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REHAB Professionals

The Transformative Power of Sports



The child with spina bifida has never been on a level playing field. While his friends learned to run, he had difficulty walking. Success was accomplishing things that were easy for others. Competitions were internal, and victories achieved through special compensation likely rang hollow. But competition is inherent in life. We compete for jobs, salaries, and mates.

How do we prepare kids to compete?

Put the child in a sled, give her hockey sticks to push and shoot with, ask her to compete where legs are not needed, and the experience is a game changer. It is truly transformative. The transformation is not instantaneous; it takes time, tears, dedication, and family support. But the same is true for any good high school athlete.

What happens when you put someone with legs on the same level field? More transformation. How do I know? The UPMC Rehabilitation Institute played sled hockey against the Mighty Penguins, a Pittsburgh sled hockey team, in a fundraiser described on the following pages. After five minutes the game was pretty much over, with the score somewhere in the neighborhood of 11-0.



Even the most dedicated clinician looks at an individual with disability differently after being bested in sport. Raising money was great. The transformation, invaluable.

Sincerely,

Michael Boninger, MD

Director, UPMC Rehabilitation Institute

*Professor and Chairman, Department of Physical Medicine and Rehabilitation,
University of Pittsburgh School of Medicine*

COMMUNITY FUNDRAISERS AND EVENTS



On April 9, 2011, the UPMC Rehabilitation Institute (RI) and the Department of Physical Medicine and Rehabilitation (PMR) faced off against the Pittsburgh Mighty Penguins and the Junior Penguins sled hockey teams at the Seventh Annual Sled Hockey Challenge. Unlike our annual Gridiron Gaming fundraiser, where donors face off against Pittsburgh Steelers in video game competitions, this challenge was not a virtual face-off.

The Mighty Penguins are serious about their slogan, "Get Ready to Play ... Our Way." Hockey is a fast game that requires quick reflexes and balance on skates or sled.

The RI/PMR sled hockey team, "Just ICE It," consisted of volunteers from PMR faculty and residents, University of Pittsburgh medical students, and RI staff. The adult team, "Just ICE It-Purple," was trounced by the Mighty Penguins adult team, losing miserably, but with great fun, by 17-2. Not to be left out, the Mighty Penguins junior/novice team outplayed its "Just ICE It-White" counterpart, winning 7-3. If humiliation builds strength of character, the Just ICE It team members are indeed noble.

Funds raised went to support the UPMC Rehabilitation Institute's community wellness programs. Next year's challenge will raise funds for the Mighty Penguins.

The annual Pittsburgh Marathon was held May 15, 2011. Gilbert Brenes, MD, assistant professor, PMR, with resident volunteers Joy Codera, MD, Feguens Bataille, MD, and David Alcantara, MD, provided medical support for the wheelchair division. Five handcyclers participated in the marathon, including Rory Cooper, PhD, professor and chair in the School of Health and Rehabilitation Sciences, Department of Rehabilitation Sciences and Technology.



Pictured L to R:
Gil Brenes, MD; Ken Bestine, wheelchair division winner; and Joy Codera, MD.

Each year, the Paralyzed Veterans of America (www.pva.org) and the Department of Veterans Affairs (www.va.gov) cosponsor the National Veterans Wheelchair Games, the largest annual wheelchair sports competition of its kind in the world. The 2011 games were held in Pittsburgh during the first week of August and drew competitors from across the United States and Puerto Rico.

The games are a sports and rehabilitation program open to U.S. military service veterans who use wheelchairs due to spinal cord injuries, certain neurological conditions, amputations, or other mobility impairments.

More than 500 novice and experienced athletes compete each year in 17 events, including swimming, table tennis, weightlifting, archery, basketball, softball, quad rugby, handcycling, wheelchair slalom, power soccer, a motorized wheelchair rally, and track and field. Athletes compete against others with similar athletic ability, competitive experience, or age.

The Human Engineering Research Laboratories (HERL) conducted special research projects designed specifically for veterans at the games. HERL is affiliated with the Department of Veterans Affairs, PMR, and RI.

Research centered on:

- evaluating the influence of participating in sports on quality of life
- studying vibration exposure for manual wheelchair users

- examining the physical activity of manual wheelchair users
- studying fatigue (in hopes of reducing upper-limb injuries)
- improving power chair control using a virtual environment

HERL also displayed four devices it has developed to make life easier for people in wheelchairs. The supportive devices are the Personal Mobility and Manipulation Appliance (PerMMA), to provide arms and hands to people who have limited use of their own limbs; the Strong Arm, to help a caregiver transfer a patient from a wheelchair to a shower seat or bed; the Virtual Seating Coach, to show powered wheelchair users how to use seat functions properly; and the SmartWheel™, to help therapists adjust manual wheelchair settings to take advantage of the wheelchair user's grip on the handrim.

Next year's Wheelchair Games will be held in Richmond, Va.



New Ways to Treat Cognitive Impairment After Stroke



Elizabeth Skidmore, PhD

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Occupational Therapy

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Every year, hundreds of thousands of individuals who suffer stroke sustain motor impairments, cognitive impairments, and/or changes in mood that require adjusting to a new way of living. Elizabeth Skidmore, PhD, associate professor in the Department of Occupational Therapy, notes that individuals with cognitive impairments and mood changes resulting from stroke sustained more disability in terms of activities of daily living than those individuals who sustained motor impairments alone.

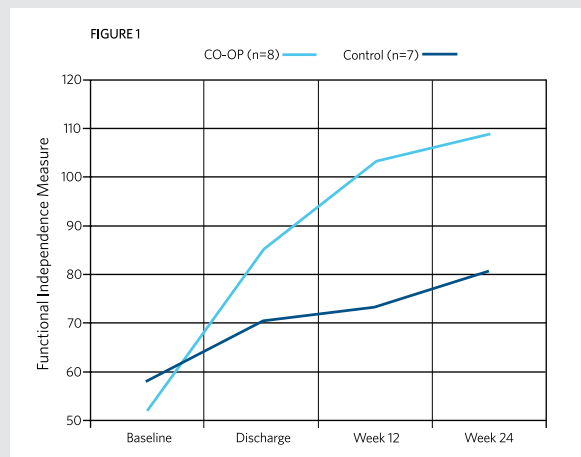
"There is a lot of research addressing motor function after stroke," says Dr. Skidmore. "In comparison, there is relatively little research addressing cognitive function and mood after stroke. Since individuals with cognitive and mood impairments are not as responsive to traditional therapy, I wanted to develop an intervention that would close the gap and help lessen disability for these individuals."

Through collaboration with senior scientists at the Kunitz-Lunenfeld Applied Research Unit at the University of Toronto, Dr. Skidmore began a pilot study to introduce the Cognitive Orientation to Daily Occupational Performance (CO-OP) intervention to adult stroke patients early in their recovery, while they are still hospitalized for inpatient rehabilitation. For the comparative study, stroke patients are divided into the CO-OP group and an attention control group. Individuals in both groups meet with occupational therapy personnel in addition to their usual inpatient therapy. Sessions are videotaped and reviewed regularly. "In the attention control group, we discuss the rehabilitation process and provide support," explains Dr. Skidmore. "In the CO-OP group, we focus on identifying and solving problems using strategies that will help our participants do the activities they want to do."

"Participants who use the CO-OP strategy increase their awareness of both their deficits and skills post-stroke," notes occupational therapist and doctoral student Emily Grattan. "They become deeply invested in the sessions because they have the opportunity to develop and work toward personal goals."

Although the study is still in its first year, early results are promising. Dr. Skidmore notes that so far the individuals who received CO-OP have higher activities of daily living scores (indicating less disability) at discharge from inpatient rehabilitation, as well as at 12 and 24 weeks after inpatient rehabilitation admission, compared to patients in the control group (see graph below).

"We are gaining critical information that can be used to change the way we treat individuals with cognitive impairments after stroke," explains Dr. Skidmore.



Awards



The Academy of Spinal Cord Professionals selected **Michael Boninger, MD**, to receive the 2011 A. Estin Comarr Award for Distinguished Clinical Service. The award is in recognition of his excellence in clinical care and research in the area of spinal cord medicine.



Michael C. Munin, MD, professor in the Department of Physical Medicine and Rehabilitation and vice chair for Clinical Development Programs, was named a 2011 Castle Connolly Top Doctor in Physical Medicine and Rehabilitation.

Biologics in Rehabilitation Research and Clinical Care



Amy Wagner, MD
Associate Professor and Vice Chair
of Research

Department of Physical Medicine
and Rehabilitation



Gwendolyn Sowa, MD, PhD
Assistant Professor
Department of Physical Medicine
and Rehabilitation

Assistant Dean
Medical Student Research,
University of Pittsburgh
School of Medicine

Amy Wagner, MD, and Gwendolyn Sowa, MD, PhD, were co-guest editors in the June 2011 PM&R Supplement 3, which focuses on biologics in the field of physical medicine and rehabilitation. The term “biologics” often has implied biopharmaceutical, biotherapeutic, or biotechnological drugs. In rehabilitation, the word biologics is extended to include “therapies and interventions generated by a living organism. Within this framework, exercise- and activity-based interventions can be considered biologics-based treatments,” (Wagner AK. Rehabilomics: a conceptual framework to drive biologics research. PMR. 2011 Jun;3(6 Suppl 1):S28-30).

Great strides in biologics and biomarker research in recent years have resulted in unique opportunities for physiatrists, rehabilitation scientists, and professionals at bench, bedside, and clinic. New discoveries are improving the treatment of conditions ranging from acute and chronic neurologic conditions to musculoskeletal degeneration.

Contributing authors, all leaders in their respective fields, address the use of biologics in their rehabilitation specialties. For instance, physiatrists long have observed the healing effects of motion-based therapies. Through biomarker research, it is understood that such effects are due to the anti-inflammatory and pro-anabolic effects of these therapies. As basic science research continues to reveal the molecular and cellular pathways producing these beneficial effects, targeted biologic therapies with improved outcomes are designed and applied at the clinical level.

The Department of PM&R at the University of Pittsburgh adopted the term “rehabilomics” to define biomarkers and biologics research. It is a field of study that involves the evaluation of biomarkers to understand rehabilitation-relevant properties of biologics as related to function, prognosis, treatment, and recovery. Rehabilomics research also focuses on developing and optimizing individualized treatment outcomes, also known as “theranostics” of “personalized medicine.” Characteristics of each patient, such as age, gender, or genetic variations, can affect the type and concentration of certain biomarkers. Using a rehabilomic approach to treatment, therapies can be greatly individualized through manipulation of effective biologics. These therapies, in theory, will increase positive outcomes of treatments because they are designed to impact specific patient deficits caused by injury or disease.

The field of physical medicine and rehabilitation is well situated to take the lead in biologics. Dr. Wagner and Dr. Sowa hope physiatrists have an opportunity to review the supplement and help guide the way to future groundbreaking biomedical research at the bench and bedside.

Recent Contributions by UPMC Rehabilitation Institute Faculty

IEEE Engineering in Medicine and Biology Society

33rd Annual International Conference (EMBC '11)
Boston, Mass.; August 30 to September 3

PRESENTATIONS

Effects of Spatial and Temporal Parameters of Primary Afferent Microstimulation on Neural Responses Evoked in Primary Somatosensory Cortex of an Anesthetized Cat

J. Hokanson, C. Ayers, R. Gaunt, T. Bruns, D. Weber

- James Hokanson, a graduate student in Pitt's Bioengineering Department, is mentored by Doug Weber, PhD, assistant professor in PMR.

Estimating Bladder Pressure From Sacral Dorsal Root Ganglia Recordings

T. Bruns, R. Gaunt, D. Weber

- Timothy Bruns, PhD, is a postdoctoral associate working with Doug Weber, PhD.

Single- and Multi-unit Activity Recorded From the Surface of the Dorsal Root Ganglia With Nonpenetrating Electrode Arrays

R. Gaunt, T. Bruns, D. Weber

- Robert Gaunt, PhD, is assistant professor in PMR.

The Impact of Electrode Characteristics on Electrooculography

B. Wodlinger, A. Degenhart, J. Collinger, E. Tyler-Kabara, W. Wang

- Brian Wodlinger, PhD, is a postdoctoral associate working with Wei Wang, MD, PhD, assistant professor in PMR.

POSTER

Online Feedback Control of Functional Electrical Stimulation Using Dorsal Root Ganglia Recordings

M. Bauman, T. Bruns, J. Wagenaar, R. Gaunt, D. Weber

- Mr. Bauman, a graduate student in the University of Pittsburgh Bioengineering Department, is mentored by Doug Weber, PhD, assistant professor in PMR.

American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM)

58th Annual Meeting, San Francisco, Calif.; September 14 to 17

POSTER

Elimination of Dysphagia Using Ultrasound Guidance for Botulinum Toxin Injections in Cervical Dystonia: A Case Report

G. Sathe, J. Hong, M. Munin

AAPMR Annual Conference

November 17 to 21; Orlando, Fla.

WORKSHOPS

Musculoskeletal Medicine Track

Musculoskeletal Ultrasound of the Foot and Ankle

G. Chimes, J. Halperin, J. Strakowski, C. Visco

- Dr. Gary Chimes is assistant professor in the PMR and the director of the Musculoskeletal Sports and Spine Fellowship.

Musculoskeletal Ultrasound of the Hand and Wrist

G. Chimes, J. Halperin, J. Strakowski, C. Visco

Advanced Musculoskeletal Ultrasound Applications: Research, Part II

G. Chimes, J. Cianca, J. Finnoff, C. Fitzgerald, K. Mautner, C. Visco

Performance Enhancement and Injury Prevention in Sports Medicine: Application of Science to Sports

M. Bartels, G. Chimes, J. Press, R. Tomas, C. Visco

Spine/Spinal Cord Injury Track*Degenerative Spine: Rehabilitation at the Molecular Level*

G. Scuderi, M. Smuck, G. Sowa

- Dr. Gwendolyn Sowa is assistant dean of Medical Student Research at the University of Pittsburgh School of Medicine and assistant professor in PMR.

Concussion Track*Emerging Findings in the Consequences and Treatment of Concussion*

C. Camiolo Reddy, B. Greenwald, L. Lombard, J. Rigg

- Dr. Cara Camiolo Reddy is assistant professor in PMR and director of the Brain Injury Fellowship and the UPMC Outpatient Brain Injury Program. She also is medical advisor to the UPMC Sports Concussion Program.

Neuroscience 2011 — Society for Neuroscience

Washington, D.C.; November 12 to 16

PRESENTATION*Sacral Dorsal Root Ganglia Recordings of Bladder and Perineal Sensory Activity*

T. Bruns, R. Gaunt, D. Weber

- Timothy Bruns, PhD, is a postdoctoral associate working with Doug Weber, PhD, assistant professor in PMR.

POSTERS*Microstimulation of Sacral Dorsal Root Ganglia for Reflex Bladder Control*

R. Gaunt, T. Bruns, D. Weber

- Robert Gaunt, PhD, is assistant professor in PMR.

Stable Control of Functional Electrical Stimulation With Online Feedback From Dorsal Root Ganglion Recordings

M. Bauman, T. Bruns, J. Wagenaar, R. Gaunt, D. Weber

Reassessment of the Potential Benefits of Environmental Enrichment in Remale Rats After Experimental Traumatic Brain Injury

C. Monaco, V. Mattioli, K. Folweiler, J. Tay, N. Yelleswarapu, L. Curatolo, A. Matter, Y. Olugbade, J. Cheng, A. Kline

- Christina Monaco is a University of Pittsburgh undergraduate in the School of Arts and Sciences and is mentored by Anthony Kline, PhD, assistant professor in PMR.

The Therapeutic Efficacy of Aripiprazole After Experimental Traumatic Brain Injury

T. Phelps, R. McAloon, N. Yelleswarapu, A. Garcia, M. Shah, J. Cheng, A. Kline

- Thomas Phelps is a third-year medical student and is mentored by Anthony Kline, PhD, assistant professor in PMR.

Elucidating the Role of 5-HT_{1A} and 5-HT₇ Receptors on 8-OH-DPAT-induced Behavioral Recovery After Traumatic Brain Injury

J. Tay, N. Yelleswarapu, W. Fryer, J. Cheng, M. Shah, A. Kline

- Justin Tay is a University of Pittsburgh undergraduate in the School of Arts and Sciences and is mentored by Anthony Kline, PhD, assistant professor in PMR.

Corticospinal Regulation of Sequential Muscle Activation During Reaching: A Model

S. Yakovenko, T. Drew

- Sergiy Yakovenko is an international visiting scholar mentored by Doug Weber, PhD.

The Same Motor Cortical Neurons Contribute to the Control of Both Reaching and Locomotion in Cats

T. Drew, S. Yakovenko

Recently Published

- Garcia AM, Dicianno BE. The frequency of Lymphedema in an adult spina bifida population. *Am J Phys Med Rehabil.* 2011 Feb;90(2):89-96.
- Wang D, Vo N, Sowa GA, Hartman R, Ngo K, Choe S, Witt W, Dong Q, Lee J, Niedernhofer L, Kang J. Bupivacaine Decreases Cell Viability and Matrix Protein Synthesis in an Intervertebral Disc Organ Model System. *Spine J.* 2011 Feb;11(2):139-46.
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- Nandoe RD, Bossers K, Ritfeld GJ, Blits B, Grotenhuis JA, Verhaagen J, Oudega M. Early passage bone marrow Stromal cells express genes involved in nervous system development supporting their relevance for neural repair. *Restor Neurol Neurosci.* 2011 Mar;29(3):187-201.
- Markert CD, Ambrosio F, Call JA, Grange RW. Exercise and Duchenne muscular dystrophy: toward evidenced-based exercise prescription. *Muscle Nerve.* 2011 Apr;43(4):464-78. E-published ahead of print.
- Arenth PM, Russell KC, Ricker JH, Zafonte RD. CDP-choline as a biological supplement during neurorecovery: a focused review. *PMR.* 2011 Jun;3 (6suppl1):S123-31.
- Russell KC, Arenth PM, Scanlon JM, Kessler LJ, Ricker JH. A functional magnetic resonance imaging investigation of episodic memory after traumatic brain injury. *J Clin Exp Neuropsychol.* 2011 Jun;33(5): 538-47. E-published ahead of print.
- Ambrosio F, Tarabishy A, Kadi F, Brown EH, Sowa G. Biologic basis of exercise-based treatments for musculoskeletal conditions. *PMR.* 2011 Jun;3(6 Suppl 1):S56-63. E-published ahead of print.
- Collinger JL, Dicianno BE, Weber DJ, Cui XT, Wang W, Brienza DM, Boninger ML. Integrating rehabilitation engineering technology with biologics. *PMR.* 2011 Jun;3(6 suppl 1):S148-57.
- Wagner AK. Rehabilomics: a conceptual framework to drive biologics research. *PMR.* 2011 Jun;3(6 Suppl 1):S28-30.
- Garcia AN, Shah MA, Dixon CE, Wagner AK, Kline AE. Biologic and plastic effects of experimental traumatic brain injury treatment paradigm and their relevance to clinical rehabilitation. *PMR.* 2011 Jun;3(6 Suppl 1):S18-27.
- Ritfeld GJ, Roos RA, Oudega M. Stem cells for central nervous system repair and rehabilitation. *PMR.* 2011 Jun;3(6 Suppl 1):S117-22.
- Ambrosio F, Wolf SL, Delitto A, Fitzgerald GK, Badylak SF, Boninger ML, Russell AJ. The emerging relationship between regenerative medicine and physical therapeutics. *Nederlands Tijdschrift voor Fysiotherapie.* Year 121. June 2011.
- Riggins MS, Kankipati P, Oyster ML, Cooper RA, Boninger ML. The relationship between quality of life and change in mobility one year postinjury in individuals with spinal cord injury. *Arch Phys Med Rehabil.* pp. 1027-33, Vol. 92 No. 7, Jul 2011.
- Lee J, Garcia AM, Lee WP, Munin MC. Inpatient rehabilitation challenges in a quadrimembral amputee after bilateral hand transplantation. *Am J Phys Med Rehabil.* 2011 Aug;9(8):688-93.

Successful First Year for the University of Pittsburgh/UPMC Rehabilitation Institute Pilot Grant

Just a little more than a year ago, the University of Pittsburgh/UPMC Rehabilitation Institute (RI) announced a new pilot grant program to provide \$200,000 to fund research each year.

The goals of the program are to increase collaboration between clinical and academic programs within the university and RI, and to provide funding for small initiatives that show promise of future government (NIH) or foundation funding. This program is innovative in the sense that both researchers and clinicians are encouraged to apply for funding across various levels of focus, ranging from bench research to clinical care.

The first full year of the RI pilot grant program has come to a close, and projects funded in the second cycle of the grant have been awarded. The call for proposals for the third cycle of funding was announced in September of this year, with funding beginning in April 2012. We are very pleased to recognize the following awardees:

1st Cycle Awardees

(April 1, 2010 to March 31, 2011):

- Fabrisia Ambrosio, PhD (one-year funding)
Assistant Professor, PMR
 - > "Electrical Stimulation Rejuvenates the Regenerative Potential of Aged Skeletal Muscle in Mice"
- Jennifer Collinger, PhD (two-year funding)
Assistant Professor, PMR
 - > "An Acute Electroencephalography (EEG) Brain-Computer Interface (BCI) for Individuals With Spinal Cord Injury"
- Terry Breisinger, MPT, NCS (one-year funding)
Team Leader, Stroke Rehab Services, UPMC Rehabilitation Institute
 - > "Sensitivity and Specificity of the Stroke Assessment of Fall Risk (SAFR)"
- Elizabeth Skidmore, PhD (two-year funding)
Assistant Professor, Department of Occupational Therapy
 - > "Strategy Training to Improve Stroke Rehabilitation Outcomes"

2nd Cycle Awardees

(April 1, 2011 to March 31, 2012):

- Brad Dicianno, MD (one-year funding)
Assistant Professor, PMR
 - > "Building Specialty Health Homes Through Gain Sharing"
- Kelly Noone, MOT (one-year funding)
Center for Spinal Cord Injury, Occupational Therapist, UPMC Rehabilitation Institute
 - > "The Effect of a Standardized Bowel Management Program on Functional Independence"
- Sara Piva, PhD, PT (18-month funding)
Assistant Professor, Department of Physical Therapy
 - > "Feasibility of a Comprehensive Behavioral Intervention in Total Knee Arthroplasty"
- Gwendolyn Sowa, MD, PhD (one-year funding), Assistant Professor, PMR
 - > "Unraveling Intervertebral Disc Mechanobiology to Facilitate Rational Design of Exercise Protocols"

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