



## ANDREW J. RENTSCHLER, Ph.D.

### PROFESSIONAL BIOGRAPHICAL OUTLINE

#### BACKGROUND

Dr. Rentschler received a Bachelors of Science in Mechanical Engineering with a minor in Biomedical Engineering from Carnegie Mellon University. He then went on to obtain a Masters of Science and a Ph.D. in Bioengineering from the University of Pittsburgh. While at the University of Pittsburgh, Dr. Rentschler's research included investigating the biomechanics of gait and falls in order to mitigate related injuries through the design of an autonomous robotic walker, as well as three dimensional motion and force analyses to study the biomechanics of shoulder, wrist, and spine injuries in wheelchair users. He has overseen clinical studies of live human subjects and participated in testing with anthropomorphic test devices (ATD) to gauge injury potential. Dr. Rentschler has completed advanced coursework in the fields of biomechanics, kinematics of the human body, biomaterials, engineering mechanics, and anatomy and physiology.

Dr. Rentschler's academic and professional experience represents an extensive combination of mechanical and biomechanical engineering, including human kinematic analysis, ATD testing, and human anatomy and physiology. Currently, he specializes in the study of the kinematics and kinetics of the human body, injury mechanisms, and associated tolerances.

#### SUMMARY OF EXPERIENCE

- Researched and analyzed the relationships between crash injuries and crash forces, occupant kinematics, and human tolerances
- Investigated crash injury potential using Hybrid III ATD
- Conducted graduate research to develop and test an autonomous robotic walker to help prevent injuries from falls and increase user independence
- Performed human subject testing and analysis to study the biomechanics and injury mechanisms of wheelchair users
- Developed and utilized safety testing for assistive technology devices being reviewed by the FDA
- Conducted clinical studies to investigate human kinematics and vibration absorption in manual and electric powered wheelchair users

#### AREAS OF SPECIALTY

- Biomechanical Consulting
- Human Injury Tolerance
- Slip and Fall Analysis
- Vehicular Accident Reconstruction
- Human Kinematic Analysis and Testing
- Injury Mechanism Analysis

#### ACADEMIC BACKGROUND

- Doctor of Philosophy in Bioengineering, University of Pittsburgh, 2004
- Masters of Science in Bioengineering, University of Pittsburgh, 2002
- Bachelors of Science in Mechanical Engineering with a minor in Biomedical Engineering, Carnegie Mellon University, 1995



## PROFESSIONAL EXPERIENCE

### Present | ARCCA, Incorporated | Senior Biomechanist

- Specializes in crash injury analysis, injury mechanism determination, and crash kinematics
- Investigates the cause, nature, and severity of injuries using biomechanics
- Participates in biomechanical investigations that explore human kinematics and tolerance to potentially injurious environments
- Researches injury mechanisms and contributes to the design of vehicles and environments to mitigate injurious events

### 2004 – 2007 | CED/Accident Analysis Inc. | Forensic Engineer

- Responsible for performing investigative and analytical consulting services in order to determine the cause and circumstances of accidents with respect to injury tolerance and mechanisms
- Consulted on biomechanics, slip and fall accidents, and vehicle accident reconstruction

### April 2004 – October 2004 | B.E.A.R. | Forensic Engineer

Assisted with performing vehicular accident reconstruction and biomechanical analyses

### 1995 – 2004 | Human Engineering Research Laboratories, School of Health and Rehabilitation Services, University of Pittsburgh, VA Pittsburgh Health Care System | Research Associate

## RESEARCH STUDIES

### Power Wheelchair Comparison Study

Performed testing on 15 electric powered wheelchairs in accordance with the ANSI/RESNA wheelchair standards. Results were statistically analyzed to determine significant safety and performance differences.

### Road Loads

Assisted in designing and implementing a wheelchair hub and caster used to record the forces acting on a wheelchair during daily use. Study was then expanded to determine accelerations and vibrations experienced by the user. Data was collected from over 30 wheelchair subjects.

### Wheelchair Biomechanics

Assisted in data collection and analysis of wheelchair user propulsion biomechanics. Study involved using OPTOTRAK 3D motion analysis system and Smartwheel force sensing pushrim to determine the shoulder, arm, and wrist forces exerted by wheelchair users during propulsion.

### Robotic Walker

Assisted in design, testing, and refinement of a walker equipped with navigational and obstacle avoidance capability. Performed engineering test and clinical studies to determine the effectiveness of the device and improvements necessary for commercialization.

### Manager of the Wheelchair and Assistive Technology Testing Lab

- Responsible for performing testing and providing consulting services for large assistive technology companies as well as small start-up firms
- Performed standard and custom testing for devices seeking FDA approval
- Provided consulting services on design and fabrication for these companies
- Designed and fabricated much of the testing equipment used in the lab

### Machine Shop

- Proficient on manual mill, lathe, drill press, welding machines, as well as CNC mill, lathe, and wire EDM
- Designed and fabricated equipment and devices used for several in-house projects

### PROFESSIONAL AFFILIATIONS

- EI, State of Florida
- Society of Automotive Engineers
- International Society of Biomechanics

### PROFESSIONAL EDUCATION

- Biomechanics of High-Impact Injuries, NTSB
- Methodology and Techniques of Crash Data Retrieval, IPTM
- Human Factors in Traffic Crash Reconstruction, IPTM
- Automobile Safety and Injury Biomechanics, VT Center for Injury Biomechanics
- Injuries, Anatomy, Biomechanics and Federal Regulations, SAE
- Vehicle Accident Reconstruction Methods, SAE
- Linear Momentum Analysis, CAARS
- Motor Vehicle Accident Reconstruction, SAE
- Advanced Collision Investigation, California Law Enforcement
- Post Collision Passenger Vehicle Inspection and Seat Belt Analysis, CAARS

### PUBLICATIONS

#### Peer-Reviewed Journal Publications

**Rentschler, AJ**, Cooper RA, Fitzgerald SG, Boninger ML, et. al. (2003). *Evaluation of Selected Electric Powered Wheelchairs Using the ANSI/RESNA Standards*. Archives of Physical Medicine and Rehabilitation.

**Rentschler, AJ**, Cooper RA, Blasch B, et. al. (2003). *Intelligent Walkers for the Elderly: Performance and Safety Testing of the VA-PAMAID Robotic Walker*. Journal of Rehabilitation Research and Development.

Fitzgerald SG, Cooper RA, Boninger ML, **Rentschler, AJ**, et. al. (2001). *Comparison of Fatigue Life for Three Types of Manual Wheelchairs*. Archives of Physical Medicine and Rehabilitation. 82:10. 1484-1488.

Cooper RA, Fitzgerald SG, Boninger ML, Prins K, **Rentschler, AJ**, et. al. (2001). *Evaluation of a Pushrim Activated Power Assisted Wheelchair*. Archives of Physical Medicine and Rehabilitation. 82:5. 702-708.

Cooper RA, **Rentschler, AJ**, O'Connor TJ, Ster JF, et. al. (2000). *Technical Note: Displacement between the Seating Surface and Hybrid Test Dummy during Transitions with a Variable Configuration Wheelchair*. Journal of Rehabilitation Research and Development. 37:3. 297-303.

DiGiovine MM, Cooper RA, Boninger ML, Lawrence BL, VanSickle DP, **Rentschler, A.J.** (2000). *User Assessment of Manual Wheelchair Ride Comfort and Ergonomics*, Archives of Physical Medicine and Rehabilitation. 81:4. 490-494.

Cooper RA, DiGiovine CP, **Rentschler, AJ**, et. al. (1999). *Fatigue Life of Two Manual Wheelchair Cross-Brace Designs*. Archives of Physical Medicine and Rehabilitation. 80:9. 1078-1081.

Cooper RA, Boninger ML, **Rentschler, A.** (1999). *Evaluation of Selected Ultralight Manual Wheelchairs Using ANSI/RESNA Standards*. Archives of Physical Medicine and Rehabilitation. 80:4. 462-467.

Cooper RA, O'Connor TJ, Gonzalez JP, Boninger ML, and **Rentschler, AJ.** (1999). *Augmentation of the 100 kg ISO Wheelchair Test Dummy to Accommodate Higher Mass*. Journal of Rehabilitation Research and Development. 36:1. 48-54. See [www.vard.org](http://www.vard.org)

### Book Chapters

**Rentschler, AJ.** (2007). Walker Systems in *The Engineering Handbook on Smart Technology for Aging, Disability and Independence*. Ed. A. Helal, M. Mokhtari and B. Abdulrazak. Wiley & Sons.

### Peer-Reviewed Proceedings Publications (i.e. expanded abstracts)

**Rentschler, AJ**, Blasch B, Boninger ML. (2003). *Evaluation of the VA-PAMAID Robotic Walker*. 26th Annual RESNA Conference, Atlanta, GA.

**Rentschler, AJ**, Cooper RA, Boninger, ML, et. al. (2001). *Using Stability and Fatigue Strength Testing When Choosing a Manual Wheelchair*. Proceedings 24th Annual RESNA Conference, Reno, NV. 335-337.

Algood D, Cooper RA, **Rentschler, AJ**, et. al. (2001). *Power and Control System Testing of Five Different Types of Power Wheelchairs*. Proceedings 24th Annual RESNA Conference, Reno, NV. 421-423.

Vitek JM, Cooper RA, **Rentschler, AJ**, et. al. (2001). *Static, Impact, and Fatigue Testing of Five Different Types of Electric Powered Wheelchairs*. Proceedings 24th Annual RESNA Conference, Reno, NV. 343-345.

**Rentschler, AJ**, Cooper RA, Wolf EJ, Boninger ML. (2000). *Climatic Testing of Five Different Types of Power Wheelchairs*. Proceedings 23rd Annual RESNA Conference, Orlando, FL. 441-443.

Wolf E, Cooper RA, **Rentschler, AJ**, et. al. (2000). *Comparison of Energy Consumption and Maximum Speed in Electric Powered Wheelchairs*. Proceedings 23rd Annual RESNA Conference, Orlando, FL. 453-455.

Fitzgerald SG, Cooper RA, **Rentschler, AJ**, et. al. (1999). *Comparison of Fatigue Life for Three Types of Manual Wheelchairs. Proceedings 21st Annual IEEE/EMBS International Conference, Atlanta, GA.* CD-ROM.

**Rentschler, AJ**, Cooper RA. (1999). *A Comparison of the Dynamic and Static Stability of Power Wheelchairs versus Scooters. Proceedings 21st Annual IEEE/EMBS International Conference, Atlanta, GA.* CD-ROM.

Dvorznak MJ, Cooper RA, **Rentschler AJ**, et. al. (1999). *Displacement between Seating Surface and Test Dummy during Transition with a Variable Configuration Wheelchair. Proceedings 21st Annual IEEE/EMBS International Conference, Atlanta, GA.* CD-ROM.

**Rentschler AJ**, Cooper RA, Boninger ML, et. al. (1999). *A Comparison of Power Wheelchair Stability using ANSI/RESNA standards. Proceedings 22nd Annual RESNA Conference, Long Beach, CA.* 284-286.

Liu D, Cooper RA, Tai C, **Rentschler A**, et. al. (1998). *Effect of a Cushion on Whole Body Accelerations during Wheelchair Propulsion. Proceedings 21st Annual RESNA Conference, Minneapolis, MN.* 137-139.

Liu D, Cooper RA, Tai C, **Rentschler A**, et. al. (1998). *Quantitative Assessment of the Vibration Experience by Wheelchair Users during Activities of Daily Living. Proceedings 21st Annual RESNA Conference, Minneapolis, MN.* 134-136.

Gonzalez J, Cooper RA, **Rentschler A**, et. al. (1997). *Frame Failures of Welded Tube Manual Wheelchairs. Proceedings 20th Annual RESNA Conference, Pittsburgh, PA.* 184-186.

### Peer-Reviewed Abstracts

Wolf EJ, Cooper RA, **Rentschler AJ**, et. al. (2000). *Comparison of Energy Consumption in Electric Powered Wheelchairs. Proceedings 2nd National Department of Veterans Affairs Rehab R&D Conference, Arlington, VA.* 223.

**Rentschler AJ**, Cooper RA, Fitzgerald SF, et. al. (2000). *Fatigue Life Analysis of Manual Wheelchairs. Proceedings 2nd National Department of Veterans Affairs Rehab R&D Conference, Arlington, VA.* 214.

DiGiovine CP, Cooper RA, DiGiovine MM, **Rentschler AJ**, et. al. (1998). *Comparison of Two Types of Cross Brace Designs Used on Rehabilitation Wheelchairs. VA Rehabilitation Research and Development Conference, Washington, D.C.*

Cooper RA, VanSickle DP, Boninger ML, Gonzalez JP, Lawrence BL, **Rentschler A**, et. al. (1997). *Design and Selection Guidelines for Wheelchair Rider Comfort. Rehabilitation Research and Development Progress Reports.* 290-291.