'Miracle machine' powered by 9-volt battery

Rowing machine designed for people with disabilities

By **Ileiren Byles**

Struggling to catch her breath after an intense workout, Kuen Tang can't stop smiling. Sitting on an innovative new rowing machine in the University of Alberta's Steadward Centre for Personal and Physical Achievement, she grinned, looking down at her legs.

"I feel like I'm whole again."

A car accident left Tang a quadriplegic while she was in her final year of her Education degree, which she earned this year. But on this machine, electrical impulses move her legs in time with her shoulders and propel her body through smooth rowing motions.

"It often feels like I just ran a marathon," Tang said of the effects. "It's awesome. I swear, I dream about coming to row the night before and all weekend long. I can't wait to get here and actually do some exercises."

Most people with spinal-cord injuries who try the functional electrical stimulation (FES) rowing machine quickly grow to love the sensation, said Dr. Dave Collins, a neuroscientists with the U of A Faculty of Physical Education and Recreation.

"Every time you get someone on there for the first time, they say that just to see their legs move again is the biggest thing," he said. "For most of us, having our legs move when our brain tells them to is simply something we take for granted. But for people with a spinal-cord injury, it's nothing short of a miracle."

The FES rowing project was sparked by Dr. Gary Wheeler, former director of the Steadward Centre, and Dr. Brian Andrews who was working with Brunel University in England at the time. Collins has been working with Andrews, now with the University of Oxford, and research participant Robin Gibbons, to help more disabled people enjoy the benefits of regular exercise.

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Kuen Tang gets a vigorous workout on the FES rowing machine.

"We were looking for a high-energy exercise, because at that time it was beginning to emerge, the problems of obesity – in particular the risks of Type 2 diabetes and cardiovascular disease," said Andrews. "We knew from the able-bodied literature that we had to get an intensity and volume of exercise that hadn't been done before. So, we looked at rowing because it naturally involves the whole body, both the lower limbs and the upper limbs – the lower limbs being paralyzed. The only way to activate paralyzed muscles is to electrically stimulate them – then you can get a volume of muscle mass involved in the exercise, and we found that took us above the threshold."

The machine is powered by a single nine-volt battery.

"It works by applying electrodes to the skin surface and then it applies electrical stimulation that we would find actually quite painful, but because paraplegics have a lack of sensation, it doesn't bother them," said Andrews. "These electrical pulses can cause the paralyzed muscles to contract and then we have a little computer that distributes the stimulation to different muscles, causing the rowing motion."

Gibbons wears the title of 'world's fastest paraplegic rower' with his tongue firmly in cheek. "Well, for a while there, I was the only paraplegic rower," he chuckled.

That being said, Gibbons entered the British Indoor Rowing Championships in 2005 and surpassed his own expectations.

"Before that competition I was struggling to finish 2,000 metres," Gibbons said about working towards the final race length. "I suppose because of the adrenaline at that event . . . I did something like 12 minutes and two seconds, which is actually inside able-bodied times. It put us on the radar screen, basically. We didn't think at the time that we could approach able-bodied results."

Besides the obvious physical and cardiovascular benefits of the exercise, there are some important psychological benefits, said Gibbons.

"Body image is important to everybody. For a disabled person, slumped in a chair, it's as important as for an able-bodied person, so to have a pair of legs that look normal is unbelievable," he said. "Strangely enough, that's something that most people see with me straight away. They say, 'Where have you got legs like that from? Are you an incomplete break?' I'm mid-chest, and I'm a complete break. My legs, on their own, can not move. To have a pair of legs that look like a pair of legs is what people notice."

Another of the intangible benefits is a feeling of belonging. "The fact that you're doing a sport or an activity that's an able-bodied activity gives you a feel-good factor that you can't even begin to imagine as an able-bodied person," said Gibbons.

And, as plans are underway to make the FES unit accessible to rowers who actually want to get out on the water, the divide between disabled and able-bodied athletes is growing smaller. It's something Tang is very excited about.

"If this were available to go out on the water, I'd go for it right now," she said. We saw some people out canoeing and I thought, 'Oh my God, I want to do that.' " ■