



MIREILLE E. KELLEY, PH.D.
STAFF CONSULTANT

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Dr. Mireille Kelley, Ph.D. is a Staff Consultant for Engineering Systems Inc. (ESi). Dr. Kelley specializes in injury biomechanics and human performance capability. She has research expertise in traumatic brain injury, pediatric injury, and quantifying human strength and speed capabilities. Dr. Kelley provides injury and biomechanical analysis for murder investigations, child injury investigations, vehicular accidents, industrial accidents, and slip and falls. Prior to joining ESi, Dr. Kelley earned a doctorate from the Virginia Tech – Wake Forest University School of Biomedical Engineering and Sciences and was a member of Wake Forest’s Center for Injury Biomechanics where she researched head impacts and concussion injury mechanisms in youth football athletes. She also conducted research as part of the National Highway Traffic Safety Administration’s Crash Injury Research and Engineering Network (CIREN) and investigated the causation of injuries resulting from motor vehicle collisions. This experience provided Dr. Kelley with a unique skillset involving the inquiry and analysis of national motor vehicle crash and injury databases. She also studied how injury patterns and injury risk change depending on variables such as crash severity and pre-crash positioning using real-world motor vehicle collision cases and finite element model reconstructions. Dr. Kelley is published in peer-reviewed scientific journals including: *Journal of Neurotrauma*, *Accident Analysis & Prevention*, *Traffic Injury Prevention*, and *Journal of Neurosurgery: Pediatrics*.

Areas of Specialization

Impact Biomechanics	Head Impacts and Injury	Statistical Analysis
Injury Causation	Concussion	Biomedical Instrumentation
Injury Mechanisms	Sports and Exercise Equipment	Motion Analysis
Injury Incidence	Sport-Related Injury	Occupant Kinematics
Accident Reconstruction and Analysis	Experimental Testing and Failure Analysis	Injury Tolerance
		Computational Modeling

Education

B.S., Biomedical Engineering, University of Connecticut
M.S., Biomedical Engineering, Wake Forest University and Virginia Polytechnic Institute and State University
Ph.D., Biomedical Engineering, Wake Forest University and Virginia Polytechnic Institute and State University

Professional Affiliations/Honors

Professional Affiliations and Reviewer Activities:

Biomedical Engineering Society (BMES), Member
Society of Automotive Engineers (SAE), Member
Society of Women Engineers (SWE), Member
Accident, Analysis, & Prevention, Reviewer

August 2020

Honors:

World Congress of Biomechanics Diversity Travel Award, 2018
International Research Council on Biomechanics of Injury Travel Grant, 2017
Margaret H. Hines Travel Award, OSU Injury Biomechanics Symposium, 2016
Program Chair's Award, 52nd Annual Rocky Mountain Bioengineering Symposium, 2015
Wake Forest Graduate Research Fellowship, 2014
Office of Undergraduate Research Student Travel Award, University of Connecticut, 2014
New England Scholar, University of Connecticut, 2014

Positions Held

Engineering Systems Inc., Charlotte, North Carolina

Staff Consultant, 2019 - Present

Wake Forest University, Winston-Salem, North Carolina

Graduate Research Engineer, Center for Injury Biomechanics, Department of Biomedical Engineering,
2015 - 2019

Simbex, LLC., Lebanon, New Hampshire

Engineering Intern, 2013

University of Connecticut, Storrs, Connecticut

Undergraduate Research Assistant, Musculoskeletal Modeling Lab, Department of Biomedical
Engineering, 2013 – 2014

Teaching Assistant, Department of Biomedical Engineering, 2013 - 2014

LPA Design, Inc., S. Burlington, Vermont

Engineering Intern, 2011

Continued Education

MADYMO Introductory Training

TASS International, Livonia, Michigan

Traffic Crash Reconstruction – 1

Northwestern University Center for Public Safety, Evanston, Illinois

Statistics 2: Introduction to ANOVA and Regression.

SAS Institute Inc., Cary, North Carolina

Statistics 1: Introduction to ANOVA, Regression, and Logistic Regression

SAS Institute Inc., Cary, North Carolina

SAS programming 1: Essentials.

SAS Institute Inc., Cary, North Carolina

43rd International Workshop on Human Subjects for Biomechanical Research.

The United States National Highway Traffic Safety Administration, New Orleans, Louisiana

Fluid Structure Interaction Course in LS-DYNA.

Livermore Software Technology Corporation, Livermore, California

Fracture, Damage, and Failure in LS-DYNA.

Livermore Software Technology Corporation, Livermore, California

Introduction to LS-PrePost and Introduction to LS-DYNA.

Livermore Software Technology Corporation, Livermore, California

Classroom Teaching Experience

Injury Physiology
Biomechanics
Biomaterials

Publications/Presentations

Journal Publications

1. Jones DA, Gaewsky JP, **Kelley ME**, Weaver AA, Miller AN, Stitzel JD. "Lumbar Vertebrae Fracture Injury Risk in Finite Element Reconstruction of CIREN and NASS Frontal Motor Vehicle Crashes." *Traffic Injury Prevention*. 2016 Sep;17 Suppl 1:109-15.
2. **Kelley ME**, Urban JE, Miller LE, Jones DA, Espeland MA, Davenport EM, Whitlow CT, Maldjian JA, and Stitzel JD. "Head Impact Exposure in Youth Football: Comparing Age- and Weight-Based Levels of Play." *Journal of Neurotrauma*. 2017 Jun 1;34(11):1939-1947.
3. **Kelley ME**, Kane JM, Espeland MA, Miller LE, Powers AK, Stitzel JD, Urban JE. "Head Impact Exposure Measured in a Single Youth Football Team During Practice Drills." *Journal of Neurosurgery: Pediatrics*. 2017 Nov;20(5):489-497.
4. Murugesan G, Saghafi B, Davenport EM, Wagner B, Urban JE, **Kelley ME**, Jones DA, Powers AK, Whitlow CT, Stitzel JD, Maldjian JA, Montillo A. "Single Season Changes in Resting State Network Power and the Connectivity between Regions: Distinguish Head Impact Exposure Level in High School and Youth Football Players." *Proc SPIE Int Soc Opt Eng*. 2018 Feb. doi:10.1117/12.2293199.
5. Saghafi B, Murugesan G, Davenport EM, Wagner B, Urban JE, **Kelley ME**, Jones DA, Powers AK, Whitlow CT, Stitzel JD, Maldjian JA, Montillo A. "Quantifying the Association between White Matter Integrity Changes and Subconcussive Head Impact Exposure from a Single Season of Youth and High School Football using 3D Convolutional Neural Networks." *Proc SPIE Int Soc Opt Eng*. 2018 Feb. doi: 10.1117/12.2293023.
6. Ye X, Gaewsky JP, Miller LE, Jones DA, **Kelley ME**, Suhey JD, Koya B, Weaver AA, Stitzel JD. "Numerical investigation of driver lower extremity injuries in finite element frontal crash reconstruction." *Traffic Injury Prevention*. 2018 Feb 28;19(sup1):S21-S28.
7. Bellamkonda S, Woodward SJ, Campolettano E, Gellner R, **Kelley ME**, Jones DA, Genemaras A, Beckwith JG, Greenwald RM, Maerlender AC, Rowson S, Duma SM, Urban JE, Stitzel JD, Crisco JJ. "Head Impact Exposure in Practices Correlates with Exposure in Games for Youth Football Players." *Journal of Applied Biomechanics*. 2018 Oct 1;34(5):354-360.
8. **Kelley ME**, Talton JW, Weaver AA, Usoro AO, Barnard ER, Miller AN. "Associations between Upper Extremity Injury Patterns in Side Impact Motor Vehicle Collisions with Occupant and Crash Characteristics." *Accident, Analysis, & Prevention*. 2019 Jan;122:1-7.
9. Urban JE, **Kelley ME**, Espeland MA, Davenport EM, Whitlow CT, Powers AK, Maldjian JA, Stitzel JD. "In-Season Variations in Head Impact Exposure in Youth Football." *Journal of Neurotrauma*. 2019 Jan 15;36(2):275-281.
10. **Kelley ME**, Espeland MA, Flood WC, Powers AK, Whitlow CT, Maldjian JA, Stitzel JD, Urban JE. "Comparison of Head Impact Exposure in Practice Drills among Multiple Youth Football Teams." *Journal of Neurosurgery: Pediatrics*. 2018 Dec 21:1-9.
11. Miller LE, Urban JE, **Kelley ME**, Powers AK, Whitlow CT, Maldjian JA, Rowson S, Stitzel JD. "Evaluation of Brain Response During Head Impact in Youth Athletes Using an Anatomically Accurate Finite Element Model." *Journal of Neurotrauma*. 2019 Jan 9.

12. Urban JE, Flood WC, Zimmerman BJ, **Kelley ME**, Espeland MA, McNamara LP, Davenport EM, Powers AK, Whitlow CT, Maldjian JA, Stitzel JD. "Evaluation of Head Impact Exposure Measured from Youth Football Game Plays." *Journal of Neurosurgery: Pediatrics*. May 2019.
13. Campolettano ET, Gellner RA, Smith EP, Bellamkonda S, Tierney CT, Crisco JJ, Jones DA, **Kelley ME**, Urban JE, Stitzel JD, Genemaras A, Beckwith JG, Greenwald RM, Maerlender AC, Brolinson PG, Duma SM, Rowson S. "Development of a Concussion Risk Function for a Youth Population Using Head Linear and Rotational Acceleration." *Annals of Biomedical Engineering*. January 2020.
14. **Kelley ME**, Jones DA, Espeland MA, Rosenberg ML, Miles CM, Whitlow CT, Maldjian JA, Stitzel JD, Urban JE. "Physical Performance Measures Correlate with Head Impact Exposure in Youth Football." *Medicine & Science in Sports & Exercise*. February 2020.
15. Maerlender AC, Smith E, Brolinson PG, Urban JE, Rowson S, Ajamil A, Campolettano ET, Gellner RA, Bellamkonda S, **Kelley ME**, Jones DA, Powers AK, Beckwith JG, Crisco JJ, Stitzel JD, Duma SM, Greenwald RM. "Psychometric properties of the standardized assessment of concussion in youth football: Validity, reliability, and demographic factors." *Applied Neuropsychology: Child*. March 2020.
16. Maerlender AC, Brolinson PG, Crisco JJ, Urban JE, Ajamil A, Rowson S, Campolettano ET, Gellner RA, Bellamkonda S, Kieffer E, **Kelley ME**, Jones DA, Powers AK, Beckwith JG, Stitzel JD, Greenwald RM, Duma SM. "Neuropsychological Change After a Single Season of Head Impact Exposure in Youth Football." *Journal of the International Neuropsychological Society*. 2020.

Refereed Conference Publications

1. **Kelley ME**, Miller LE, Urban JE, Stitzel JD. "Mesh Smoothing Algorithm Applied to a Finite Element Model of the Brain for Improved Brain-Skull Interface." *Rocky Mountain Bioengineering Proceedings*. April 2015.
2. **Kelley ME**, Talton JW, Usoro AO, Weaver AA, Barnard ER, Miller AN. "Upper Extremity Injury Patterns in Side-Impact Crashes." *2017 IRCOBI Conference Proceedings*. September 2017.
3. Murugesan GK, Famili A, Davenport EM, Wagner B, Urban JE, **Kelley ME**, Jones DA, Whitlow CT, Stitzel JD, Maldjian JA, Montillo A. "Changes in Resting State MRI Networks from a Single Season Of Football Distinguishes Controls, Low, And High Head Impact Exposure." *International Symposium on Biomedical Imaging*. April 2017.
4. Flood WC, **Kelley ME**, Zimmerman B, Stitzel JD, Urban JE. "Head Impact Exposure Measured from Youth Football Games." *Biomedical Sciences Instrumentation*. April 2018.
5. McNamara LP, Urban JE, **Kelley ME**, Miller LE, Stitzel JD. "Characterizing Head Impact Exposure by Player Position in High School Football." *Biomedical Sciences Instrumentation*. April 2018.

Conference Presentations and Abstracts

1. **Kelley ME**, Kaplan J, Williams J. "Quantifying Error in Force Platforms." *Northeast Bioengineering Conference: Undergraduate Research Design Competition*. Northeastern University, Boston, MA. April, 2014.
2. **Kelley ME**, Miller LE, Urban JE, Stitzel JD. "Mesh Smoothing Algorithm Applied to a Finite Element Model of the Brain for Improved Brain-Skull Interface." *Rocky Mountain Bioengineering Symposium, Inc*. Salt Lake City, UT. April 2015.

3. **Kelley ME**, Urban JE, Jones DA, Miller LE, Maldjian JA, Whitlow CT, Powers AK, Stitzel JD. "Head Impact Exposure in Youth Football Over Three Seasons." *12th Annual North American Brain Injury Society Conference on Brain Injury*. San Antonio, TX. April-May 2015.
4. **Kelley ME**, Miller LE, Urban JE, Stitzel JD. "Improving Brain-Skull Interface through application of Mesh Smoothing Algorithm." *2015 SBES Symposium*. Blacksburg, VA. May, 2015
5. **Kelley ME**, Miller LE, Urban JE, Stitzel JD. "Improving Brain-Skull Interface through application of Mesh Smoothing Algorithm." *2015 Summer Biomechanics, Bioengineering, and Biotransport Conference*. Salt Lake City, UT. June 17-20, 2015.
6. **Kelley ME**, Urban JE, Jones DA, Miller LE, Stitzel JD. "Head Impact Exposure of Youth Athletes over Multiple Seasons." *2015 BMES Annual Meeting*. Tampa, FL. October 7-10, 2015.
7. **Kelley ME**, Gaewsky JP, Jones DA, Miller LE, Koya B, Weaver AA, Stitzel JD. "Development and Optimization of Simplified Finite Element Reconstructions of Frontal Motor Vehicle Crashes." *43rd International Workshop on Human Subjects for Biomechanical Research*. New Orleans, LA. November 8, 2015.
8. Urban JE, **Kelley ME**, Davenport EM, Maldjian JA, Whitlow CT, Stitzel JD. "Cumulative Head Impact Exposure in Youth Football Players." *Keystone Symposium on Traumatic Brain Injury: Clinical, Pathological, and Translational Mechanisms of TBI*. Santa Fe, NM. January 2016.
9. Stitzel JD, Urban JE, Miller LE, **Kelley ME**, Jones DA, Davenport EM, Whitlow CT, Powers AK, Maldjian JA. "Subconcussive Impact Exposure and Computational Modeling of the Brain Using an Atlas-Based Biomechanical Finite Element Model." *International Brain Injury Association*. Hague, Netherlands. March 2016.
10. **Kelley ME**, Kane JM, Espeland MA, Miller LE, Stitzel JD, Urban JE. "Head Impact Exposure in Youth Football Practice Drills." *2016 SBES Symposium*. Winston-Salem, NC. May 2016.
11. Miller LE, Urban JE, **Kelley ME**, Stitzel JD. "Evaluation of Directional Dependence of Brain Response in Youth Athletes Using an Anatomically Accurate Finite Element Model." *2016 SBES Symposium*. Winston-Salem, NC. May 2016.
12. Jones DA, Gaewsky JP, **Kelley ME**, Weaver AA, Stitzel JD. "Lumbar Vertebrae Fracture Injury Risk In Reconstruction Of CIREN And NASS Frontal Motor Vehicle Crashes." *2016 SBES Symposium*. Winston-Salem, NC. May 2016.
13. Murugesan GK, Montillo A, Wagner B, Famili A, Davenport EM, Maldjian JA, Jones DA, **Kelley ME**, Joel Stitzel JD, Whitlow CT, Urban JE. "Changes in Resting State MRI Networks from a Single Season of Football Distinguishes Controls, Low, and High Head Impact Exposure." *2017 International Symposium on Biomedical Imaging*. Melbourne, AU. April 2017.
14. **Kelley ME**, Kane JM, Espeland MA, Miller LE, Stitzel JD, Urban JE. "Head Impact Exposure in Youth Football Practice Drills." *2016 OSU Injury Biomechanics Symposium*. Columbus, OH. June 2016.
15. **Kelley ME**, Kane JM, Espeland MA, Miller LE, Stitzel JD, Urban JE. "Evaluation of Head Impact Exposure in Youth Football Practice Drills." *2016 BMES Annual Meeting*. Minneapolis, MN. October 2016.
16. Urban JE, **Kelley ME**, Miller LE, Jones DA, Stitzel JD. "Assessment of Single Season Accumulation of Head Impact Exposure in Youth Athletes." *2016 BMES Annual Meeting*. Minneapolis, MN. October 2016.
17. Miller LE, **Kelley ME**, Jones DA, Urban JE, Rowson S, Stitzel JD. "Evaluation of Brain Response Following Head Impact in Youth Athletes Using an Anatomically Accurate Finite Element Model." *2016 BMES Annual Meeting*. Minneapolis, MN. October 2016.
18. Lord AJ, **Kelley ME**, Stitzel JD, Urban JE. "Biomechanical Evaluation of Football Practice Drills in Youth Athletes." *2016 BMES Annual Meeting*. Minneapolis, MN. October 2016.

19. Stitzel JD, Miller LE, **Kelley ME**, Jones DA, Rowson S, Urban JE. "Brain Deformation of Youth Athletes During Subconcussive Head Impact." *IBIA World Congress 2017*. New Orleans, LA. April 2017.
20. Urban JE, **Kelley ME**, Miller LE, Jones DA, Stitzel JD. "Evaluation of Time-Varying Aspects of Head Impact Exposure in Youth Athletes." *IBIA World Congress 2017*. New Orleans, LA. April 2017.
21. **Kelley ME**, Talton JW, Weaver AA, Usoro AO, Barnard ER, Miller AN. "Upper Extremity Injuries In Side-Impact Motor Vehicle Collisions." *2017 SBES Symposium*. May 10, 2017
22. **Kelley ME**, Talton JW, Usoro AO, Weaver AA, Barnard ER, Miller AN. "Upper Extremity Injury Patterns in Side-Impact Crashes." *2017 IRCOBI Conference*. Antwerp, Belgium. September 2017.
23. Zimmerman BJ, **Kelley ME**, Flood WC, Stitzel JD, Urban JE. "Head Impact Exposure Measured During Youth Football Games." *2017 BMES Annual Meeting*. Phoenix, AZ. October 2017.
24. **Kelley ME**, Urban JE, Rosenberg ML, Whitlow CT, Maldjian JA, Stitzel JD. "Changes in Head Impact Exposure Over Consecutive Seasons Among Individual Youth Football Players." *2017 BMES Annual Meeting*. Phoenix, AZ. October 2017.
25. Garland JA, **Kelley ME**, Urban, JE, Stitzel JD. "Evaluation of Head Impact Exposure in High School Football Players by Position Group." *2017 BMES Annual Meeting*. Phoenix, AZ. October 2017.
26. Urban JE, **Kelley ME**, Espeland MA, Miller LE, Jones DA, Davenport EM, Whitlow CT, Powers AK, Maldjian JA, Stitzel JD. "Subject- and Season-Specific Factors Influencing Head Impact Exposure in Youth Football." *2017 BMES Annual Meeting*. Phoenix, AZ. October 2017.
27. Davenport EM, Urban JE, **Kelley ME**, Jones DA, Wagner B, Espeland MA, Powers AK, Whitlow CT, Stitzel JD, Maldjian JA, "Subconcussive Impacts in Youth Football Correlate with MEG Mean Default Mode Network." *American Society of Functional Neuroradiology 11th Annual Meeting*. Portland, OR. October 2017.
28. Davenport EM, Urban JE, **Kelley ME**, Jones DA, Wagner B, Espeland MA, Powers AK, Whitlow CT, Stitzel JD, Maldjian JA, "Decreases in MEG Measured Default Mode Network Correlates with Subconcussive Impacts in Youth Football." *NIH MEG-North America Workshop*. Bethesda, MD. November 2017.
29. Flood W, **Kelley ME**, Zimmerman B, Stitzel JD, Urban JE. "Head Impact Exposure Measured from Youth Football Games." *Rocky Mountain Bioengineering Symposium*. Fargo, North Dakota. April 2018.
30. McNamara LP, Urban JE, **Kelley ME**, Miller LE, Stitzel JD. "Characterizing Head Impact Exposure by Player Position in High School Football." *Rocky Mountain Bioengineering Symposium*. Fargo, North Dakota. April 2018.
31. Vaughan CG, Sady M, Burns A, Levan A, Davenport EM, Urban J, **Kelley ME**, Whitlow CT, Stitzel JD, Maldjian JA, Gioia GA "Examining functional outcomes after a season of tackle football in youth without diagnosed concussion" *Sports Neuropsychology Society 6th Annual Concussion Symposium*. Washington, DC. May 2018.
32. **Kelley ME**, Jones DA, Miles CM, Stitzel JD, and Urban JE. "Physical Performance and Head Impact Exposure Characteristics in Youth Football." *2018 SBES Symposium*. May 9, 2018.
33. Miller LE, Urban JE, **Kelley ME**, and Stitzel JD. "Evaluation of Brain Response Following Real-World Football Head Impacts Using an Anatomically Accurate Brain Finite Element Model." *2018 SBES Symposium*. May 9, 2018.
34. **Kelley ME**, Espeland MA, Flood WC, Stitzel JD, Urban JE. "Multi-team comparison of head impact exposure in youth football practice drills." *2018 World Congress of Biomechanics*. Dublin, Ireland. July 2018.
35. **Kelley ME**, Urban JE, Jones DA, Flood WC, Powers AK, Whitlow CT, Maldjian JA, Stitzel JD. "Football Concussion Case Series Using Biomechanical and Video Analysis." *American Academy of Neurology 2018 Sports Concussion Conference*. Indianapolis, IN. July 2018.

36. **Kelley ME**, Jones DA, Miles CM, Stitzel JD, Urban JE. "The Effect of Player Performance on Head Impact Exposure in Youth Football." *42nd Annual Meeting of the American Society of Biomechanics*. Rochester, MN. August 2018.
37. **Kelley ME**, Espeland MA, Flood WC, Powers AK, Whitlow CT, Maldjian JA, Stitzel JD, Urban JE. "Evaluating head impact exposure in practice drills among multiple youth football teams." *2018 BMES Annual Meeting*. Atlanta, GA. October 2018.
38. Kim D., Kim J, Carroll C, **Kelley ME**, Urban JE, Johnston ME, Davenport EM, Jung Y, Powers AK, Stitzel JD, Maldjian JA, Whitlow CT. "Repetitive Non-concussive Head Impact Exposure Alters Brain Connectivity of Youth Football Players." *2018 BMES Annual Meeting*. Atlanta, GA. October 2018.
39. Flood WC, **Kelley ME**, Jones DA, McNamara LP, Stitzel JD, Urban JE. "Relationship Between Head Impact Exposure and Intrinsic Athlete Characteristics Among Youth Football Players." *2018 BMES Annual Meeting*. Atlanta, GA. October 2018.
40. Olson O, **Kelley ME**, Jones DA, Urban JE, Johnston ME, Davenport EM, Snively BM, Jung Y, Kim J, Rosenbaum DA, Powers AK, Stitzel JD, Maldjian JA, Whitlow CT. "Cerebral Blood Flow Changes Associated with Repetitive Head Impact Exposure in Youth Football." *2018 BMES Annual Meeting*. Atlanta, GA. October 2018.
41. **Kelley ME**, Urban JE, Jones DA, Davenport EM, Miller LE, Snively BM, Powers AK, Whitlow CT, Maldjian JA, Stitzel JD. "Longitudinal Head Impact Exposure and White Matter Integrity Analysis Among Returning Youth Football Players." *2019 Summer Biomechanics, Bioengineering, and Biotransport Conference*. Seven Springs, PA. June 2019.