

What
Others



Are
Saying

ERGYS First-Hand Report

Independent Living - September/October 1994

Gene Leber, executive director of the Access Center for Independent Living in Centerville, OH, exercises on the ERGYS, a Computerized Electrical Stimulation (CFES) exercise bike by Therapeutic Alliances.

A T-4 paraplegic from a gun-shot wound in 1979 when he was 20, Leber pedals the bike with his own legs, which are, in turn, powered by computer-coordinated impulses through electrodes. He also plays wheelchair basketball and uses an upper-body ergometer at a local fitness center, but he points to the ERGYS sessions as having a lasting impact on many aspects of his life.

"Number one, it has kept me out of the hospital," he comments. "Number two, in keeping me out of the hospital it has allowed me to continue being employed, and it has allowed me to stay much longer hours in my wheelchair." Using his own muscles in the exercise program has increased the muscle mass in his legs, he says, so he's not as susceptible to skin breakdowns. Grade four pressure sores can mean three to six weeks in a hospital with a cost up to \$100,000, he reports.

Leber contends that because the exercise increases blood flow through the lower extremities, it has helped him to have children--a six-year-old boy and three-year-old girl.

He also notes a psychological benefit from exercising his leg muscles. "The lower portion of my body looks fairly normal. It has given me the pleasure of being able to wear shorts because my legs aren't these skinny, withered away legs you would see on somebody with a spinal cord injury. Cosmetically, I feel good about myself."

Absence makes the heart grow fonder, or, in this case, the body grow weaker. Leber notices that on vacation when he misses a couple weeks of ERGYS sessions, he can feel the energy draining from him. "It's like any exercise program; you have to use it or you lose it," he observes. "With someone who has spinal cord injury, you lose it quickly, and you can't gain it back like someone without an injury."

Diabetes, FES exercise studied

Caliper - Spring 1998

Researchers at the University of Alberta say that exercise--and specifically, exercising leg muscles with an FES (functional electrical stimulation) cycle--can help control diabetes in people with SCI.

According to the research team, people with SCI are at high risk of developing Type 2 diabetes, in which the pancreas often makes sufficient or excessive amounts of insulin, but the tissue cells are resistant to it and cannot use glucose as energy. The high incidence of this type of diabetes in the SCI population is related to physical inactivity, changes in body composition and a large mass of paralyzed muscle.

Aerobic exercise has proven to be beneficial for treatment and prevention of this type of diabetes in an able-bodied population. There is, however, no research on the benefits of exercise for treatment and prevention in people with SCI.

Since the 1980's, exercise options such as the FES leg cycle ergometer (ERGYS II, Therapeutic Alliances, Ohio) have become more popular among people with SCI. Research has clearly demonstrated physiological benefits of exercise with the ERGYS II in terms of cardiovascular, muscular, pulmonary and hormonal adaptations--but not in terms of glucose metabolism. Therefore, the effects of exercise training with the ERGYS II on glucose metabolism in people with SCI became the focus of the investigation at the U of A's Rick Hansen Centre.

Glucose metabolism was measured before and after exercise training with the ERGYS II. Subjects trained with the ERGYS II three times per week, 30 minutes per day at 50 RPM for eight weeks. To measure glucose metabolism in subjects with SCI, two-hour oral glucose tolerance tests and hyperglycemic clamp tests were performed at the University of Alberta Hospital at three different times: before exercise, 48 hours after the last bout of exercise and 72 hours after the last bout of exercise.

Results indicated that five out of seven subjects (71.4%) with SCI had abnormal glucose tolerance (57.1 with impaired glucose tolerance or IGT, 14.3% with actual diabetes) before starting the exercise program with the ERGYS II. After eight weeks of training, two people with IGT obtained normal glucose values and one person with diabetes also achieved normal glucose values. In other words, only two people out of seven had IGT (28.6%) and none had diabetes after the exercise training program. These results are supported by the hyperglycemic clamp tests which were performed on three out of seven subjects. The hyperglycemic clamp test showed that all three subjects improved either glucose utilization or insulin sensitivity.

"The results from this study suggest that exercise training with the ERGYS II improves glucose tolerance and may improve glucose utilization and insulin sensitivity in people with SCI," wrote the researchers in a report outlining their findings. "This result is consistent with research performed on the able-bodied. Therefore, it is concluded that regular exercise with the ERGYS II may prevent diabetes in people with SCI. Thus, regular FES-assisted exercise such as the ERGYS II is recommended as a way to optimize the effects of physical activity and to decrease the risk of developing diabetes mellitus."

The research project described above was funded by The Alberta Paraplegic Foundation and was carried out by Jeon, J. Y., Weiss, C. B., Steadward, R. D., Wheeler, G. D., Burnham, R. S., & Ryan, E.



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FES and Leg Cycles

by Spencer Bevan-John

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Functional Electrical Stimulation (FES) began drawing a lot of attention in 1983 when Nan Davis, a paraplegic, got out of her wheelchair and walked to collect her diploma at Wright State University (WSU) with the help of FES.

FES applies electric current to paralyzed muscles to produce function. As well as allowing persons with spinal cord injuries, like Nan Davis, to walk, FES has been used in a variety of other ways. When used in conjunction with other technologies, particularly computers, FES has played an important role in everything from pacemakers to inducing ejaculation in spinal cord injured (SCI) men.

Roger M. Glaser, Ph.D., Director of Wright State University's Institute for Rehabilitation Research & Medicine (IRRM), Kettering, Ohio, has been working in the area of FES for over 24 years. He has published extensively on a number of topics including the use of functional electrical stimulation for exercise training of paralyzed muscles and for assisting locomotion. Dr. Glaser remains a key player in FES, and in September 1996, he and the Institute co-hosted an event with Therapeutic Alliances Inc. (TAI) of Fairborn, Ohio, called **A Gathering of ERGYS Enthusiasts** at WSU.

A leg cycle ergometer, basically a sophisticated exercise bike that allows its user's muscles to function with FES, was one of the devices developed at WSU, and Dr. Glaser is one of the co-inventors of the leg cycle ergometer. The FES bikes made commercially by TAI are based on the patents and research completed at Wright State's laboratory. The Gathering brought together over 100 researchers, engineers, subjects



Susan Steele (left) and Connie Leber reminisce at the reception



Shown in the photo on the right are conference speakers. From left to right: Thomas Janssen, Gene Leber, Mark Britton, Roger Glaser, Frank Zeiss, James Schorey, Charleene Frazier (rear), Sarah Everhart, Philip Muccio

of various research projects, and users of TAI's commercial leg cycle ergometer known as the ERGYS.

Susan Steele was present at the Gathering. (See photo at top of page.) She became a quadriplegic (C 7-8) in August 1979 when she was in high school. First, she went to college in North Carolina at St. Andrews. She says, "I transferred to Wright State University when I found out about the research they were doing." Susan was a research subject from July 1982 until she graduated in September 1986.

The Gathering was an opportunity for old friends to get together. Susan spoke with great warmth about James Schorey, President of TAI, and his team. "They are good people," she says.

Susan joined CNN over six years ago. She works at their Bureau in Washington, DC as a producer. Several times a week, Susan continues to work out on the ERGYS she has in her home. She has always been motivated to participate in physical exercise. "The ERGYS definitely gives you a work-out and the exercise leaves you with the same glow and feeling that motivates the able bodied," she says.

Some of the other benefits that derive from the use of FES include better controlled spasticity, increased muscle strength, less likelihood of developing pressure sores, improvement in bladder and bowel function, and a whole range of benefits that come from just looking and feeling good as the result of a workout. Also, as well as being a great form of exercise, Susan, like many others, feels that someday there will be a cure for SCI. Those keeping in shape (particularly their leg muscles) will ensure that they'll be one step ahead of the game when the cure eventually occurs.

For over a decade, TAI and its predecessor company, TTI*, has marketed the REGYS, ERGYS 1, and, most recently, the ERGYS 2. The ERGYS 2 incorporates improvements on the first two models including a full line of electrode interface choices. The strides that have been made are due to an alliance that has recognized the vital role that the user plays. TAI's recognition of this is summed up by James Schorey, "The ERGYS Gathering was a great opportunity to thank both past and present research subjects, researchers, engineers and clinicians. Their dedication has helped to ensure that this technology is available to everyone."

**Therapeutic Alliances acquired the products of Therapeutic Technologies Inc. (TTI) in 1993. TAI's staff are all former employees of TTI.*

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