Exponent®
Engineering & Scientific Consulting

Christine Raasch, Ph.D.

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Professional Profile

Dr. Raasch specializes in the biomechanics of injury, vehicle occupant dynamics and kinematics, human injury tolerance and associated test criteria, occupant restraint systems, and accident reconstruction. Her work involves analysis of traumatic injuries associated with motor vehicle and other accidents, computer simulation of occupant motions using ATB, DYNAMAN, and MADYMO, and analysis of vehicle restraint system performance.

Dr. Raasch has conducted test projects including full-scale vehicle crash and sled testing, motorcycle testing, component testing, and specialized biomechanical studies such as helmet impact testing.

Dr. Raasch also oversees Exponent's anthropomorphic test dummy (ATD) laboratory, and provides analysis of ATD biofidelity issues and project-specific modification of ATDs. She has developed ATD calibration fixtures and procedures, and managed the design and integration of Exponent's own Hybrid III-based motorcycle ATD, which includes an onboard data collection system and instrumented leg. Her research has focused on analysis of locomotion and reaching movements, and impaired control of movement after head injury or stroke. Her investigations have included the creation of complex computer models of muscle and skeletal dynamics, use of optimization techniques, and experiments using motion analysis and electromyography.

Prior to joining Exponent, Dr. Raasch was a Research Associate and Post-Doctoral Fellow at the Rehabilitation Institute of Chicago and Northwestern University, a Biomedical Engineer and Research Assistant at Rehabilitation Research & Development Center of Palo Alto Veterans Administration Health Care System and Stanford University, and a Satellite Systems Engineer at TRW Space & Technology Group.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Stanford University, 1996

M.S., Mechanical Engineering, Stanford University, 1986

B.S., Mechanical Engineering, University of Arizona, 1985

Society of Automotive Engineers (SAE) Excellence in Oral Presentation Award, 2008

SAE Arch T. Colwell Merit Award, 2006

National Institute of Health Postdoctoral Fellowship

Stanford Mechanical Engineering Departmental Fellowship

Graduated top of class, UA Aerospace & Mechanical Engineering Department

Continental Oil Company Scholarship

Fleischmann Scholarship

National Honor Society Scholarship

Tau Beta Pi, National Engineering Honor Society

Phi Kappa Phi, Academic Honor Society

Licenses and Certifications

CLASS Motorcycle School

Motorcycle Safety Foundation (MSF) Basic Rider Course

Northwestern University Center for Public Safety, Traffic Crash Reconstruction for Engineers

PADI Certified Open Water Scuba Diver

Professional Affiliations

Society of Automotive Engineers—SAE

Southwestern Association of Technical Accident Investigators—SATAI

Publications

Imler S, Heller M, Raasch C, Watson H, Zhao K. The effect of rear impact collision delta-V and restraint status on injury outcome. SAE World Congress, 2014-01-0524, Society of Automotive Engineers, Warrendale, PA, 2014.

McGowan J, Bussone W, Raasch C, Smith J, Smedley J. Tractor-semitrailer driver and sleeping compartment occupant responses to low-speed impacts. SAE World Congress, 2012-01-0566, Society of Automotive Engineers, Warrendale, PA, 2012.

Jones S, Henry S, Raasch C, Hitt J, Bunn J. Individuals with non-specific low back pain use a trunk stiffening strategy to maintain upright posture. Journal of Electromyography and Kinesiology 2012; 22:13-20.

Rodowicz K, Dupont K, Smedley J, Raasch C, Mkandawire C, Fittanto D, Bare C, Smith J. Passenger vehicle occupant response to low-speed impacts with a tractor-semitrailer. SAE World Congress, 2011-01-1125, Society of Automotive Engineers, Warrendale, PA, 2011.

Raasch C, Carhart M, Ivarsson BJ, Lucas S. Development of lower neck injury assessment reference values based on comparison of ATD and PMHS tests. SAE World Congress, 2010-01-0140 and International Journal of Passenger Cars 2010; 3:308-323, Society of Automotive Engineers, Warrendale, PA, 2010.

Welch T, Bridges A, Gates D, Heller M, Stillman D, Raasch C, Carhart C. An evaluation of the BioRID II and Hybrid III during low- and moderate-speed rear impact. SAE World Congress, 2010-01-1031 and

International Journal of Passenger Cars 2010; 3:704-733, Society of Automotive Engineers, Warrendale, PA, 2010.

Brown J, Raasch C, Davee D. Comparison of restraint system marks with proper and improper belt usage. SAE World Congress, 2009-01-1243, Society of Automotive Engineers, Warrendale, PA, 2009.

Moore T, Ray R, Raasch C, Huang S-W, Corrigan C. Police accident report restraint usage accuracy and injury severity. SAE World Congress, 2009-01-1253, Society of Automotive Engineers, Warrendale, PA, 2009.

Raasch C, Davee D, Luepke P. Seat belt entanglement in rollover accidents: Physical evidence and occupant kinematics. SAE World Congress, 2008-01-1237, Society of Automotive Engineers, Warrendale, PA, 2008.

Davee D, Van Arsdell W, Raasch C, Moralde M. Seat belt buckle release by inadvertent contact. SAE World Congress, 2008-01-1236, Society of Automotive Engineers, Warrendale, PA, 2008.

Jones S, Henry S, Raasch C, Hitt J, Bunn J. Responses to multi-directional surface translations involve redistribution of proximal versus distal strategies to maintain upright posture. Experimental Brain Research 2008; 187:407-417.

Henry S, Jones S, Raasch C, Hitt J, Bunn J. People with chronic low back pain re-weight proximal vs. distal torque responses to maintain upright posture. 6th Interdisciplinary World Congress on Low Back and Pelvic Pain, Barcelona, Spain, November 7-10, 2007.

Richards D, Carhart M, Raasch C, Pierce J, Steffey D, Ostarello A. Incidence of thoracic and lumbar injuries for restrained occupants in frontal collisions. Proceedings, 50th Annual Association for the Advancement of Automotive Medicine 50:119-133, Chicago, IL, October 16-18, 2006.

Raasch C, Carhart M. Comparison of ATD upper and lower neck flexion/extension moments, and implications for neck injury criteria. 5th World Congress of Biomechanics, Munich, Germany, July 29-August 4, 2006. Journal of Biomechanics 2006; 39(suppl. 1):S145.

Larson R, Raasch C, Pierce J. Measurement and evaluation of vibration exposure for locomotive crew members. 1st American Conference on Human Vibration, Morgantown, WV, 2006.

Newberry W, Lai W, Carhart M, Richards D, Brown J, Raasch C. Modeling the effects of seat belt pretensioners on occupant kinematics during rollover. SAE World Congress, 2006-01-0246 and SAE Transactions Journal of Passenger Cars, Society of Automotive Engineers, Warrendale, PA, 2006.

Davee D, Brown J, Raasch C. Case study of clothing fabric transfer to seat belt webbing under accident forces. SAE World Congress, 2006-01-0904, Society of Automotive Engineers, Warrendale, PA, 2006.

Jones S, Henry S, Raasch C, Hitt J, Bunn J. Persons with chronic low back pain (LBP) demonstrate less dynamic frontal plane torque responses to unexpected perturbations. International Society of Posture and Gait Research Conference XVII, Marseilles, France, May 29-June 2, 2005.

Jones S, Henry S, Raasch C, Hitt J, Bunn J. Persons with chronic low back pain (LBP) demonstrate reduced sagittal plane joint torques in response to surface translations. International Society of Posture and Gait Research Conference XVII, Marseilles, France, May 29-June 2, 2005.

Yamaguchi G, Carhart M, Larson R, Richards D, Pierce J, Raasch C, Scher I, Corrigan C. Electromyographic activity and posturing of the human neck during rollover tests. SAE World Congress, 2005-01-0302, Society of Automotive Engineers, Warrendale, PA, 2005.

Jones S, Henry S, Raasch C, Hitt J. Differential effects of two physical therapy interventions on automatic

postural responses in patients with low back pain. World Congress for Low Back and Pelvic Pain, Melbourne, Australia, November 9-13, 2004.

Jones S, Raasch C, Hitt J, Henry S, Bunn J. Persons with chronic, recurrent low back pain exhibit altered neuromuscular patterns in response to postural perturbations. APTA Annual Scientific Exposition, Chicago, IL, June 2004.

Jones S, Henry S, Raasch C, Hitt J. Patients with chronic, recurrent low back pain demonstrate more generalized joint torque patterns in response to postural perturbations. XVth International Society of Electrophysiology and Kinesiology Conference, Boston, MA, June 18-21, 2004.

Davee D, Van Arsdell W, Raasch C. Minimal effect of amplified vehicle accelerations on seat belt buckle resistance to inertial release. SAE World Congress, 2004-01-0854, Society of Automotive Engineers, Warrendale, PA, 2004.

Raasch C, Zajac F. Locomotor strategy for pedaling: muscle groups and biomechanical functions. Journal of Neurophysiology 1999; 82:515-525.

Ting L, Raasch C, Brown D, Kautz S, Zajac F. Sensorimotor state of the contralateral leg affects ipsilateral muscle coordination of pedaling. Journal of Neurophysiology 1998; 80:1341-1351.

Raasch C, Mussa-Ivaldi F, Rymer WZ. Motor learning in reaching movements by hemiparetic subjects. Society for Neuroscience Abstracts 1997; 23(part 2):2374.

Raasch C, Zajac F, Ma B, Levine W. Muscle coordination of maximum-speed pedaling. Journal of Biomechanics 1997; 30:595-602.

Raasch C, Zajac F. A primitive locomotor strategy for pedaling. Proceedings, Neural Control of Movement 7th Annual Meeting, Cancun, Mexico, p. 20, April 8-13, 1997.

Raasch C. Coordination of pedaling: functional muscle groups and locomotor strategies. Ph.D. Dissertation, Stanford University, 1996.

Raasch C, Zajac F. A simple muscle synergy control for different steady-state pedaling goals. Proceedings, 19th Annual American Society of Biomechanics Conference, p. 263, Palo Alto, CA, August 24-26, 1995.

Ting L, Raasch C, Zajac F. Muscle coordination of one-legged pedaling. Proceedings, 19th Annual American Society of Biomechanics Conference, p. 265, Palo Alto, CA, August 24-26, 1995.

Ting L, Raasch, C, Sheehan F, Brown D, Kautz S, Zajac F. Is one leg controlled the same during two mechanically equivalent tasks? 2nd World Congress of Biomechanics Abstracts 1994; II: 112.

Raasch C, Zajac F, Ma B, Levine W. Importance of biarticular muscle control to smooth pedaling. 2nd World Congress of Biomechanics Abstracts 1994; II: 124.

Raasch C, Ma B, Zajac F, Levine W. Use of an optimal control model to study normal and constrained control of maximum-speed pedaling. Proceedings, International Federation of Automatic Control (IFAC) Symposium on Modeling and Control in Biomedical Systems, pp. 456-457, Galveston, TX, March 27-30, 1994.

Raasch C, Zajac F, Ma B, Levine W, Dairaghi C, Stevenson P, Brown D. Muscle coordination of maximum-speed pedaling based on modeling and kinesiological data. Society for Neuroscience Abstracts 1993; 19(part 1):146.

Raasch C, Zajac F, Ma B, Levine W, Dairaghi C, Stevenson P. The use of optimal control and

kinesiological data to study muscle coordination of pedaling. Proceedings, 15th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, San Diego, CA, pp. 1147-1148, October 28-31, 1993.

Presentations

Raasch C. Biomechanics for (crash test) dummies: A lot happens in the blink of an eye. Brain-Body Dynamics Laboratory Seminar Series on Engineering, Neuroscience & Health, University of Southern California, Los Angeles, CA, March 21, 2011.

Raasch C. Development of lower neck injury assessment reference values based on comparison of ATD and PMHS tests. SAE World Congress, Detroit, MI, April 13, 2010.

Raasch C. Seat belt entanglement in rollover accidents: Use of physical evidence to investigate claims of seat belt usage. Kia Motors America Hot Topics Product Litigation Seminar, Irvine, CA, May 15, 2008.

Raasch C. Seat belt entanglement in rollover accidents: Physical evidence and occupant kinematics. SAE World Congress, Detroit, MI, April 17, 2008.

Raasch C. Comparison of ATD upper and lower neck flexion/extension moments, and implications for neck injury criteria. 5th World Congress of Biomechanics, Munich, Germany, July 31, 2006.

Raasch C, Van Arsdell W. Minimal effect of amplified vehicle accelerations on seat belt buckle resistance to inertial release. SAE World Congress, Detroit, MI, March 10, 2004.

Raasch C. Importance of biarticular muscle control to smooth pedaling. 2nd World Congress of Biomechanics, Amsterdam, The Netherlands, July 13, 1994.

Raasch C. The use of optimal control and kinesiological data to study muscle coordination of pedaling. 15th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, San Diego, CA, October 1993.