

RESEARCH

The Division of Biokinesiology and Physical Therapy at USC has a highly productive research program that is focused on biokinesiology, the integrative study of biological bases of human movement, both normal and disordered. The focus of biokinesiology is on understanding how the human body adapts to growth and experience as well as to injury, disease, and aging. The Division's researchers collaborate with other scientists at USC, as well as regionally and nationally, on innovative and interdisciplinary studies with 13 state-of-the-art laboratories:

APPLIED MATHEMATICAL PHYSIOLOGY LABORATORY

- **Investigator:** Jason Kutch, PhD
- **Research Focus:** understanding brain and spinal cord networks controlling muscle fibers with neuro-imaging, electrophysiology, and mathematical models; optimizing rehabilitation for restoring normal control of muscle in individuals with chronic pain.

BRAIN-BODY DYNAMICS LABORATORY

- **Investigator:** Francisco Valero-Cuevas, PhD
- **Research Focus:** biomechanics, neuromuscular control and clinical rehabilitation of human mobility, with an emphasis on dexterous hand function.

CLINICAL BIOMECHANICS ORTHOPEDIC AND SPORTS OUTCOMES RESEARCH

- **Investigator:** Lori Michener, PhD, PT, ATC, SCS
- **Research Focus:** examine the diagnosis and treatment outcomes of upper quadrant disorders, and elucidate the mechanisms of shoulder disorders to facilitate the design of interventions to reduce shoulder pain and restore the ability to perform activities and participate at work, home and sports.

CLINICAL EXERCISE RESEARCH CENTER

- **Investigators:** E. Todd Schroeder, PhD
- **Research Focus:** health and rehabilitation using exercise as a stimulus to elucidate the mechanisms and define adjunctive therapy by which people will optimally adapt, heal, and overcome debilitating disease or injury.

COMPUTATIONAL NEUROREHABILITATION AND LEARNING LABORATORY

- **Investigator:** Nicolas Schweighofer, PhD
- **Research Focus:** computational neural models of motor skill learning and motivation; neuromodulation in motor learning and motivation; learning- and motivation-based adaptive practice schedules to enhance motor learning after stroke.

DEVELOPMENT OF INFANT MOTOR PERFORMANCE LABORATORY

- **Investigator:** Linda Fetters, PhD, PT, FAPTA
- **Research Focus:** development of both typical and atypical human action during infancy and the rehabilitation of movement disorders in infants and children.

HUMAN PERFORMANCE LABORATORY

- **Investigator:** Susan Sigward PhD, PT, ATC
- **Research Focus:** the influence of maturation, experience and training on the development movement patterns related to lower extremity injury and the maturation of postural strategies needed for participation in physical activities.

INFANT NEUROMOTOR CONTROL LABORATORY

- **Investigator:** Beth Smith, PT, DPT, PhD
- **Research Focus:** the development of neural control of movement during infancy; evaluates interventions for neural and functional development in infants with or at risk for developmental delay.

LOCOMOTOR CONTROL LABORATORY

- **Investigator:** James Finley, PhD
- **Research Focus:** understanding how locomotion is controlled and adapted in both the healthy and injured neuromuscular system.

MOTOR CONTROL DEVELOPMENT LABORATORY

- **Investigator:** Nina Bradley, PhD, PT
- **Research Focus:** prenatal movement, the impact of environmental conditions on fetal motor development, and their relationship to neonatal motor behavior in normal locomotor development.

MOTOR BEHAVIOR AND NEURO-REHABILITATION LABORATORY

- **Investigators:** Carolee Winstein, PhD, PT, FAPTA; James Gordon, EdD, PT, FAPTA
- **Research Focus:** brain behavior relationships in learning and execution of skilled movement behaviors; new methods for treatment of individuals with brain disorders; efficacy and effectiveness of standardized treatment approaches.

MUSCULOSKELETAL BIOMECHANICS RESEARCH LABORATORY

- **Investigators:** Christopher Powers, PT, PhD, FAPTA; George Salem, PhD; Kornelia Kulig, PT, PhD, FAPTA
- **Research Focus:** root causes of musculoskeletal disorders and efficacy of selected interventions; biomechanical basis of functionally based exercises and principles governing their application in special populations.

NEUROPLASTICITY AND IMAGING LABORATORY

- **Investigator:** Beth Fisher, PhD, PT, FAPTA
- **Research Focus:** central mechanisms underlying motor skill learning and motor control in non-disabled and brain injured individuals; physiological changes and neuroplasticity related to motor skill learning and rehabilitation; effectiveness of rehabilitation programs based on evidence of activity-dependent neuroplasticity.

WOMEN'S HEALTH AND EXERCISE LABORATORY

- **Investigator:** Christina Dieli-Conwright, PhD, CSC, CET
- **Research Focus:** basic to clinical and translational science with a concentration on the hormone-related pathways in muscle hypertrophy and strength development, and metabolic diseases affecting cancer (i.e., breast, ovarian) survivors.