



WAYNE STATE
College of Engineering

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Injury Biomechanics, Orthopaedic Trauma, Spinal Disorders

INTRODUCTION

Dr. Cavanaugh's research has been funded by institutions that include the National Institutes of Health, the U.S. Centers for Disease Control, the National Highway Traffic Safety Administration, United States Army, Aircast Foundation, Ethicon Endo Surgery, Ford Motor Company and General Motors.

Awards to his group include the 1995 Ann Doner Vaughn Kappa Delta Award, 1993 and 2005 Stapp Car Crash Conference best paper award and best student paper awards at the 2005, 2006, 2011 and 2018 Stapp Car Crash Conferences.



SPINAL PAIN AND INJURY

The total cost of musculoskeletal disorders is \$50-100 billion annually. By combining methods in neuroscience and biomechanics, our group has studied the sources of spinal pain, including nerve roots, intervertebral discs and facet joints.

In the United States neck sprains are the most serious injuries reported by 40% of insurance claimants. Our lab has characterized the effects of strain and strain rate on the discharge of pain fibers and other neurons in facet joints of cervical spine as well as the discharge from muscles that may lead to muscle spasm.

Current research also focuses on the effects of accelerative floor and seat loads that are produced by improvised explosive devices (IEDs), which cause spine and other orthopedic trauma to soldiers. The research is part of the national effort to develop the WIAMAN anthropomorphic test device.

BRAIN INJURY AND NEURAL TRAUMA

In the US, an estimated 50,000-75,000 deaths are caused by traumatic brain injury (TBI) annually, with another six million suffering neurobehavioral sequela and functional loss.

Our lab has studied how biomarkers are expressed after mild to severe TBI. Through collaboration with our finite element modeling group we are studying the relationship between stress and strain in brain white matter to diffuse axonal injury (DAI). We have also characterized the effects of stress and strain on spinal nerve injury. More recently we have studied the effects of primary blast overpressure on the brain, including biomechanical responses of the brain and quantitative cellular injury.

