
MY OWN MOTION

A childhood invention inspires two longtime friends to create a life-changing device: **A ROBOTIC ARM BRACE** that not only acts as an assistive device but can also restore strength and mobility to patients with a neurologically impaired arm.

“It was one of the most compelling moments in my life.”

Kailas Narendran is talking about a day several years ago when he was working with Maggie,

a stroke patient in her 30s whose rehabilitation had “plateaued.” Based on prevailing medical wisdom, Maggie knew her impaired right arm wouldn’t improve further. So she had joined a clinical trial of an assistive device: a powered arm brace invented by Narendran and his friend John McBean, to help stroke and spinal cord injury patients reach, push, stretch and support weight with a weakened arm. Now, during a therapy session, Maggie’s arm suddenly started moving with greater ease.

“I didn’t make much of it at first,” says Narendran. “I assumed we had just gotten some adjustments right. But she ripped the device off — it was like televangelism — and she started running around the room doing things she couldn’t do before, opening doors and pushing in chairs. It was amazing.”

That moment was a revelation. It supported an emerging theory that stroke patients have the capacity to improve, even decades after an injury — a phenomenon called neuroplasticity. And it suggested that the brace, whose inventors viewed it as an assistive device, could also be used in therapeutic and functional ways to restore arm strength and mobility.

DOING THINGS MOST PEOPLE TAKE FOR GRANTED

Narendran and McBean — who met in their freshman year at MIT and have collaborated ever since — joined with their mentor Steve Kelly to form Myomo, Inc., short for “My own motion”. In 2007, the company received FDA clearance to sell the device, and today a streamlined version, weighing less than two pounds, is used in more than 100 rehab clinics and hundreds of patients’ homes. Worn throughout the day, the brace lets patients use their impaired arm to do tasks most people take for granted: turning on a light switch, carrying a serving dish with two hands, or pushing themselves up from a chair. During rehab, the device retrains damaged neural pathways and improves mobility for individuals with debilitating muscle weakness.

IT ALL STARTED IN SECOND GRADE

Narendran first conceived of the brace after breaking his leg in second grade. When his cast came off, he couldn’t walk because the muscles had atrophied. Inspired by TV characters in their mechatronic suits, he imagined a wearable brace that could sense his desire to move — and help him do it. Years later, as he and McBean neared the end of their graduate studies, they set out to develop a product based on this childhood invention.

KEY INNOVATORS

- KAILAS NARENDRAN, co-founder of Myomo, Inc.
- JOHN McBEAN, co-founder of Myomo, Inc.
- STEVE KELLY, President, Chairman and co-founder of Myomo, Inc.



LIKE POWER STEERING The Myomo mPower 1000 brace, which has been likened to power steering in a car, differs from similar devices in an important way: it is the patient's intended movement — not the device itself — that initiates arm movement. An electronic sensor detects electrical impulses in the muscle, and a signal processor translates those into assisted motion, driven by a small motor.

TAPPING INTO A STARTUP-FRIENDLY CULTURE

The two friends drew heavily on MIT's entrepreneurial resources. Through the Venture Mentoring Service, they connected with Kelly, an entrepreneur who specializes in commercializing late-stage research projects. (He would become the President and Chairman of Myomo.) They entered MIT's \$50K business plan contest, winning on their third try. And with support from McBean's thesis advisor, Professor Woodie Flowers, they received one of the Deshpande Center's first Ignition Grants.

"In the U.S. alone, there are 5,000 new people each week who need assistive technology to move again following strokes, spinal cord injuries and progressive illnesses like ALS."

STEVE KELLY
President of Myomo

The funding enabled them to hone their business plan, build a working prototype of the brace, and begin clinical tests with spinal cord injury patients at Boston's Spaulding Rehabilitation Hospital. During the funding period they also made an important shift in focus.

"WE WERE IDIOTS"

While their studies on spinal cord injuries were tied up in review, they decided to conduct a clinical trial with stroke patients (the one Maggie joined). Treating this population was considered more challenging than spinal cord patients. "But we were idiots," Narendran says. "We didn't know anything about neurology or medicine, so we didn't realize that our idea shouldn't work. As it turns out, by patients moving their bodies and reconnecting thought with action, it's possible to retrain the brain."

They also discovered that the brace addresses a problem they hadn't considered: the muscle contraction pattern following a stroke, which results in the arm and hand curling inward. The device seemed to lessen this effect by teaching the patient to relax the entire limb.

TAKING A RISK AND IMPROVING LIVES

Narendran credits the Deshpande Center with opening doors for him and McBean. "We didn't have Ph.D.s or other credentials," he says. "Their support gave us credibility in academia, research, and business. Because of Deshpande, we became entrepreneurs. And because of their willingness to take a risk on something totally different, thousands of lives have been improved."