Spinal Stability Research with Dr. Kevin P. Granata

by Martin L. Tanaka

Abstract:

Dr. Granata was a world recognized researcher in the field of spinal stability. He was interested in understanding the factors that influenced stability in order to improve our understanding of low back pain. He founded the Musculoskeletal Biomechanics Laboratory at Virginia Tech to conduct biomechanical test on human volunteers. In impulse response testing, the pelvis of the subject is held securely while a servomotor applies random force perturbations to the torso; force, angle and electromyographic data are recorded. From these data, parametric system identification is used to determine the effective mass, stiffness, and damping of the spine. Non-parametric analysis may also be applied to calculate the reflex time delay and gain using deconvolution techniques. He and his students designed a wobble chair to gain insight into the effects of neuromuscular control on low back stability. Subjects perform seated balance tests while the seat angle and torso angle are recorded. Stability is quantified by determining the maximum Lyapunov exponent. In addition, purely mathematical models of the spine have been developed to investigate neurocontrol, muscle properties, reflex, posture, and stability under a variety of external loads. Dr. Granata was truly an excellent mentor and a great man. He encouraged us to "dream big" and to do work that will make a difference in the world. Following the tragedy at Virginia Tech, our laboratory has been renamed the Kevin P. Granata Musculoskeletal Biomechanics Laboratory.