ABC Monthly Seminar

Date: February 25, 2019  
Speaker: Prof. Itshak Meltzer

Title: Properties balance control associated with compensatory rapid leg movements: age-related differences

Abstract: A research is the first step in understanding any natural phenomenon. Reaching an understanding of human movement behavior must, by its very nature, be a long-term study, and a yardstick is required to track our progress. Testing age related differences in the properties of balance control associated with voluntary self-initiated rapid leg movements and with compensatory rapid leg movements to unexpected perturbation of balance during standing and during walking in both single and dual task conditions provides answer to a basic hypothesis that are driven from our past research. One of the most important motor/brain function is the control of balance when balance is lost due to unexpected perturbation of balance. We hypothesize that compensatory balance reactions to external unexpected perturbation of posture will be automatic in nature ("reflex like response") while balance reactions to internal (i.e., self-induced) perturbation will demonstrate a non-automatic responses, i.e., anticipatory balance response. We use the BaMPer system that was developed and built here in collaboration between the Physical Therapy and Mechanical Engineering departments at Ben-Gurion University a device with abilities to produce unexpected perturbations of balance during standing and walking. The implications of the research studies cover many aspects of medicine, life sciences, engineering, and social sciences. The BaMPer enabled us to test the balance function and human motor responses to real life situation when the balance is lost and fall is initiated. Falls are one of the major treats on life, the quality of life and physical independency of older adults in the next decades. In our studies, we exposed old and young adults as well as stroke patients to unexpected perturbation of posture evoking compensatory stepping response during standing and walking and in single task and dual task conditions. Our research revealed that self-initiated stepping (i.e., voluntary step) in attending-demanding task while the compensatory stepping responses to external unexpected perturbation of posture during standing or walking trials is automatic (reflex like response). In a different set of studies we found that rapid leg movement can be improved by a perturbation training, specifically the voluntary stepping response, walking stability and the spatial components of compensatory balance reactions.
Bio: Itshak Melzer PhD, PT

Itshak Melzer is lecturer in the physical Therapy Department and Supervisor of the Schwartz Rehabilitation and movement Analysis Laboratory at the Physical Therapy Department at Ben-Gurion University. His teaching experience includes Kinesiology, biomechanics, and neurophysiology of pain as well as Electro-Therapy. Dr. Melzer received his doctorate at the Faculty of Health sciences in 2001. From 2001-2003 he worked at the NeuroMuscular Research Center at BU, USA, as a post-doctoral fellow, and then in BGU, Conducting a randomized Control Studies, Improving balance Function and Gait in healthy elderly persons using progressive specific training program as well as in stroke. Prof. Melzer’s research interests include 1) Mechanism of postural control in the elderly.

Understanding the contribution of age-related deterioration in postural control to an increased risk of falling in elderly individuals; (2) Understanding the specific environmental and behavioral factors that contribute to an increased incidence of falls; (3) Developing improved methods of testing postural balance so as to increase our ability to identify individuals who are at risk of sustaining falls; (4) Developing novel interventions to reduce the incidence of falls and to mitigate the injuries and other adverse consequences of falls; (5) Study the efficiency of traditional treatment methods in physical therapy and develop new rehabilitation methods in the field of gerontology, neurology, degenerative joint diseases and orthopedics (6); Muscular function during musculo-skeletal disorders, development of objective laboratory measurements for diagnosis and for assessment of the outcome of physical therapy intervention.