



RESEARCH

The **USC Division of Biokinesiology and Physical Therapy** has a highly productive research program focused on biokinesiology, the integrative study of biological bases of human movement, both normal and disordered. This focus is meant to better understand how the human body adapts to growth and experience as well as to injury, disease and aging. The division's researchers collaborate with other USC scientists, as well as their regional and national counterparts, on innovative and interdisciplinary studies with 15 state-of-the-art laboratories and research centers:

Applied Mathematical Physiology Laboratory

Web: ampl.usc.edu

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

Web: valerolab.org

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 Outcome Research Laboratory

Web: sites.usc.edu/coorlab

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

Web: sites.usc.edu/cerc

Investigator: 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

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Computational Neurorehabilitation and Learning Laboratory

Web: sites.usc.edu/cnrl

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

Web: sites.usc.edu/dimpl

Investigator: Barbara Sargent, PhD, PT, PCS, CEEAA

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

Web: sites.usc.edu/hpl

Investigator: Susan Sigward, PhD, PT, ATC

Research Focus: Prevention and rehabilitation of knee injuries with emphasis on improving outcomes following anterior cruciate ligament reconstruction (ACLR) and understanding the relationship between athletic maneuverability patterns related to lower extremity injury

Infant Neuromotor Control Laboratory

Web: sites.usc.edu/inclab

Investigator: Beth Smith, PhD, PT, DPT

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

Web: lcl.usc.edu

Investigator: James Finley, PhD

Research Focus: Understanding how locomotion is controlled and adapted in both the healthy and injured neuromuscular system

Motor Behavior and Neurorehabilitation Laboratory

Web: sites.usc.edu/mbnl

Investigators: Carolee Winstein, PhD, PT, FAPTA and 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

Web: sites.usc.edu/mbrl

Investigators: Christopher Powers, PhD, PT, FAPTA; George Salem, PhD; and Kornelia Kulig, PhD, PT, 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

Web: sites.usc.edu/nail

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 experience-dependent neuroplasticity

Institute for Senior Golf Science

Web: sites.usc.edu/golfscience

Investigator: George Salem, PhD

Research Focus: Developing safe, evidence-based and effective golf training programs for seniors to combat typical effects of aging, including decreased cardiovascular fitness, flexibility, muscular strength, endurance, power, reaction time, balance, mobility and cognition

Phillips-Fisher Center for Brain Repair and Rehabilitation

Web: sites.usc.edu/phillips-fisher

Investigators: Beth Fisher, PhD, PT; Michael Jakowec, PhD; Giselle M. Petzinger, MD; James Gordon, EdD, PT, FAPTA; Helena C. Chui, MD; and George Salem, PhD

Research Focus: Enhancing the physical well-being and quality of life of humans with degenerative brain disorders by advancing the basic science, clinical research and rehabilitation associated with brain repair

FAST FACTS

- Our faculty members conduct research in the areas of musculoskeletal biomechanics, motor behavior and neural control, exercise science and muscle research and motor development.
- Last year, our faculty members received external funding of nearly \$2 million from foundations and federal funding agencies, including the National Institutes for Health.
- Our faculty are involved in one of the fastest growing areas of physical therapy research: the role of exercise in preventing and treating chronic diseases, including Alzheimer's disease, Parkinson's disease and breast cancer.

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