



RONALD J. FIJALKOWSKI, Ph.D.

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Fijalkowski received a Bachelor of Science in Biomedical Engineering from the Milwaukee School of Engineering and went on to obtain his Ph.D. in Biomedical Engineering from Marquette University while involved in a joint program with the Medical College of Wisconsin. His scientific research has focused on trauma biomechanics with test programs involving human volunteers, post-mortem human subjects, live-surrogates, and anthropomorphic test devices, as well as full scale automotive crash tests and sled tests.

Dr. Fijalkowski has also designed and implemented original research involving experimental and computational models focused on human injury mechanisms, tolerance thresholds, pathological outcomes, and behavioral deficits. He specializes in the study of human kinematics and kinetics during injurious scenarios. This background has provided an intricate knowledge of human anatomy and physiology in the context of biomedical principles and physics that is applicable to a wide range of environments.

SPECIALTIES

- Injury Causation Biomechanics
- Brain Injury Biomechanics
- Spinal Biomechanics
- Sports Biomechanics
- Human Injury Mechanisms
- Human Tolerance Thresholds
- Vehicular Accident Reconstruction
- Diffuse Brain Injury

EDUCATION

- September 1999 to May 2003: Bachelor of Science (B.S.) in Biomedical Engineering from the Milwaukee School of Engineering, Milwaukee, Wisconsin.
- September 2003 to May 2008: Doctorate of Philosophy (Ph.D.) in Biomedical Engineering from Marquette University, Milwaukee, Wisconsin.

PROFESSIONAL EXPERIENCE

ARCCA, Incorporated | Director of Biomechanics & Human Factors – East Coast, V.P., Senior Biomechanist

- Conducted in-game National Hockey League (NHL) player evaluations to measure torso accelerations during body-to-body and body-to-board checking events. These data were used to assess individual biomechanical performance and effectiveness of protective equipment.
- Investigated the design and performance of NHL protective equipment such as gloves, shoulder pads, and skate guards
- Performed real-world dynamic impact testing of various professional baseball, football, and hockey helmet designs to investigate the kinematic and kinetic response.
- Scientifically evaluated the performance of hockey boarding systems to develop and implement a new design focused on trauma mitigation.
- Performed dynamic underbody blast testing in the military environment to design and implement a new seating and restraint system for ground vehicles
- Assessed the response of the human body and various injury mechanisms during automotive collisions through full-scale sled testing involving anthropomorphic test devices (ATDs).

- Evaluated forensic evidence associated with impact or inertial loading conditions induced during incidents such as motor vehicle collisions, slips, trips, or falls.

Epic Sports Biomechanics, LLC. | Director of Sports Biomechanics

- Designed and implemented physical skill assessment protocols focused on identifying movement quality, power, flexibility, mobility, and overall athleticism.
- Planned and executed biomechanical investigations targeting all aspects of the body to evaluate the athlete's risk of injury.
- Established novel scientific testing protocols utilizing advanced biomechanical technologies such as motion capture, inertial measurement units, high-speed cameras, and pressure mats, to evaluate individualized skill-specific performance.
- Analyzed the unique biomechanical data (i.e. kinematics and kinetics) associated with all athletes to evaluate their risk of injury and athletic deficiencies to streamline long-term athletic development.
- Created and carried out training programs that mitigated the risk of injury and focused on improving athletic performance.

Medical College of Wisconsin | Engineering Technician / Researcher

- Applied biomedical engineering principles to investigate real-world injury scenarios and evaluated injury causation, injury tolerance, and protective measures.
- Designed and implemented novel experimental and computational models to evaluate the propensity for human neurological injury in the automotive environment.
- Developed more robust brain injury tolerance thresholds and injury metrics in the context of new experimental data and retrospective analyses.
- Performed human spinal column investigations to explore the soft tissue response to crash forces and cyclic loading conditions in the presence of degeneration and surgical intervention.
- Performed post-mortem human surrogate experimentation to evaluate spinal injury mechanisms, tolerance thresholds, and injury metrics in dynamic loading environments.
- Evaluated motor vehicle crash forces, accelerations, and changes in velocity in various test programs including frontal barrier impact tests, moving barrier side impact tests, low speed vehicle collisions, and sled tests.

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

2004 – Present American Society of Mechanical Engineers

2008 – Present Society of Automotive Engineers

2012 – Present Biomedical Engineering Society

2016 – Present International Society of Biomechanics in Sports

APPOINTMENTS AND COMMITTEES

2011 – Present Journal of Neurotrauma Reviewer

2013 – Present Industry Affairs Committee of the Biomedical Engineering Society

FUNDED RESEARCH PROJECTS

- 2009 – 2013 *Dual Stage Variable Energy Absorber for Military Ground Vehicles*, Co-Investigator
Funding Agency: Department of Defense (DoD) – Army Research Laboratories Weapons and Materials Directorate
- 2011 – 2013 *Biomedical Engineering Analysis of Player Safety and Rink Design*, Co-Investigator
Funding Agency: National Hockey League (NHL)
- 2013 – 2015 *Player Shoulder Pad Performance and Design*, Co-Investigator
Funding Agency: National Hockey League (NHL)
- 2015 *Impact Biomechanics*, Co-Investigator
Funding Agency: Major League Baseball
- 2016 - Present *Sports Helmet Performance and Design*, Co-Investigator
Funding Agency: TBA
- 2016 – Present *Protective Equipment Dynamic Performance*, Co-Investigator
Funding Agency: National Hockey League (NHL)

PUBLICATIONS

Doctoral Dissertation

Fijalkowski RJ: Pulse Characteristics Affect Mild Diffuse Brain Injury Severity. Marquette University, Milwaukee, WI

Peer-Reviewed Journal Publications

Stemper, BD, Yoganandan, N., Paskoff, GR, **Fijalkowski, RJ**, Storvik, SG, Baisden, JL, Pintar, FA, Shender, BS: *Thoraco-Lumbar spine trauma in military environments. Minerva Ortopedica E Traumatologica* (2011).

Stemper, BD, Storvik, SG, Yoganandan, N, Baisden, JL, **Fijalkowski, RJ**, Pintar, FA, Shender, BS, Paskoff, GR: *A new PMHS model for lumbar spine injuries during vertical acceleration. J Biomech Eng* 133.

Fijalkowski RJ, Yoganandan N, Zhang J, Pintar FA: *A finite element model of region-specific response for mild diffuse brain injury. Stapp Car Crash Journal* 53: 2009.

Fijalkowski RJ, Ropella KM, Stemper BD: *Determination of lowpass filter cutoff frequencies for high-rate biomechanical signals obtained using videographic analysis. J Biomech Eng* 131(5): 054502, 2009.

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *A new rat model for diffuse brain injury using coronal plane angular acceleration. J Neurotrauma* 24(8): 1387-97, 2007.

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *Biomechanical correlates of mild diffuse brain injury in the rat. Biomed Sci Instrum* 43: 18-23, 2007.

Fijalkowski RJ, Ellingson BM, Stemper BD, Yoganandan N, Gennarelli TA, Pintar FA: *Interface parameters of impact-induced mild traumatic brain injury. Biomed Sci Instrum* 42: 108-113, 2006.

Ellingson BM, **Fijalkowski RJ**, Yoganandan N, Pintar FA, Gennarelli TA: *New mechanism for inducing closed head injury in the rat. Biomed Sci Instrum* 41: 86-91, 2005.

Peer-Reviewed Journal Publications: In Preparation/Revision

Fijalkowski RJ, Gushue DG: *Injury Mechanisms and Spinal Response to Blunt Dorsal Impact. Accident Analysis and Prevention (in preparation).*

Referred Conference Proceedings

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *Influence of angular acceleration duration on functional outcomes following mild diffuse brain injury.* Proceedings of the International IRCOBI Conference on the Biomechanics of Impact, Maastricht, the Netherlands, p. 161-171, September 19-21, 2007.

Fijalkowski RJ, Stemper BD, Cole D, Ellingson, BM, Yoganandan N, Pintar FA, Gennarelli TA: *Inducing mild traumatic brain injury in the rodent through coronal plane angular acceleration.* Proceedings of the International IRCOBI Conference on the Biomechanics of Impact, Madrid, Spain, p. 115-125, September 20-22, 2006.

Non-Referred Publications and Original Papers

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *Determination of diffuse brain injury thresholds using retrospective analysis.* Proceedings of the 2007 ASME Summer Bioengineering Conference, Keystone, CO, paper # SBC2007-176346.

Fijalkowski RJ, Ellingson BM, Pintar FA, Yoganandan N, Gennarelli TA: *Impact Mechanics and Histopathological Characterization of Closed Brain Injury in the Rat Induced by a New Mechanism.* Proceedings of 2005 ASME Summer Bioengineering Conference – Brain Biomechanics, Vail, CO, paper # B0028995.

Ellingson BM, **Fijalkowski RJ**, Pintar FA, Yoganandan N, Gennarelli TA: *Mechanism and Mathematical Model for Producing Closed Head Diffuse Brain Injury in the Rat.* Proceedings of 2005 ASME Summer Bioengineering Conference – Student Poster Competition, Vail, CO, paper # B0029999.

Abstracts

Markushewski, M, Gushue DG, **Fijalkowski RJ**, McCrae C: Performance characteristics of “concussion reducing” helmet designs and products. ASME International Mechanical Engineering Congress & Exposition, November 15-21, 2013, 2013.

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *Head angular acceleration pulse characteristics affect behavioral outcomes following mild diffuse brain injury.* North American Congress on Biomechanics (NACOB), August 5-9, 2008.

Stemper BD, **Fijalkowski RJ**, Pintar FA, Yoganandan N, Gennarelli TA: *Effects of head angular acceleration pulse characteristics on TBI injury severity and outcomes.* Seventh World Congress on Brain Injury, Lisbon, Portugal, April 9-12, 2008.

Stemper BD, **Fijalkowski RJ**, Pintar FA, Yoganandan N, Gennarelli TA: *Insult characteristics may lead to differing brain injuries.* Rachidian Society 16th Annual Meeting, Kona, HI, February 3-7, 2008.

Fijalkowski RJ, Stemper BD, Gennarelli TA, Yoganandan N, Pintar FA: *An Experimental Rodent Model to Characterize Mild Traumatic Brain Injury.* Rachidian Society 16th Annual Meeting, Kona, HI, February 4-8, 2008.

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *Behavioral Outcomes Following Biomechanically Distinct Diffuse Brain Injuries.* 25th Annual National Neurotrauma Society Symposium, Kansas City, MO, July 30-August 1, 2007.

Fijalkowski RJ, Stemper BD, Pintar FA, Yoganandan N, Gennarelli TA: *Behavioral Deficits Following Concussion: A Function of Rotational Kinematics*. Sigma Xi Advances in Sciences Symposium, Milwaukee, WI, April 25, 2007.

Fijalkowski RJ, Stemper BD, Yoganandan N, Pintar FA, Gennarelli TA: *Relationship Between Loading Conditions of the Head and Resultant Unconscious Time*. Marquette University Biomedical Engineering Symposium, Milwaukee, WI, April 10, 2007.

Fijalkowski RJ, Stemper BD, Gennarelli TA, Yoganandan N, Pintar FA: *An Experimental Rodent Model to Characterize Mild Traumatic Brain Injury*. Rachidian Society 15th Annual Meeting, Kona, HI, February 4-8, 2007.

Stemper BD, **Fijalkowski RJ**, Yoganandan N, Pintar FA, Gennarelli TA: *Acute ventriculomegaly following mild traumatic brain injury*. 8th International Neurotrauma Symposium, Rotterdam, The Netherlands, May 21-25, 2006.

Fijalkowski RJ, Stemper BD, Yoganandan N, Pintar FA, Gennarelli TA: *Graded Diffuse Brain Injury in the Rodent*. Marquette University Biomedical Engineering Conf., Milwaukee, WI, p. 13, February 16, 2006.

Fijalkowski RJ, Stemper BD, Yoganandan N, Pintar FA, Gennarelli TA: *Characterizing Concussion in the Rat by Novel Means of Induction*. 23rd Annual National Neurotrauma Society Meeting, Washington, DC, November 10-11, 2005.

Fijalkowski RJ, Ellingson BM, Pintar FA, Yoganandan N, Gennarelli TA: *Impact Mechanics and Histopathological Characterization of Closed Brain Injury in the Rat Induced by a New Mechanism*. Marquette University Biomedical Engineering Conf., Milwaukee, WI, p. 37, February 15, 2005.

Ellingson BM, **Fijalkowski RJ**, Pintar FA, Yoganandan N, Gennarelli TA: *Mechanism and Mathematical Model for Producing Closed Head Diffuse Brain Injury in the Rat*. Marquette University Biomedical Engineering Conf., Milwaukee, WI, p. 35, February 15, 2005.

Fijalkowski RJ, Pintar FA, Yoganandan N: *A Mathematical Disease Model for the Effects of Apolipoprotein e4 and Age on Head Injury Tolerance*. Marquette University Biomedical Engineering Conf., Milwaukee, WI, p. 14, October 12, 2003.

INVITED LECTURES, WORKSHOPS, PRESENTATIONS, SEMINARS, AND SITE VISITS

International

November 2009 *A finite element model of region-specific response for mild diffuse brain injury*. 2009 Stapp Car Crash Conference, Savannah, Georgia

September 2007 *Influence of pulse duration on diffuse brain injury severity*. 2007 International IRCOBI Conference on the Biomechanics of Impact, Maastricht, the Netherlands

September 2006 *A device for inducing diffuse brain injury in the rodent*. 2006 International IRCOBI Conference on the Biomechanics of Impact, Madrid, Spain

National

February 2008 *Rotational acceleration pulse characteristics affect mild diffuse brain injury severity*. Public Defense of Dissertation Research, Milwaukee, WI

July 2007 *Behavioral outcomes following concussion: A function of rotational kinematics*. 25th National Neurotrauma Society Meeting, Kansas City, MI

June 2007 *Determination of diffuse brain injury thresholds using retrospective analysis*. 2007 ASME Summer Bioengineering Conference, Keystone, CO

- April 2007** *Behavioral deficits following concussion: A function of rotational kinematics.* 2007 Advances in Sciences Symposium, Milwaukee, WI
- April 2007** *Biomechanical correlates of mild diffuse brain injury in the rat.* 2007 Rocky Mountain Bioengineering Symposium Conference Denver, CO
- April 2007** *Relationship between loading conditions of the head and resultant unconscious time.* 2007 Marquette University Bioengineering Symposium, Milwaukee, WI
- April 2006** *Interface parameters of impact-induced mild traumatic brain injury.* 2006 Rocky Mountain Bioengineering Symposium Conference Terre Haute, IN
- February 2006** *Graded diffuse brain injury.* 2006 Marquette University Bioengineering Symposium, Milwaukee, WI
- November 2005** *Characterizing concussion in the rat by novel means of induction.* 23rd National Neurotrauma Society Meeting, Washington, DC
- June 2005** *Impact mechanics and histopathological characterization of closed head injury in the rat induced by a new mechanism.* 2005 ASME Summer Bioengineering Conference, Vail, CO
- April 2005** *New mechanism for inducing closed head injury in the rat.* 2005 Rocky Mountain Bioengineering Symposium Conference, Copper Mountain, CO
- February 2005** *Impact mechanics and histopathological characterization of closed head Injury in the rat induced by a new mechanism.* 2005 Marquette University Bioengineering Symposium, Milwaukee, WI
- October 2003** *A mathematical disease model for the effects of apolipoprotein e4 and age on head injury tolerance.* 2003 Marquette University Bioengineering Symposium, Milwaukee, WI