refereed Conference Publications

1. **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*.
2. 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*.
3. 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*.
4. **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*.
5. 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*.
6. Op't Eynde J, Yu AW, **Eckersley CP**, Bass CR. The Lessons of History: Helmets and Primary Blast. *Personal Armour Systems Symposium 2018 Proceedings*.
7. **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

1. 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.
2. 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.
4. 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.
5. 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.
7. **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.
8. **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.
9. **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.
10. 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.
11. 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.
12. **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.
13. **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.
14. **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.

Presentations and Invited Lectures

1. **Eckersley CP.** "Cavitation in Blast Neurotrauma." *BME 535 – Blast and Ballistics*, Duke University, Durham, North Carolina, March 4, 2022.
2. **Eckersley CP.** "Can Neck Strength Prevent Concussions?" *BME – 590 Biomechanics of Neurotrauma*, Duke University, North Carolina, September 28, 2022.
3. 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.
4. **Eckersley CP.** "Cavitation in Blast Neurotrauma." *BME 535 – Blast and Ballistics*, Duke University, Durham, North Carolina, March 3, 2023.
5. Stern AL, **Eckersley CP.** "Biomechanics: Understanding Its Use in Claims and Litigation." MGC Charlotte Seminar, Charlotte, North Carolina, June 22, 2023.
6. 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."
7. 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.
8. **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.
9. **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.
10. **Eckersley CP.** "What a Blast: Pressure Induced Injuries in Civil Litigation." North Carolina Association of Defense Attorneys Webinar, Charlotte, North Carolina, July 31, 2024.
11. Stern AL, **Eckersley CP.** "Biomechanics: Its Use in Claims and Litigation." Nick Schnyder Law Firm Webinar, Charlotte, North Carolina, October 28, 2024.