DESIGN RESEARCH ENGINEERING

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Chris A. Van Ee

Professional Specialization

Impact biomechanics research to identify mechanisms of injury with application to product safety and design. Injury causation is investigated using a combination of computational modeling, laboratory experimental studies, and investigations of real world accidents to define human kinematics, injury mechanisms, interactions with product components and effectiveness of intervention strategies. Specific areas of focus include automotive and marine accidents, child safety, contact sports injuries; industrial machine accidents, and small power hand tool injury investigations.

Past research and product investigations have included pediatric head and neck injury biomechanics, crash induced injuries to the knee, thigh, and hip; crash induced ruptures of the large vessels of the thorax; injury mechanisms and tolerance of the cervical spine; identifying correlations between thoracic loading, skeletal fractures, and internal organ injuries in crash occupants; identifying injury mechanisms to pregnant automobile occupants, evaluating the performance of current and prototype belt restraint systems; evaluating and refining anthropomorphic test device designs and injury reference values; designing assembly machines for increased operator safety; quantifying the protective performance of football, boxing, and motorcycle helmets; evaluating the effectiveness of protective eyewear in small power tool accidents; quantifying the dynamics of circular, miter, and table saw injuries including blade binding, operator error, and the effectiveness of safety interventions; determination of the sufficiency of machine guarding components; and the cause and nature of slip and fall accidents.

Education

Ph.D. (Biomedical Engineering), Duke University, 2000.
Advisor: Barry S. Myers M.D. Ph.D.
B.S. (Mechanical Engineering), Dordt College, 1992.

Professional Background

Senior Biomechanical Engineer
Design Research Engineering, Novi, Michigan
2005 - Present
Adjunct Assistant Professor
Department of Biomedical Engineering, Wayne State University, Detroit, Michigan
2002 - Present
Project Engineer
Design Research Engineering, Novi, Michigan
2002 - 2005
Assistant Research Scientist
University of Michigan Transportation Research Institute, Ann Arbor, Michigan
2000 - 2002
Doctoral Candidate
Department of Biomedical Engineering, Duke University, Durham, North Carolina
1998-2000
Research Assistant
Department of Biomedical Engineering, Duke University, Durham, North Carolina
1992-1998

Custom Design Engineer
Pella Corporation, Pella, Iowa
1991 - 1992
Engineering Technician
Vermeer Manufacturing, Pella, Iowa
1990

Professional Affiliations and Service

Child Passenger Safety Technician - The National Standardized Child Passenger Safety Training Program (2006-Present)
Scientific Program Committee: Association for the Advancement of Automotive Medicine (2006-2008)
Co-chairperson of the Biomechanics Session: SAE World Congress 2006
Co-organizer of the Occupant Restraints Session: SAE World Congress 2006
Society of Automotive Engineers Occupant Protection Committee (2005-Present)
- Vice-Chairman of Occupant Protection Committee (2006-presnet)

Review Panel Member, National Institutes of Health (NIH) (2003-2006)
- Study Section ZRG1 BDCN-K Clinical Neurophysiology, Devices and Neuroprosthetics / Brain Disorders and Clinical Neuroscience
- Study Section ZRG1-GRM, Geriatrics and Rehabilitation Medicine
- Study Section MRS, Musculoskeletal Rehabilitation Sciences
- Study Section ZRG1-SBDD, Rehabilitative Medicine

Reviewer, SAE Congress:
- Biomechanics
- Occupant Protection
- Side Impact, Rear Impact and Rollover

Reviewer, Traffic Injury Prevention
Reviewer, ASME: Occupant Protection & Biomechanics
Member, American Society of Biomechanics (ASB)
Member, American Society of Mechanical Engineers (ASME)
Member, Society of Automotive Engineering Society (SAE)
Member, Association for the Advancement of Automotive Medicine (AAAM)

Honors and Awards

UMTRI Best Publication Award
University of Michigan Transportation Research Institute best publication award for 2004

UMTRI Best Publication Award
University of Michigan Transportation Research Institute best publication award for 2003

John Paul Stapp Award
Best paper at the 2000 Stapp Car Crash Conference. The paper was voted the most significant contribution in the field of impact biomechanics relating to the reduction of injuries in automotive transportation.

Stapp Association Student Award
Most outstanding student presentation at the 2000 Stapp Car Crash conference.

Ralph H. Isbrandt Automotive Safety Award
Best paper presented to the Society of Automotive Engineers on the subject of Automotive Safety Engineering for the year 1995.

Arnold W. Siegel Award

Society of Automotive Engineers' award for the most outstanding paper presented at the 1995 Stapp Car Crash Conference.

Duke University Research Fellowship

National Science Foundation Fellowship Committee Honorable Mention

Dordt College Merit Scholarship

Publications

"Dynamic Biaxial Tissue Properties of the Human Cadaver Aorta," Stapp Car Crash Journal, Vol. 50, November 2006 (with C.S. Shah, W.N. Hardy, M.J. Mason, and K.H. Yang, R. Morgan, and K. Digges).

"Study of Potential Mechanisms of Traumatic Rupture of the Aorta Using In Situ Experiments," Stapp Car Crash Journal, Vol. 50, November 2006 (W.N. Hardy, C.S. Shah, J.M. Kopacz, K.H. Yang, R. Morgan and K. Digges).

"Investigation of Potential Mechanisms of Traumatic Rupture of the Aorta" (Abstract #5245) Proceedings of the World Congress of Biomechanics – Munich, Germany 29th July to 4 August 2006 (with Warren N. Hardy, Chirag S. Shah, Matthew J. Mason, King H.Yang, and Kennerly Digges)

"Safety Restraint System Physical Evidence and Biomechanical Injury Potential Due to Belt Entanglement," SAE Paper 2006-01-1670, 2006 SAE World Congress (with D.E. Toomey and M.E. Klima)

"High-Speed Biaxial Tissue Properties of the Human Cadaver Aorta," Proceedings of IMECE05 - 2005 ASME International Mechanical Engineering Congress, November 2005. (with C.S. Shah, M.J. Mason, K.H. Yang, W.N. Hardy, R. Morgan, and K. Digges)

"A New Device for High-Speed Biaxial Tissue Testing: Application to Traumatic Rupture of the Aorta," SAE Paper 2005-01-0741, SAE 2005 Transactions: Journal of Passenger Cars. (with M.J. Mason, C.S. Shah, M. Maddali, K.H. Yang, W. N. Hardy , K. Digges)

"Use of Computer Models in Forensic Investigations of Human Kinematics: Examples from Alpine Skiing and Marine Accident Reconstruction", Proceedings of AmeriPAM 2004 (Abstract) (with E. Morphy and R. Taylor).

"Mechanical Properties and Anthropometry of the Human Infant Head," Stapp Car Crash Journal, 2004 (with M.T. Prange, J. F. Luck A. Dibb, R. W. Nightingale, B. S. Myers).

"Cervical-spine Geometry in the Automotive Seated Posture: Variations with Age, Stature, and Gender," Stapp Car Crash Journal, 2004 (with K. D. Klinich, S. Ebert, C. Flannagan, M. Prasad, M. P. Reed, L. W. Schneider).

"Improved Estimation of Human Neck Tensile Tolerance: Reducing the Range of Reported Tolerance Using Anthropometrically Correct Muscles and Optimized Physiologic Initial Conditions." Stapp Car Crash Jounal, November 2003, (with V. C. Chancey, R. W. Nightingale, K. E. Knaub, B. S. Myers).

"The Tolerance of the Human Hip to Dynamic Knee Loading." Stapp Car Crash Jounal, pp 211-228, November, 2002. (with J. D. Rupp, M. P. Reed, S. Kuppa, S. C. Wang, J. A. Goulet, L. W. Schneider).

"Techniques and Applications in Strain Measurements in Skeletal Muscle." **Biomechanic Systems, Techniques, and Applications. Volume III**. Leondes CT, ED., CRC Press, Boca Raton, Florida 2001 (with B. S. Myers).

"Lateral Bending Strength of the Cervical Spine Estimated from Muscle Generated Moments," 2001 BMES Annual Fall Meeting Proceedings (Abstract) (with V. C. Chancey, R. W. Nightingale, K. E. Knaub, B. S. Myers).

"Tensile Properties of the Human Muscular and Ligamentous Cervical Spine." 2000 Stapp Car Crash Journal, pp 85-102, November, 2000 (with R. W. Nightingale, D. L. A. Camacho, V. C. Chancey, K. E. Knaub, E. A. Sun, B. S. Myers).

"Tensile Properties of the Human Muscular and Ligamentous Cervical Spine." Ph.D. Thesis, Duke Universty, 2000.

"Quantifying Skeletal Muscle Properties in Cadaveric Test Specimens: Effects of Mechanical Loading, Postmortem Time, and Freezer Storage." Journal of Biomechanical Engineering, 122:9-14, February 2000 (with A. L. Chasse, B. S. Myers).

"Understanding and Minimizing Error in Cervical Spine Tensile Testing," Proceedings: The 28th International Workshop on Human Subjects for Biomechanical Research, 2000 (with V. C. Chancey, R. W. Nightingale, D. L. A. Camacho, B. S. Myers).

"Tensile Testing of the Ligamentous Cervical Spine: Biomechanical Considerations for a Proposed Testing Methodology." Proceedings: The 27th International Workshop on Human Subjects for Biomechanical Research, 1999 (with R. W. Nightingale, B. S. Myers).

"Muscle Fixation Methods to Increase Cadaveric Biofidelity: Results of a Single Fiber Muscle Model," The 9th Injury Prevention Through Biomechanics Symposium Proceedings, Detroit, MI, 1999 (with M. R. Larochelle, W. Feng, M. K. Reedy, F. H. Schachat, B. S. Myers).

"The Effects of Postmortem Time and Freezer Storage on the Mechanical Properties of Skeletal Muscle." The 8th Injury Prevention Through Biomechanics Symposium Proceedings, Detroit, MI, 1998 (with A.L Chasse, B. S. Myers).

"Injury Mechanisms in the Pediatric Cervical Spine During Out-of-Position Airbag Deployments." Proceedings of the 42nd Association of the Advancement of Automotive Medicine, 1998 (with R. W. Nightingale, B. A. Winkelstein, B. S. Myers).

"The Effects of Postmortem Time and Freezer Storage on the Mechanical Properties of Skeletal Muscle." Society of Automotive Engineers, J. Passenger Cars, SAE Paper #983155, 1998 (with A. L. Chasse, B. S. Myers).

"Measurement of Human Neck Muscle Volume Geometry and Physiologic Cross Sectional Area in 5th, 50th and 95th Percentile Subjects using Cadaveric Dissection and MRI." 25th Annual International Workshop for Human Subjects for Biomechanical Research, 1997 (with K. E. Knaub, C. Cheng, B. Poon , C. Spritzer, B. S. Myers).

"On the Structural and Material Properties of Mammalian Skeletal Muscle and its Relevance to Human Cervical Impact Dynamics." Society of Automotive Engineers, J. Passenger Cars, SAE Paper #952723, 1995 (with B. S. Myers, D. L. A. Camacho, C. T. Woolley, T. M. Best).

"Measurement of the Structural and Material Properties of Mammalian Skeletal Muscle." The 5th Injury Prevention Through Biomechanics Symposium Proceedings, Detroit, MI, 1995 (with D. L. A. Camacho, C. T. Woolley, T. M. Best, B. S. Myers).

Presentations

"Safety Restraint System Physical Evidence and Biomechanical Injury Potential Due to Belt Entanglement," co-presenter with M. Klima, SAE World Congress, Detroit, MI, April 2006.

"Biomechanics, Falls, and Shaken Baby Syndrome," Guest Lecturer for BME 7995 – Forensic Bioengineering, Wayne State University, October, 2005.

"Trial Techniques and Strategies: Making the Most of Your Experts," co-presenter with Jeffrey Weiner, Florida Bar Continuing Legal Education Seminar, Miami, FL, January 21, 2005.

"Use of Computer Models in Forensic Investigations of Human Kinematics: Examples from Alpine Skiing and Marine Accident Reconstruction", AmeriPAM Nov 3, 2004.

"Marine Accident Reconstruction: Forensic Engineering and Biomechanics" Wayne State University, June 7, 2004.

"Biomechanics and Physical Restraint, An Analysis of the Mandt System." Dallas, TX, April 22, 2004.

"Rollovers, Neck Injury, and Defining the Role of Lateral Bending in Compressive Neck Injury." Wayne State University, March 15, 2004.

"Development of an Experimental Protocol to Quantify the Tolerance of the Hip to Axial Femur Loading." The 29th International Workshop on Human Subjects for Biomechanical Research. San Antonio, TX, November, 2001.

"Head and Cervical Spine Geometry in the Automotive Neutral, Flexion, and Extension Postures." Ford Motor Company, Dearborn, MI, September, 2001.

"Tensile Properties of the Human Muscular and Ligamentous Cervical Spine." 2000 Stapp Car Crash Conference, Atlanta, GA, November, 2000.

"Development of an Experimental Model of Tensile Neck Injury." The 27th International Workshop on Human Subjects for Biomechanical Research, San Diego, CA, October, 1999.

"A Combined Experimental and Computational Study of Tensile Neck Injury." National Highway Traffic Safety Administration, Durham, NC, July, 1999.

"Neck Surrogates: A Systematic Experimental and Computational Study Designed to Provide Anthropometric Test Device Injury Reference Values." National Highway Traffic Safety Administration, Washington, DC, December, 1998.

"The Effects of Postmortem Time and Freezer Storage on the Mechanical Properties of Skeletal Muscle." The 42nd Annual Stapp Car Crash Conference, Phoenix, AZ, November 2-4, 1998.

"The Effects of Postmortem Time and Freezer Storage on the Mechanical Properties of Skeletal Muscle." The 8th Injury Prevention Through Biomechanics Symposium, Detroit, MI, May 7-8, 1998.

"Measurement of the Structural and Material Properties of Mammalian Skeletal Muscle." The 5th Injury Prevention Through Biomechanics Symposium, Detroit, MI, May 4-5, 1995.

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