

Health Policy Newsletter

Volume 12 Number 1

January, 1999

Article 6

The Human Performance Laboratory

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Suggested Citation:

Selby-Silverstein L, Besser MP. The Human Performance Laboratory. *Health Policy Newsletter* 1999; 12(1): Article 6. Retrieved [date] from <http://jdc.jefferson.edu/hpn/vol12/iss1/6>.

The Human Performance Laboratory

The Human Performance Laboratory (HPL) is a center for multidisciplinary research in human movement in states of health, disease and injury for the Jefferson Medical College, Thomas Jefferson University, and the community-at-large. Understanding the intricacies of human movement can lead to advances in diagnosis, prevention and management of various neuromuscular and skeletal conditions. The HPL was established in 1993 and is housed in the Department of Physical Therapy in the College of Health Professions. It is staffed by Lisa Selby-Silverstein, PhD, PT, NCS, Director, Marcus P. Besser, PhD, Assistant Director and Kenneth J. Chesnin, Research Associate. In addition to serving as a research center, the HPL also provides patient services and is an education and training resource.

Currently, prevention research is a major focus of the HPL. One of the initiatives aims to reduce the number and severity of foot ulcerations in patients with diabetes through the use of in-shoe plantar pressure assessment (<http://www.biomech.com/>, <http://www.tju.edu/jeffnews/past/98/may/>). Another initiative uses on-location quantitative gait screenings for early identification of decline in functional ambulation in the elderly. Other research, spearheaded by Roger Nelson, PhD, PT, FAPTA, and Marcus Besser is aimed at collecting of cross-cultural normative gait data. This research currently involves data collection by international colleagues in the Netherlands and Kuwait, as well as a variety of assisted living centers and nursing homes in the U.S. Lisa Selby-Silverstein is currently expanding this database to include children from local daycare centers.

Recent projects, in collaboration with the School of Biomedical Engineering, Science, and Health Systems of Drexel University, have developed models for quantifying upper body motion in three dimensions, quantifying the development of tibial torsion, and quantifying the degree of femoral torsion. Research has also centered on outcomes of interventions such as footwear for patients with diabetes and aquatic therapy for the elderly. The accuracy and reliability of various clinical outcome tools also have been tested. Most recently, faculty Julie Mount, PhD, PT, and Stan Dacko, PhD, PT, received funding from the Multiple Sclerosis Society to support their research related to multiple sclerosis and muscle fatigue which uses the HPL. Also, a new faculty member associated with the HPL, Jan Bruckner, PhD, PT, is collaborating with University of Pennsylvania computer engineers on a project which utilizes virtual reality and computer models in 3 and 4 dimensions to study normal variations in gait, clinical pathologies and the associated gait deviations and virtual orthoses to treat gait problems. She also seeks to expand the HPL work related to managing foot problems into a service for the homeless population.

The HPL also provides clinical gait and balance assessments using state of the art equipment. Movements can be quantified to screen, diagnose, or monitor a variety of conditions. Patients undergoing analysis in the laboratory include those with diagnoses as varied as spinal cord injury; diabetes mellitus; hemiparesis; cerebral palsy; amputation; arthritis; congenital abnormalities; nerve injury; muscular dystrophy; spina bifida; down syndrome; osteoporosis; and traumatic joint or limb injury. After analyzing a patient's gait, the HPL staff works with both the patient and the referring clinician to optimize interventions, evaluate treatment outcomes, or quantitatively monitor the patient over time.

Among examples of HPL teaching initiatives is the recent seminar, Prevention of Diabetic Foot Ulcers: An International Colloquium. The goal of the colloquium, sponsored by a grant from ParomedÆ, Inc., a German manufacturer of in-shoe plantar pressure measurement systems, was to establish a top-notch approach to treating and preventing diabetic foot ulcers, consisted of a week of activities leading up to a one-day seminar. Teams provided custom footwear for patients with diabetes, with the goal of reducing plantar pressures. Results were assessed using in-shoe plantar pressure measurements.

Each year, laboratory personnel teach and mentor hundreds of professional students about clinical and research applications of technology aimed at quantifying human movement. The HPL fosters the interdisciplinary training of students and clinicians and provides them with a foundation for integrating technology into their clinical practices.

Anyone wishing additional information on the Human Performance Laboratory and its research, or other activities, may contact Lisa Selby-Silverstein, PhD, PT, NCS, at (215) 503-1644, Marcus Besser, PhD, at (215) 503 1645.

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