David M. Fortenbaugh

PhD, ASP

Principal, Director of Safety & Risk Assessment

Dr. Fortenbaugh applies his expertise in biomechanics, human factors, ergonomics, and safety to evaluate how people interact with products and environments and how those interactions influence performance, risk, and injury. His work spans residential, commercial, retail, recreational, healthcare, transportation, and industrial settings and includes both proactive safety and risk assessment and post-incident accident investigation. His analyses integrate physical, visual, and cognitive demands, user behavior, and injury mechanics under real-world use conditions.

He has investigated hundreds of product-related incidents involving consumer, medical, recreational, and industrial equipment, as well as incidents involving slips, trips, falls, missteps, and transitions across walking surfaces and elevation changes. These evaluations examine product and environmental design features, set-up and use conditions, on-product communications, visual conditions, geometry, and layout in relation to hazard presence, hazard recognition, balance, stability, movement, and injury outcomes. Findings are assessed using established biomechanical and human factors methodologies and evaluated relative to ADA, OSHA, and applicable consensus safety standards.

Prior to joining ESi, Dr. Fortenbaugh conducted biomechanics research in academic and clinical settings, including five years at the American Sports Medicine Institute, with emphasis on human movement, musculoskeletal loading, and injury mechanisms. In his current role at ESi, he applies this scientific foundation to consulting work involving safety evaluation, accident investigation, and standards-based analysis, while remaining actively engaged in standards development and research-informed practice.

Education

PhD, Ergonomics. University of Miami. 2011

MS, Movement Science, Biomechanics Specialization. Barry University. 2005

BS, Biomedical Engineering. Yale University. 2003

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ESi Colorado Springs

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Areas of Specialization

- Biomechanical Accident Reconstruction
- Human Factors & Ergonomics
- Sports, Fitness & Recreational Equipment
- Warnings, Instructions & Safety Labeling
- Medical & Assistive Devices
- Slips, Trips & Falls
- Visibility & Conspicuity
- Product Safety & Design
- Injury Analysis
- Industrial & Workplace Safety
- Risk Assessment & Hazard Analysis

Licenses & Certifications

- Associate Safety Professional (Board of Certified Safety Professionals)
- Walkway Auditor Certificate Holder (National Floor Safety Institute)

Positions Held

Engineering Systems Inc., Colorado Springs, Colorado

- Principal, 2026 – Present
- Director of Safety & Rish Assessment, 2026 – Present
- Senior Managing Consultant, 2023 – 2025
- Senior Consultant, 2021–2023
- Senior Staff Consultant, 2018–2021

Engineering Systems, Inc., Fort Myers. Florida

- Senior Staff Consultant, 2018
- Staff Consultant, 2014–2018

Motus Global, Bradenton, Florida

- Executive VP, Biomechanics Research and Development, 2012–2013

American Sports Medicine Institute, Birmingham, Alabama

- Biomechanist, 2007–2012

Continuing Education

- **Passenger Restraint Safety Systems** – Institute of Police Technology & Management (IPTM), 2025
- **Forklift Training, J.J Keller**, 2022
- **Neuroradiology 101** – Association for the Advancement of Automotive Medicine (AAAM), 2021
- **Preventing Falls in the Workplace** – International Ergonomics Association, 2021
- **Child Safety: The New Decade and Beyond** – AAAM, 2021
- **OSHA 30-Hour Outreach Training Program: Construction** – 360 Training, 2021
- **Behind the Scenes Look at an IIHS Crash Test** – AAAM, 2020
- **Recent Developments at the US CPSC** – Sports and Fitness Industry Association, 2019
- **ADA Basic Building Blocks Course** – ADA National Network, 2019
- **Human Factors in Traffic Crash Reconstruction** – IPTM, 2017

- **Understanding Bloodstain Pattern Analysis** – Bevel, Gardner & Associates, 2017
- **Certified XL Tribometrist (CXLT)** – Excel Tribometers, LLC, 2016
- **Course on Injury Scaling: Uses and Techniques** – AAAM, 2015
- **Traffic Crash Reconstruction 1** – Northwestern University, 2014

Professional Affiliations/Honors

ASTM International

- Member, E17, Vehicle – Pavement Systems, 2024 – Present
- Member, F27, Snow and Water Sports, 2021 – Present
- Member, F24, Amusement Rides and Devices, 2019 – Present
- Member, F15, Consumer Products, 2018 – Present
- Member, E34, Occupational Health and Safety, 2015 – Present
- Member, F08, Sports Equipment, Playing Surfaces and Facilities, 2014 – Present
- Member, F13, Pedestrian/Walkway Safety and Footwear, 2014 – Present
- Member, F25, Ship and Marine Technology, 2020–2021

Association for the Advancement of Automotive Medicine

- Member, 2016 – Present
- Chair, Policy Committee, 2020–2023
- Vice Chair, Policy Committee, 2019–2020

American National Standards Institute

- Member, A14.5 Subcommittee on Portable Reinforced Plastic Ladders, 2021 – Present
- Member, A14.11 Subcommittee on Stepstools, 2021 – Present

American Society of Safety Professionals

- Professional Member, 2022 – Present

American Orthopedic Society for Sports Medicine

- Recipient, O'Donoghue Sports Injury Research Award, 2013

Human Factors and Ergonomics Society

- Member, 2016 – Present
- Program Chair, Forensic Professional Technical Group, 2024–2025
- Session Chair, Reducing Risk Through Design, 2017

- President, University of Miami Chapter, 2006–2007

American Sports Medicine Fellowship Society

- Recipient, Clinical Science Award, 2011
- Basic Science Award, 2008 & 2011

International Consumer Product Health and Safety Organization

- Member, 2026-present

International Society of Biomechanics in Sports

- Director, 2009–2011
- Member, 2004–2012

ARC-CSI Crash Conference

- Pedestrian Crash Research Team, 2017

Project Experience

Physical Environment & Premises Safety

- Slips, trips, and missteps on surfaces with liquid, ice, snow, or environmental debris
- Falls from height, including ladders, stepstools, stairways, mezzanines, scaffolds, aerial lifts, and roofs
- Walkway transitions, ramps, thresholds, curbs, sidewalks, mats, floor grates, and drains
- Lighting, visibility, and contrast in interior and exterior spaces
- ADA compliance, access route design, and handrail/guardrail presence/geometry
- Safety of public, commercial, residential, healthcare, and recreational environments
- Human movement and hazard perception in workplaces, gyms, schools, and hotels

Product Use, Design & Safety

- **Ladders**: step, extension, articulating, telescoping; ANSI A14 compliance and failure analysis
- **Children's products**: car seats, bassinets, cribs, infant loungers, strollers, toys, play yards
- **Household tools and equipment**: stepstools, folding chairs, shelving, furniture, window blinds
- **Kitchen products**: cooktops, blenders, food processors, knives, pressure cookers, air fryers
- **Bathroom safety aids**: shower chairs, grab bars, bathmats, transfer benches
- **Medical and mobility devices**: walkers, rollators, wheelchairs, canes, crutches, lift systems
- **Fitness/sports equipment**: treadmills, resistance bands, pull-up bars, selectorized weight machines
- **Recreational equipment**: climbing walls, playground equipment, foam pits, inflatable features, trampolines

- **Packaging and labels**: visibility, legibility, iconography, and hierarchy in warnings/instructions
- **Pre-market evaluation** of design concepts, prototypes, warnings, and manuals for safety optimization

Human Factors, Ergonomics & Biomechanics

- Gait, balance, and task-specific biomechanics such as climbing, lifting, slipping, reaching, and bending
- Analysis of injury potential based on occupant kinematics and mechanical input
- Visual and cognitive factors like attention, expectancy, workload, reaction time, distractions
- Usability and ergonomic evaluation of product interfaces, including reach/access, grip and actuation forces, feedback, and task/workstation design
- Analysis of operator-machine interfaces in vehicles, equipment, and industrial settings
- Nighttime visibility and conspicuity, including evaluation of sight lines, warnings, and obstructions
- Risk assessment for tasks involving manual material handling, repetition, and force

Peer Reviewer

- American Journal of Sports Medicine
- International Journal of Industrial Ergonomics
- International Journal of Sports Science & Coaching
- Journal of Applied Biomechanics
- Journal of Motor Behavior
- Journal of Shoulder and Elbow Surgery
- Journal of Sports Sciences
- Perceptual and Motor Skills
- PLOS ONE
- Sports Biomechanics
- Sports Health

Publications

“Advanced Camera Matching Techniques and Human Factors Methodologies for Pedestrian Fall Analysis and Investigation,” A. Mathias, H. Chan, D. Kruger, A. Stern, **D. Fortenbaugh**, and R. Plichta. Proceedings of the Human Factors and Ergonomics Society, 2025.

“Accident Reconstruction of a Ladder Slide-Out: Integrating Human Factors, Design, and Safety,” **D. Fortenbaugh**, E. Knox, and D. Kruger. Proceedings of the XXXVIIth Annual International Occupational Ergonomics and Safety Conference, 2025.

"Forensic Analysis of a Walker-Related Fall: Balancing Design, Safety, and Intrinsic Risk Factors," **D. Fortenbaugh**, E. Knox, and S. Smith. Proceedings of the XXXVIIth Annual International Occupational Ergonomics and Safety Conference, 2025.

"Flip-Flops: A Survey of Risk Perception and Acceptance," **D. Fortenbaugh**, P. Shibata, M. Meza-Arroyo, K. Thobe, and T. Welch, Proceedings of the Human Factors and Ergonomics Society, 2022.

"A Methodology for Assessing Driver Perception-Response Time During Unanticipated Cross-Centerline Events," L. Riexinger and **D. Fortenbaugh**, Traffic Injury Prevention, 2021.

"Validation of the Han-Brach Vehicle-Pedestrian Impact Mechanics Model," R.M. Brach, **D. Fortenbaugh**, and J. van Poppel, Collision Magazine, Vol. 13, No. 2, pp. 8–23, Spring 2020.

"A Parametric Study of an Adaptive Load-Limiting Restraint System with Weight Sensing Considerations," J. van Poppel, A. Stern, **D. Fortenbaugh**, and G. Wilcox, 26th ESV, Eindhoven, Netherlands, 2019.

"Changes in Youth Baseball Pitching Biomechanics: A 7-Year Longitudinal Study," G. Fleisig, A. Diffendaffer, B. Ivey, K. Aune, T. Laughlin, **D. Fortenbaugh**, B. Bolt, W. Lucas, K. Moore, and J. Dugas, American Journal of Sports Medicine, 2017.

"Long-Term Outcomes After Ulnar Collateral Ligament Reconstruction in Competitive Baseball Players: A Minimum of 10 Years Follow-Up," D. Osbahr, L. Cain, **D. Fortenbaugh**, B. Raines, J. Dugas, and J. Andrews, American Journal of Sports Medicine, 2014.

"Trunk Axial Rotation in Baseball Pitching and Batting," G. Fleisig, W. Hsu, **D. Fortenbaugh**, A. Cordover, and J. Press, Sports Biomechanics, 2013.

"Dynamic Ultrasonography: A Cadaveric Model for Evaluating Aseptic Loosening of Total Ankle Arthroplasty," P. Ryan, **D. Fortenbaugh**, M. Downey, and J. Kirchner, Journal of Foot and Ankle Surgery, 2013.

"Comparison of Back Squat Kinematics Between Barefoot and Shoe Conditions," K. Sato, **D. Fortenbaugh**, D. Hydock, and G. Heise, International Journal of Sports Science and Coaching, 2013.

"Kinematic Changes Using Weightlifting Shoes on Barbell Back Squat," K. Sato, **D. Fortenbaugh**, and D. Hydock, Journal of Strength and Conditioning Research, 2012.

"The Effect of Pitch Type on Ground Reaction Forces in the Baseball Swing," **D. Fortenbaugh**, G. Fleisig, A. Onar-Thomas, and S. Asfour, Sports Biomechanics, 2011.

"Biomechanical Comparison of Baseball Pitching and Long-Toss: Implications for Training and Rehabilitation," G. Fleisig, B. Bolt, **D. Fortenbaugh**, K. Wilk, and J. Andrews, Journal of Orthopedic and Sports Physical Therapy, 2011.

"Effects of the Bench Shirt on Sagittal Bar Path," T. Silver, **D. Fortenbaugh**, and R. Williams, Journal of Strength and Conditioning Research, 2009.

"Baseball Pitching Biomechanics in Relation to Injury Risk and Performance," **D. Fortenbaugh**, G. Fleisig, and J. Andrews, Sports Health: A Multidisciplinary Approach, 2009.

"The Biomechanics of Situational Baseball: Execution and Perception of Left-Handed Pitchers' Simulated Pick-Off Moves to First Base," **D. Fortenbaugh** and M. Butcher-Mokha, Sports Biomechanics, 2007.

Presentations

"From Classroom to Courtroom: Becoming a Forensic Human Factors and Ergonomics Expert," ASPIRE: The Annual Meeting of the Human Factors and Ergonomics Society, Chicago, IL, October 16, 2025.

"An Integrated Approach to Visualizing a Nighttime Accident Scene for Human Factors Analysis," ASPIRE: The Annual Meeting of the Human Factors and Ergonomics Society, Phoenix, AZ, September 13, 2024.

"Beyond the Horizon of Consumer Communications," ICPHSO International Virtual Symposium, 2021.

"These Issues Will Get Your Heart Rate Up: Fitness Equipment," CLM Focus: Diversity & Inclusion, Product Liability, Transportation, Claims & Litigation, Webcast, June 25, 2020.

"Pathology of Baseball Pitching: Biomechanics and Epidemiology," Seventh Annual Coaches and Sport Science College, Johnson City, TN, December 15, 2012.

"Elbow Biomechanics & Pathomechanics," ASMI Weekly Conference, Birmingham, AL, September 2, 2011.

"Coming Down: Throwing Mechanics of Baseball Catchers," ASMI Injuries in Baseball Course, Tampa, FL, January 29, 2011.

"Elbow Biomechanics & Pathomechanics in Pitching," ASMI Injuries in Baseball Course, Tampa, FL, January 29, 2011.

"Pitching Biomechanics and Epidemiology," Jefferson County High School Baseball Coaches Meeting, Kimberly, AL, November 4, 2010.

"Elbow Biomechanics & Pathomechanics," ASMI Weekly Conference, Birmingham, AL, September 3, 2010.

"Coming Down: Throwing Mechanics of Baseball Catchers," International Society of Biomechanics in Sport Conference, Marquette, MI, July 22, 2010.

"The Effects of Weightlifting Shoes on Squat Kinematics," International Society of Biomechanics in Sport Conference, Marquette, MI, July 20, 2010.

"Biomechanics of Baseball Batting," ASMI Injuries in Baseball Course, Birmingham, AL, January 24, 2010.

"Elbow Biomechanics & Pathomechanics in Pitching," ASMI Injuries in Baseball Course, Birmingham, AL, January 23, 2010.

"Elbow Biomechanics & Pathomechanics," ASMI Weekly Conference, Birmingham, AL, September 28, 2009.

"Mechanical Efficiency in Baseball Pitching," International Society of Biomechanics in Sport Conference, Limerick, Ireland, August 20, 2009.

"Do Biomechanical Evaluations Help?" ASMI Injuries in Baseball Course, Houston, TX, January 25, 2009.

“Elbow Biomechanics & Pathomechanics in Pitching,” ASMI Injuries in Baseball Course, Houston, TX, January 24, 2009.

“Elbow Biomechanics & Pathomechanics,” ASMI Weekly Conference, Birmingham, AL, September 5, 2008.

“Head Motion During Baseball Pitching,” North American Congress on Biomechanics, Ann Arbor, MI, August 8, 2008.

“Ballpark Forces: Ground Reaction Forces During Batting,” International Society of Biomechanics in Sport Conference, Seoul, South Korea, July 15, 2008.

“Incorporating Dartfish into a Sports Camp,” Southeastern Meeting of the American Society of Biomechanics, Birmingham, AL, April 28, 2008.

“The Biomechanics of Baseball Pitching: Shoulder & Elbow,” Samford University, Birmingham, AL, February 8, 2008.

“25 Years of the ISBS: A Silver Salute to Sports Biomechanics Presentations,” International Society of Biomechanics in Sport Conference, Ouro Preto, Brazil, August 26, 2007.

“Differences in Angular Velocity Among Selected Kinematics During a Left-Handed Pitchers’ Pick-Off Move,” International Society of Biomechanics in Sport Conference, Salzburg, Austria, July 15, 2006.

“Selected Kinematic Comparisons Between Football Quarterbacks and Baseball Catchers at Maximum External Rotation of the Shoulder,” Southeast Biomechanics Conference, Atlanta, GA, April 1, 2006.

“Deliveries to Home Plate and First Base Made by Left-Handed Pitchers,” International Society of Biomechanics in Sport Conference, Ottawa, Canada, August 10, 2004.

Patents

United States Patent No. 10,314,536: “Method and for delivering biomechanical feedback to human and object motion”