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New tech helps build stronger muscles – sans a workout

Older folk too frail to exercise may benefit from using machine

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Get stronger muscles without needing to exercise.

It sounded like fake advertising, or a claim too good to be true.

But now, a patent on the technology has been filed out of Singapore, a machine to make this possible will soon be available on the market and thousands of older people who are too frail to exercise stand to gain.

When Professor C.N. Lee of the Yong Loo Lin School of Medicine at the National University of Singapore (NUS) heard of research being carried out on the subject, he not only believed it, but also went further.

He persuaded the researcher, Associate Professor Alfredo Franco-Obregon from the Swiss Federal Institute of Technology, better known as ETH Zurich, to relocate to Singapore. "The data presented was very convincing scientifically," said Prof Lee. As a surgeon, he wanted to see if it could be used to improve outcomes, especially for older patients following surgery.

That was six years ago.

Today, a patent has been filed – with NUS owning 80 per cent and ETH the remaining 20 per cent. The technology has been tested on patients at National University Hospital (NUH) and on a group of seniors in the community, and will be available commercially from the middle of next year.

The technology flows through a machine. Just 10 minutes on it, twice a week, for 10 weeks, and it has produced good results in most of the 69 participants, aged 60 to 85, who are members of Gym Tonic gyms initiated by the Lien Foundation for seniors.

About 85 per cent saw at least a 10 per cent improvement in strength. On average, their legs were able to push 26 per cent harder, while two in three said they had less trouble with their daily activities. About 5 per cent did not benefit, while 10 per cent had some improvement.

HOW MUSCLES WORK

The muscle doesn't know if it has been exercised. All it really understands is how much energy is used. It uses energy production as a feedback mechanism.

ASSOCIATE PROFESSOR ALFREDO FRANCO-OBREGON, who carried out research on the technology.

Ms Maureen Swee, 71, used to lean on her umbrella while climbing the stairs. After 10 weeks on the machine, she climbed 103 steps up to a temple and down again on a recent trip to South Korea without problems or aids. The retired senior office assistant said: "I have spurs on my hip and calf that used to hurt when I walk. Now I can walk steadily for quite a distance without much pain."

The technology, called Bio Ionic Currents Electromagnetic Pulsing Systems, or Biceps, involves the use of low-energy magnetic fields to stimulate cells in the muscles.

Exercise consumes energy. The magnetic fields cause muscles to create energy. The net effect is the same – the production of energy. This is all muscles know and they respond the same way, explained Prof Franco-Obregon, who is now with NUS.

"The muscle doesn't know if it has been exercised. All it really understands is how much energy is used. It uses energy production as a feedback mechanism," he said.

Based on this, the muscles create energy and reap the benefits that exercise would have brought.

Two clinical trials at NUH – one with 10 healthy people and the other with 20 patients after knee surgery – showed some benefits, with significant increase in muscle strength for the healthy group.

"We got very good changes in blood markers that indicated muscle regeneration, bone regeneration. We got blood markers that indicated a reduction in muscle breakdown and in bone breakdown," said Prof Franco-Obregon.

Why just 10 minutes and only twice a week?

He said that when it is too frequent, the cells stop responding to the stimulus. Too strong a magnetic field does not yield more benefits.

Mr Ivan Goh, chief executive of QuantumTX, the firm taking the machine to the market, said there is an initial increase in muscle mass, but this is coupled with a reduction in fats, resulting in only "a slight gain in mass but a shift in the underlying biology within the muscles".

If only one leg is treated, the other leg also improves, he said.

The machine, on sale from mid-2020, will have a price tag of about $25,000. It may also be provided on a pay-per-use basis at around $30 a month, said Mr Goh.

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Retiree Maureen Swee on the Biceps machine at the Centre for Innovation in Healthcare co-working space, with QuantumTX CEO Ivan Goh (far left) and NUS Associate Professor Alfredo Franco-Obregon. Ms Swee, who used to lean on her umbrella while climbing the stairs, is now able to climb the stairs unaided after using the device over 10 weeks.
ST PHOTO: LIM YAOHUI

It's not just muscles that could get a boost from Biceps

The target was to increase the muscle mass in older people who may be too frail to exercise enough.

But the benefits of the Biceps (Bio Ionic Currents Electromagnetic Pulsing Systems) machine are yet to be fully plumbed.

Apart from the strengthening of muscles – which has been tested – clinical trials will now look at whether this technology can have wider health benefits.

Associate Professor Alfredo Franco-Obregon of the department of surgery at the Yong Loo Lin School of Medicine at the National University of Singapore (NUS) said that aside from the localised improvement to muscles, there appears to be "mild changes of the circulatory system that gets distributed throughout the body".

He explained: "The muscle is basically a secretory organ. When it gets activated, it releases agents that basically improve brain development, that improve bone and cartilage. We are very lucky that it played out that way."

For example, blood tests showed that the participants had changes to the levels of agents that may help with metabolic dysfunction, cardiovascular disease and mental decline after using the machine.

Prof Franco-Obregon said: "The changes were significant. In some cases, it was 30 per cent, and in some cases, it was 40 per cent."

He now has the go-ahead from National University Hospital (NUH) to run two more clinical trials to test the effect of the machine on cognition and diabetes.

The trial on cognition and brain function has started. It will have 34 people, half of whom will use the machine, with the other half acting as the control group.

"Muscles feed the brain, both metabolically and via growth of new neutrons," he said. This is why exercise is good for the brain. He hopes the Biceps machine can provide the same function.

The diabetes trial is expected to start next year. It will show if the low-level electromagnetic fields can activate muscles and increase the absorption of sugar.

If it works, it could help diabetics control the amount of sugar in their blood, which is what causes all the damage to the body.

The trials do not come cheap, but Prof Franco-Obregon is hoping to get approval from NUH for a third trial on the effects on people who are too frail to exercise.

He said: "We have 15 years of cell research, and maybe 10 years of animal research. But animal studies only take you so far. The results are very promising, but everything has to be reproduced in humans because in humans, it can actually play out in a different way."

Meanwhile, Dr Serena Teo, facility director of NUS' St John's Island National Marine Laboratory, is trying the technology on sea urchins.

She said: "The results from human trials are exciting, and we would be interested to see if these electromagnetic fields can be used to improve animal health in aquaculture."

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