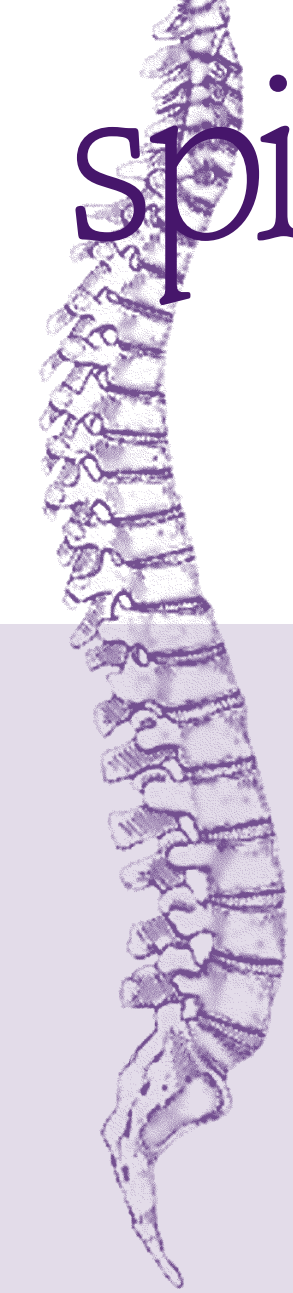
spinal cord injury UPDATE

Department of Rehabilitation Medicine

Volume 18 Issue 3 • Fall 2009

INSIDE:

UW Medicine
SCHOOL OF MEDICINE



Be Active after SCI

We all know physical activity is important for good health. Research has shown that regular physical activity after SCI can improve breathing ability, muscle strength, blood circulation, body composition (more muscle, less fat), bowel function, cholesterol, self-esteem and self-confidence. It has also been found to reduce pain and depression.

But it can be hard to be physically active when you have a spinal cord injury. This issue is devoted to helping you find ways to increase your physical activity to improve your health and well-being.

What do I need to do?

It's important to remember that *all* physical activity provides health benefits, not just structured exercise or sports. Joining a club, buying expensive equipment or joining a team isn't the only way to get physically active.

Any movement of the body that is produced by the muscles and uses energy can increase fitness. Called "lifestyle physical activity," this can be done anywhere and be part of whatever you are doing. Moderate activity produces the same health benefits as high intensity activity, and it does not have to be done all at once to be beneficial. Three 10-minute sessions during the course of a day may have the same benefits as longer sessions, and this approach is easier for many people to adopt as a habit. Lifestyle physical activity may be a good way to start out or to increase your physical activity.

Choosing an assortment of different activities and varying them from day to day will help you avoid boredom and prevent overuse of certain muscles.

How do I get started?

- **Ask: What can I do now?** Begin by doing it three to four times a week, then gradually increase duration or intensity. Add in new activities little by little.
- **Consult a health care provider before starting a new exercise program, especially if you have arm or shoulder pain.** Overuse is often caused by doing things the wrong way rather than too much.
- **To prevent overuse syndromes:** Vary your activities from day to day, strengthen your upper back and posterior shoulder muscles, and stretch the muscles in front of your shoulders and chest.
- **For people with tetraplegia (quadriplegia):** Exercise in a cool environment to prevent overheating. Take measures to prevent low blood pressure by wearing support hose, ace wraps and an abdominal binder. Stop exercising if you develop dizziness, nausea or light-headedness. Know the symptoms of autonomic dysreflexia (AD).

I want to join a fitness club. How can I find one I can use?

What to look for in a fitness facility, and how to get changes made to improve accessibility. **Page 2.**

What do other people with SCI do to get active?

Real life fitness stories from people with injuries ranging from L2 to C2. **Page 4.**

I'd like to try something new. What's out there?

From team sports to yoga to accessible outdoor trails, see our physical activity resources. **Page 5.**

Finding an Accessible Fitness Center

This article was adapted with permission from "Using A Fitness Center Does Not Have to be an Exercise in Frustration: Tips for People With Mobility and Visual Disabilities" (2008) by June Kailes, Associate Director, Center for Disability Issues and the Health Profession (CDIHP). Download the original document at http://www.cdihp.org/fitness%20center%20nov08.pdf or contact CDIHP, Western University of Health Sciences, 309 E. Second Street, Pomona, CA 91766-1854; 909-469-5380; ahcs@westernu.edu.

You know you should be more active. You would like to find a usable fitness center or health club, but it seems like an overwhelming task. On the other hand, isn't your health worth the hassle?

Here are some tips to help you in this process:

Your rights

- Like other public places, fitness centers must comply with the Americans with Disabilities Act (ADA), which requires them to provide equal access for people with disabilities, including accessible parking, entrances, restrooms, paths of travel, signage, etc.

- Fitness centers cannot deny services or membership to people with disabilities. Neither can they require anything from you that they do not require of all members, such as a doctor's permission to be there.
- You have a right to ask fitness centers to remove barriers and make changes to improve accessibility. The ADA law can only be enforced if you bring accessibility problems to the attention of the fitness center's staff and owners. Often they are not aware that barriers exist or they may not think there is a problem because no one has ever told them.

What to ask a fitness center

- Call ahead to ask about accessibility (see "Fitness Center Accessibility Checklist," right). If it sounds promising, request a tour of the facility.
- While touring a facility, see if there are any barriers that will make it harder or impossible for you to do the exercises you want to do. If you see problems, tell the person who is taking you around and see if they have solutions already.
- What does membership cost? If it is too expensive, ask about scholarships, sliding-scale options or other financial assistance. YMCAs or public community fitness centers are more likely to have these policies.
- Ask whether the facility will allow you to bring a companion to assist you at no cost.
- Ask for a guest pass for a small daily fee or no cost so you can try out the facility a few times.

Getting changes made

- Asking fitness centers to make changes to improve access may feel uncomfortable, but approach it with the attitude that you are helping these centers expand their potential membership base (including the growing population of aging baby-boomers). While fitness centers may not be required to make the changes you want, you may be able to convince them that improvements are in their best interest. (See "Accessibility: Frank's Story," page 3.)
- When you first visit a facility, discuss any barriers you find with the staff person showing you around. If you want to request a change, make sure you address it to the appropriate staff person. While simple changes might be handled by center staff, larger changes may require that you talk to the manager or owner. Ask about the best way to contact that person.

CONTINUED ON NEXT PAGE

Fitness Center Accessibility Checklist

- ☐ Where is the closest public transportation?
- ☐ Is there accessible parking? Where is it in relation to the entrance?
- ☐ Is the entrance wheelchair accessible? Does it have an automatic door opener?
- ☐ Are all doorways in the facility wide enough to go through with a wheelchair?
- ☐ Are the locker rooms, restrooms and shower area accessible?
- ☐ Are the spaces around the equipment wide enough to fit a wheelchair?
- ☐ Are there elevators between floors?
- ☐ Do they have the specific features you are looking for (such as a pool lift, handcycle-type ergometer or other equipment, yoga classes, etc.)?
- ☐ What are the fitness trainers' qualifications? Do they have training or experience working with people with disabilities?

CONTINUED FROM PREVIOUS PAGE

- Be familiar with what the ADA requires, or know where to find more information (see "Accessible Fitness Centers: Resources," below).
- Know your resources, including where to find information on accessible equipment (see "Equipment & Products," page 5). Be prepared to make recommendations, and have this information ready to share with the facility's staff.
- Suggest simple, low-cost solutions as well as bigger, high-cost solutions. For example, asking a staff member to assist you with transferring to a piece of equipment is cheaper than buying a machine with removable seats to accommodate a wheelchair. You will need to teach the staff about your abilities and limitations and work together with them to meet your needs.
- Shortly after you speak with center staff, send a letter that describes in detail the changes you need or want. Also mention the possible benefits to the facility of improving accessibility, and include related helpful resources. (A sample letter can be found on page 22 of *Using a Fitness Center Does Not Have to be an Exercise in Frustration*; see listing under "Accessible Fitness Centers: Resources," below.)
- Be willing to file a complaint. If your request comes under the ADA requirements, you may file a formal, legal complaint with the United States Department of Justice (*www.ada.gov/*; 800-514-0301).

Speak up

It pays to speak up and get fitness centers to recognize the accessibility barriers that exist in their facilities. When you speak up you create demand for change.

❖ ❖ ❖

Accessible Fitness Centers: Resources

- *Using A Fitness Center Does Not Have to be an Exercise in Frustration: Tips for People With Mobility and Visual Disabilities,* Center for Disability Issues and the Health Profession, *www.cdihp.org/fitness%20center%20nov08.pdf*. Call 909-469-5380 or email *ahcs@westernu.edu* to request a copy.
- *Removing Barriers to Health Clubs and Fitness Facilities*, North Carolina Office on Disability and Health (2008). Go to *www.fpg.unc.edu/~ncodh/pdfs/rbfitness.pdf* or call 919.966.0857 to request a copy.
- *Access Equals Opportunity: Recreation Facilities & Fitness Centers*, King County Office of Civil Rights (2008). Go to *http://your.kingcounty.gov/dias/ocre/fun.htm*, or call 206-296-7592 to request a copy.
- For questions about the ADA or to contact your local ADA Information Center, call the National Network of ADA Centers at 800-949-4232 or visit *www.dbtac.vcu.edu.*

Accessibility: Frank's Story

I became eligible to join a gym through a new employer. Being a paraplegic, I knew that I better check it out first to see if there was enough equipment there for me to make a membership worthwhile. Overall, I was disappointed. I could use some of the equipment, but I did not feel as though I would be able to get a good workout (either cardio or strengthening). Since this facility was going to be very convenient for me, I decided to try to get them to purchase some additional equipment.

I did some homework and decided to come at the problem as an advocate for people in wheelchairs. Since the facility itself was fairly new and built to be accessible, I made the case that in order to be truly accessible they should offer equipment that would be usable for anyone with a disability that could get to the gym. After a few emails and calls, I had an appointment with the director and the manager of the facility.

When we met, I brought printouts from the Internet showing the equipment I wanted to recommend. I presented a variety of options: inexpensive vs. expensive, cardio vs. strength, etc. Most of the equipment I had chosen to show them either came with adaptations or required only small changes so non-wheelchair users could also use them, including older individuals or anyone who wanted to focus on the upper body.

The management seemed very receptive to my input. Ultimately, they bought a cardio/strength item (VitaGlide) and a strength item (Challenge Circuit 7000). They also posted signs saying that people with disabilities had priority on these items. I joined the gym after the equipment arrived, and I made sure to follow up by letting them know that I appreciated their efforts and that I loved the equipment.

—Frank Lampard, age 41, T3

Real Life Fitness

What do your SCI peers do for exercise and physical activity? Here are some answers:

58-year-old female, T10/11, injured 13 years—Uses hand weights and bands at least four times/week, plus 120 crunches before getting out of bed. For aerobic exercise, she uses an hour-long wheelchair exercise video. "I also dance to my favorite music. Cleaning a room from top to bottom burns up mega calories for me." The endorphins she gets from exercise "are energizing (better than caffeine) and help somewhat with pain management. My advice is to make exercise a regular part of your schedule and then stick to it until it becomes a habit. Start out slowly or you could injure yourself right out of the gate. Build up to longer workouts and vary your activities to keep it interesting. Also be sure to stay stretched by daily range of motion exercises. Keep your workouts fun and don't beat yourself up for missing a day."

26-year-old male, C5, injured 7 years—Uses exercise bands attached to his rear casters on his power chair to work out his arms for 30–45 minutes at a time. He also wheels in his manual wheelchair for exercise when he has time. He needs assistance attaching the bands to the wheelchair or helping him transfer to his manual chair, but these activities have helped increase his "energy, strength in arms, and overall feeling of well-being."

30-year-old female, L2, injured 12 years—Saved up money to buy a VitaGlide machine and uses it 2–3 times/week, up to 45 minutes per session. She also attends a boxing fitness class once a week, and she lifts weights at home once a week. In sunny weather, she rides a bike outdoors using a Dragonfly attachment. This "was very expensive, but much more affordable than a handcycle. I cannot get it out of the apartment myself, or maneuver it up and down many of the hills around my apartment, so I only bike with my partner, who drives me to a bike trail." Benefits? "I have more energy and less pain in my back because I've worked hard on building up the muscles that will support me (core and trunk)."

❖ ❖ ❖

"Keep your workouts fun. Don't beat yourself up for missing a day."

❖ ❖ ❖

43-year-old male, T4, injured 12 years— Exercises with an arm ergometer at home for 35–45 minutes, 3–4 times/week; with free weights for 30 minutes, twice a week; and does exercises for his shoulders with bands twice a week for 15 minutes. These activities have helped him build strength and endurance. Besides, "it just feels good after working out." His advice is to set small goals and measure your progress. "Since it is often hard for people with SCI to get their heart rate up, get a heart rate monitor so that you can see how your body is reacting to different exercises. For cardiovascular exercise, my favorite piece of equipment is the VitaGlide because it seems to get the greatest number of muscles involved and is the best for getting my heart rate up."

An exercise band going from the hand to the rear wheelchair caster provides resistance for an arm workout.

38-year-old male, C4-5, injured 17 years—Rides an E-stim bike at home, usually twice a week. He needs another person to assist him with it and it takes a lot of time, but "I can feel my heart rate increasing…it's the best exercise for cardio you can get when you are paralyzed." He would recommend it to all quads. It is expensive, and this may be a big obstacle for many people.

25-year-old female, C5/6 injury with C2/3 function (vent-dependent), injured 7 years—Attends a rehab exercise facility (Pushing Boundaries in Redmond, Wash.) for two hours, three days/week and does a range of activities there, including E-stim bike, standing, core and postural training, breathing exercises, and weight training. Exercising has had huge benefits: "I am able to work off some of my pent up energy. I sleep better. I can support myself better. I have improved my independent breathing functions. I have stopped and even reversed muscle atrophy. And finally, I have discovered that I have some control over muscles that I did not before and have been able to strengthen those muscles and muscle groups. It has been worth the time and financial commitments tenfold."

52-year-old male, C5 injury with C6 function, injured 26 years—After years of exercising with strap-on cuff weights, he switched to tubing on the advice of the physical and occupational therapists he consulted for shoulder pain and weakness. With the help of an assistant, he does his workouts with the tubing for 20 minutes/day, 5–6 days/week and has noticed increased strength and reduced pain. He has also benefitted from breathing exercises, yoga, tai chi and stretching. His advice : get a partner and/or assistant to help and encourage you in your fitness efforts.

Get Going: Physical Activity and Exercise Resources

On our Web site

- Universal Fitness, an SCI Forum presentation by Cathy Warms, PhD, ARNP, CRRN, May 8, 2007. Read the report or watch the streaming video at *http://sci.washington.edu/info/forums/reports/universal_fitness.asp*.
- Fitness after SCI: How to Get Started, *SCI Update,* Fall 2004, *sci.washington.edu/info/newsletters/articles/04fall_fitness.asp*.

National Organizations

- NCPAD—National Center on Physical Activity and Disability. Excellent resource, plus exercise videos specifically for people with paraplegia and quadriplegia: *www.ncpad.org*.
- Accessbile fitness and recreation programs, by state (from NCPAD): *www.ncpad.org/programs*
- National Parks Service Free Access Pass to all National Parks and Federal Recreational Lands: *www.nps.gov/pub_aff/access/access_pass.htm*
- Paralyzed Veterans of America sports information: *www.pva.org/site/PageServer?pagename=sports_main&s_src=Google*

Articles & Publications

- Choosing a workout that's right for you and your disability: *www.disaboom.com/Health/Articles/fitnessandnutrition/Choosing-a-Workout-that_1920_s-Right-for-You.aspx*
- Chair Yoga is Accessible for All: *www.disaboom.com/Health/Articles/fitnessandnutrition/chair-yoga-get-fit-where-you-sit.aspx*
- Resistance Band Workout for Wheelchair Users: *www.disaboom.com/Health/Articles/fitnessandnutrition/resistance-band-workout.aspx*
- Using a Fitness Center Does Not Have to be an Exercise in Frustration: *www.cdihp.org/fitness%20center%20nov08.pdf*
- Paralyzed Veterans of America articles on quad weight lifting and fitness training: *www.pva.org/site/PageServer?pagename=sports_fitness_workout*
- *Sports 'n' Spokes* magazine: *www.pvamagazines.com/sns*

Disability Sports Organizations

- Disabled Sports USA: *www.dsusa.org*
- Adaptive Adventures—Sports and recreation programs and events throughout the U.S.: *www.adaptiveadventures.org*
- Extreme Chairing—Extreme sports for people with disabilities: *www.extremechairing.com*
- Wilderness Inquiry — Accessible adventure travel: *www.wildernessinquiry.org*
- Handicapped Scuba Association: *www.hsascuba.com/index.html*
- National Alliance for Accessible Golf: *www.accessgolf.org*
- National Wheelchair Basketball Association: *www.nwba.org*
- No Barriers USA—Adaptive rock climbing, hiking, off-road biking, kayaking, sailing and scuba diving for individuals with disabilities: *www.nobarriersusa.org/index.html*
- United States Quad Rugby Association: *www.quadrugby.com*

Parks in Washington State

- Washington State Parks Accessible Outdoor Recreation Guide: *www.parks.wa.gov/ada-rec*
- Washington Department of Fish and Wildlife, Accessing Washington's Outdoors: *wdfw.wa.gov/outreach/access/accessibility*
- Mount Rainier National Park: *www.nps.gov/mora/planyourvisit/accessibility.htm*
- North Cascades National Parks Service: *www.nps.gov/noca/planyourvisit/accessibility.htm*
- Olympic National Park: *www.nps.gov/olym/planyourvisit/accessibility.htm*

Western Washington Opportunities

- Bellevue Aquatic Center has a warm therapy pool: *www.bellevuewa.gov/aquatic_center.htm*
- Bellevue Parks and Recreation—Highland Community Center para gym: *www.bellevuewa.gov/highland_community_center_sk8_park.htm*
- Footloose Sailing program—the Northwest's sailing program for people with disabilities: *www.footloosesailing.org*
- King County Accessible Pools: *www.kingcounty.gov/recreation/parks/pools/accessibility.aspx*
- Outdoorsforall—year-round outdoor recreation for people with disabilities: *www.outdoorsforall.org*
- Pushing Boundaries—exercise therapy center for people with paralysis. *www.pushing-boundaries.org*
- Sammamish Rowing Association: *http://srarowing.com/adult/adaptive.aspx*
- Seattle Adaptive Sports: *www.seattleadaptivesports.org/index.php*
- Seattle Adaptive Sports Experience (Seattle Parks and Recreation): *www.seattle.gov/parks/SpecialPops/index.htm*
- Seattle Parks Guide: *www.seattle.gov/parks/ParkGuide.htm*
- Seattle Accessible Pools: *www.seattle.gov/parks/Aquatics/poolamenitychart.htm*

Equipment & Products

- Sportaid—sport wheelchairs and accessories: *www.sportaid.com/xcart*
- Access To Recreation: *www.accesstr.com*

Link to these resources from the online newsletter:
http://sci.washington.edu/info/newsletters/09_fall.asp

literature review

The articles previewed below were selected from a recent screening of the National Library of Medicine database for articles on spinal cord injury. In the judgment of the editors, they include potentially useful information on the diagnosis or management of spinal cord injury. You may obtain copies of the complete articles through your local medical library or from UW Health Sciences Library Document Delivery Service (call 206-543-3436 for fee schedule).

REPAIR AND RESTORATIVE THERAPIES

■ **Stem cell-based therapies for spinal cord injury.**
This paper reviews stem cell applications for spinal cord repair. It provides a definition of different stem cell types and describes the mechanisms that could be used to limit damage or repair the spinal cord, including neuroprotective strategies and axon regeneration. The paper reviews the ethical issues surrounding the use of embryonic stem cells (ESCs), and summarizes the advantages and disadvantages of using adult stem cells as an alternative to ESCs. While stem cell therapies have shown promise in animal studies of spinal cord injury, the risks to humans are unclear and several hurdles still need to be overcome. Ethical concerns surrounding the use and possible misuse of both embryonic and adult stem cells also need to be resolved.
Tewarie RS, Hurtado A, Bartels RH, et al.
J Spinal Cord Med. 2009;32(2):105-14.

■ **Systemic administration of an antagonist of the ATP-sensitive receptor P2X7 improves recovery after spinal cord injury.**
Traumatic spinal cord injury is characterized by an immediate, irreversible loss of tissue at the lesion site, followed by secondary expansion of tissue damage over time. No effective treatment options currently exist to prevent secondary injury. Excessive release of the chemical ATP at the time of injury plays a role in secondary injury. The authors found that administering Brilliant blue G (BBG) a P2X7R antagonist, 15 minutes after injury in rats, reduced spinal cord anatomic damage and improved motor recovery without evident toxicity. Moreover, BBG treatment directly reduced local activation of astrocytes and microglia, as well as neutrophil infiltration. BBG is a derivative of a commonly used blue food color (FD&C blue No. 1), which crosses the blood–brain barrier. The authors suggest that this may be a feasible approach to treating traumatic SCI in humans.
Peng W, Cotrina M, Han X, et al.
PNAS July 28, 2009 vol. 106 no. 30 12489-12493

■ **Activity-based restorative therapies: Concepts and applications in spinal cord injury-related neurorehabilitation.**
This article reviews basic and clinical science evidence pertaining to using physical activity and exercise as a therapeutic tool in the management of chronic spinal cord-related neurological paralysis. The concept of an irreparable central nervous system (CNS) is slowly being replaced with evidence related to CNS plasticity, repair and regeneration, all related to persistently maintaining appropriate levels of neurological activity both below and above the area where the damage occurred. Activity-based restorative therapies (ABRTs) are a new fundamental approach to deficits induced by neurological paralysis. The goal of this approach is to achieve activation of the neurological levels located both above and below the injury level using rehabilitation therapies. While ABRTs are not the "cure" for paralysis, they are evidence-based therapeutic interventions that can be used as a tool for neurological recovery.
Sadowsky CL, Mcdonald JW
Developmental Disabilities Research Reviews 15: 112 – 116 (2009)

■ **Toward the restoration of hand use to a paralyzed monkey: brain-controlled functional electrical stimulation of forearm muscles.**
Functional electrical stimulation (FES) of forearm and hand muscles has been used to provide basic, voluntary hand grasp to hundreds of individuals with SCI. However, even the most advanced systems limit hand function to the few tasks programmed into the controller. In contrast, the authors are developing a system that uses neural signals recorded from a multi-electrode array implanted in the motor cortex of the brain. This system has the potential to provide independent control of multiple muscles over a broad range of functional tasks. Two monkeys were able to use this cortically controlled FES system to control the contraction of four forearm muscles despite temporary limb paralysis. Furthermore, the monkeys were able to control the magnitude and time course of the force with sufficient accuracy to match a cursor to targets at different force levels. The authors are working to refine this approach to allow voluntary control of more complex and varied hand movements. These results suggest that brain-controlled FES prostheses may ultimately benefit paralyzed patients with injuries in the mid-cervical spinal cord and be of even greater benefit to individuals with high-cervical injuries and paralysis of the entire upper limb.
Pohlmeyer EA, Oby ER, Perreault EJ, et al.
PLoS One. 2009 Jun 15;4(6):e5924.

HYPOTHERMIA FOR ACUTE CARE

■ **Therapeutic hypothermia for spinal cord injury.**
This review summarizes experimental and clinical studies of the use of hypothermia (cooling the body) for treatment of acute spinal cord injury (SCI). While early investigations evaluated the beneficial effects of more profound levels of local hypothermia treatment following SCI, recent studies have concentrated on the benefits of mild hypothermia in protecting and promoting functional recovery in animal (rat) models. In these studies, early cooling strategies improved locomotive function as well as forelimb gripping strength and coordination. In a small human study (14 subjects), modest hypothermia was found to be safe in severely injured SCI patients. Larger studies are needed to determine if therapeutic hypothermia is safe and beneficial in large numbers of SCI patients.
Dietrich, W Dalton III PhD
Crit Care Med. 2009 Jul;37(7 Suppl):S238-42.

SPASTICITY

■ **Clinical and neurophysiologic assessment of strength and spasticity during intrathecal baclofen titration in incomplete spinal cord injury: single-subject design.**
Spasticity after spinal cord injury (SCI) is commonly managed with oral and intrathecal baclofen (ITB) (baclofen delivered directly into the cerebrospinal fluid surrounding the spinal cord by means of a catheter connected to a battery-powered pump implanted in the abdominal wall). The effects of ITB on strength and voluntary muscle activation have been largely ignored because most users have either (1) complete SCI or (2) incomplete SCI with only traces of voluntary movements and need ITB to manage spasticity that interferes with self-care or transfers. For a subset of patients who rely on residual motor control for functional mobility such as walking, there may be a fine balance between controlling spasticity and maintaining strength. This study evaluated the effects of varying doses of oral baclofen and ITB on clinical and neurophysiologic measures of strength and spasticity in a patient with an incomplete SCI. Results showed that control of spasticity can be achieved without reducing strength in incomplete SCI and suggests the need for including strength testing in comprehensive clinical assessment of spasticity.
Bowden M, Stokic DS.
J Spinal Cord Med. 2009;32(2):183-90.

CONTINUED ON NEXT PAGE

CONTINUED FROM PAGE 6

ASSISTIVE TECHNOLOGY

■ **Evaluation of Tooth-Click Triggering and Speech Recognition in Assistive Technology for Computer Access.**
The Tooth-click (TC) detector is a small lightweight device that fits around the ear and senses jaw vibrations when teeth are clicked together. When paired with an optical or gyrometer head mouse, it may be used to control cursor movement and mouse button clicks. This study compared the effectiveness of TC to speech recognition (SR) and compared an optical head mouse (OHM) to a gyrometer head mouse (GHM) for cursor and mouse button control of a computer. Three individuals with tetraplegia and six able-bodied controls used the devices in four combinations (TC/OHM, TC/GHM, SR/OHM and SR/GHM) to perform specific tasks involving cursor movements and mouse clicks. TC was found to be significantly faster than SR in generating mouse button clicks when paired with either type of head mouse device. Such a system may improve computer access for people with tetraplegia. The study also found that with only five minutes of training, people with tetraplegia using TC paired with either OHM or GHM could achieve cursor movement and button clicking faster than an able-bodied person using a standard mouse.
Simpson T, Gauthier M, Prochazka A
Neurorehabil Neural Repair. 2009 Aug 13.

WALKING

■ **Development of hybrid orthosis for standing, walking, and stair climbing after spinal cord injury.**
This study explores the feasibility of a hybrid system of exoskeletal bracing and multichannel functional electrical stimulation (FES) to facilitate standing, walking, and stair climbing after spinal cord injury (SCI). The orthotic components consist of electromechanical joints that lock and unlock automatically to provide upright stability and free movement powered by FES. New orthotic components, including a variable constraint hip mechanism, were designed, prototyped and successfully tested on nondisabled volunteers and an individual with SCI. The power requirements are low enough to provide more than 4 hours of continuous operation with standard camcorder batteries. Further refinements of the mechanism and additional orthotic components for the trunk, knees and ankles need to be completed before this type of system can be a practical option for persons with SCI.
Kobetic R, To CS, Schnellenberger JR, et al.
J Rehabil Res Dev. 2009;46(3):447-62.

■ **Whole-body vibration improves walking function in individuals with spinal cord injury: A pilot study.**
Whole-body vibration (WBV)—in which subjects stand on a vibration platform for short periods—has improved walking in elderly individuals and individuals with Parkinson's disease in previous research. This study involved 17 individuals (14 men, 3 women; age 28–65) with motor-incomplete SCI of at least one year duration. All had the ability to rise from sitting to standing with no more than moderate assistance from one person, and ability to stand (using upper extremity support) for at least one minute. They also had asymmetrical leg strength. Subjects received WBV sessions three days/week for four weeks. After the 12-session intervention, there were significant improvements in walking speed, cadence and other walking parameters. All subjects tolerated the intervention, were able to maintain the standing posture for the 45-second bouts of WBV, and reported no adverse effects. Improvements in walking speed were comparable to improvements associated with locomotor training. These findings suggest that regular use of WBV may be a potent intervention for improving walking function in individuals with incomplete SCI.
Ness LL, Field-Fote EC.
Gait Posture. 2009 Jul 31.

PRESSURE ULCER PREVENTION

■ **Comparative study of pressure distribution at the user-cushion interface with different cushions in a population with spinal cord injury.**
Wheelchair cushions for people with SCI are used to redistribute pressure in the seating area and reduce the risk of developing pressure ulcers. While consensus is lacking on what is the critical pressure at which pressure ulcers develop, the general recommendation is that skin should be subjected to the lowest possible pressure. In this study, a user-cushion pressure-recording system was used for assessing the mechanical characteristics of different types of wheelchair seat cushions. Each one of 48 patients with spinal cord injury was seated in his or her own wheelchair on the four models of cushions analyzed (low-profile air, high-profile air, dual-compartment air, and gel and firm foam), which were presented in randomized order. The pressure distribution readings and support surface area of the user-cushion interface were obtained. The dual-compartment air cushion was found to have the best pressure distribution and largest contact surface of the user-cushion interface compared to the other three cushions studied.
Gil-Agudo A, De la Peña-González A, Del Ama-Espinosa A, et al.
Clin Biomech (Bristol, Avon). 2009 Aug;24(7):558-63.

BOWEL MANAGEMENT

■ **Effect of sacral anterior root stimulator on bowel dysfunction in patients with spinal cord injury.**
The sacral anterior root stimulator (SARS) has been used for neurogenic bladder, and there have been indications that it also may be useful for neurogenic bowel. In this study, 18 patients were evaluated for bowel function before and 12 months after receiving an SARS implant. Results showed that SARS improved constipation, increased the frequency of defecation, reduced time spent on defecation, and reduced the number of methods used to achieve evacuation. Most patients reported being more satisfied with bowel function after implantation of the SARS. However, further studies focused on the characteristics of stimulation parameters are required to obtain better results.
Vallès M, Rodríguez A, Borau A, Mearin F.
Dis Colon Rectum. 2009 May;52(5):986-92.

NEUROLOGICAL CHANGE

■ **Conversion in ASIA Impairment Scale during the first year after traumatic spinal cord injury.**
When new therapeutic approaches to spinal cord repair and regeneration move from animal studies to human clinical trials, it will be important to understand the exact time course of spontaneous recovery in order to assess the effectiveness of new therapies. The aim of this study was to assess the extent and timing of the natural course of neurological change after injury, particularly of the American Spinal Injury Association (ASIA) Impairment Scale (AIS), within the first year after traumatic SCI. Data were derived from a multicenter cohort at five fixed time points after injury: within the first 15 days and at one, three, six and twelve months post injury. About 72% of the SCI subjects, who were classified within the first 15 days as AIS A were still classified as AIS A at 6 months. While 16% of the AIS A subjects converted (changed) to AIS B, only a few became motor incomplete. In contrast, only a quarter of the AIS B subjects remained AIS B, and most of them converted to AIS C and D. Over 70% of the AIS C subjects converted to AIS D, while almost 90% of the AIS D did not convert. The natural rate of neurological change that occurs in the first year in patients treated with standard therapies needs to be considered when planning clinical trials as well as when assessing the effectiveness of new regeneration-inducing therapies.
Spiess MR, Mueller RM, Rupp R, et al.
J Neurotrauma. 2009 May 20.

Spinal Cord Injury Update is supported by grant H133N060033 from the National Institute of Disability and Rehabilitation Research (NIDRR), U.S. Department of Education, Office of Special Education and Rehabilitative Services (OSERS), to the Northwest Regional Spinal Cord Injury System, one of 14 model SCI care systems nationwide. Project Director: Charles Bombardier, PhD.

To add your name to the mailing list, contact the editor, Cynthia Salzman, at the University of Washington Department of Rehabilitation Medicine, Box 356490, Seattle WA 98195-6490; 206-685-3999; *csalzman@u.washington.edu*.

Visit our Web site: *http://sci.washington.edu*

What you told us: Reader Responses

Readers tell us how we're doing

Thank you to the 138 readers who completed our survey in the Summer 2009 issue of this newsletter. We were pleased to learn that most respondents (92%) said they learned new information from the newsletters and that the information has been useful to them (97%) and has helped improve their health or quality of life (65%). Fifty-nine percent reported that they had changed a behavior or taken some action based on new information they learned in the newsletter. Ninety-six percent gave the newsletter a favorable overall rating.

Readers' top concerns

We asked readers to tell us their top concerns having to do with living with a spinal cord injury and received a variety of responses. Four concerns were mentioned far more frequently than any others: **(1) research on spinal cord injury repair and recovery, (2) exercise, diet and weight management, (3) pain, and (4) aging with SCI.** We will use this feedback to help plan future programs and research and to choose topics for our newsletter. We appreciate your suggestions and invite you to contact us anytime at *scirehab@uw.edu*. or 206-685-3999.

Did you know?

Some readers were unaware that we have a Web site or that they can watch streaming videos of many of our SCI Forums there. Please go to *http://sci.washington.edu* to see our full range of articles, reports, videos and patient education pamphlets.

Read the newsletter online at *http://sci.washington.edu/info/newsletters*

61-8238

ADDRESS SERVICE REQUESTED

Spinal Cord Injury Update
FALL 2009 • Volume 18, Number 3
UNIVERSITY OF WASHINGTON
Rehabilitation Medicine, Box 356490
Seattle, Washington 98195–6490

Nonprofit Org.
US Postage
PAID
Seattle WA
Permit 62