



GTXmedical

Introduction
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The Spinal Cord Injury Iceberg

Wheelchair

what people don't see



Heart rate	Pressure ulcers
Blood pressure (hypo)	Sleep
Transpiration	Infections
Thermoregulation	Antibiotics use
Bladder physiology	Bone density
Bowel physiology	Muscle mass
Sexual function	Spasticity
Cardiovascular cap.	Pain
Dependence on others	Hours daily routine
Limitations in jobs, activities with kids, weekend activities, travel, etc	

400'000 spinal cord injuries every year



Photo: Herb Ritts

Single patient lifetime healthcare cost is above 2 m\$

GTXmedical

- Lausanne and Eindhoven
- Spin-off of research group at EPFL
- Team started in 2016, now 40 employees
- Strong IP & licensing position
- Strong Investor support & solid financing (April 2016)
- Initial focus: paraplegic incomplete SCI patients



Lausanne, Switzerland



Eindhoven, The Netherlands

Current: Lifelong severe disability



Lesion

- Traffic accident
- Falls
- Bleeding



Care and rehab

- Training
- Learning to perform tasks
- Achieving best quality of life



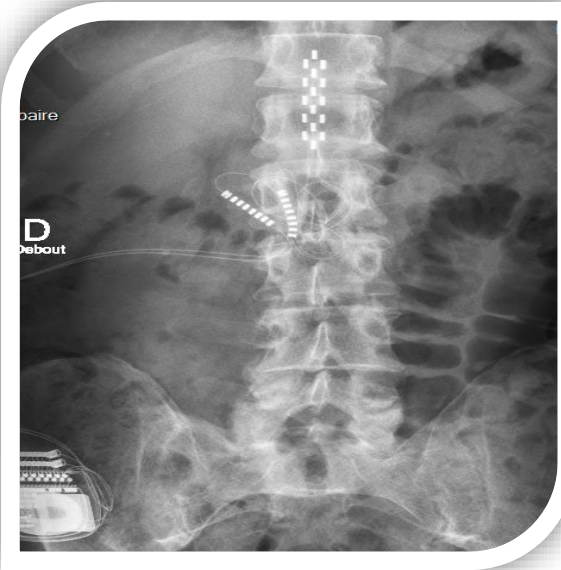
Live with the disability

GTXmedical neuroprosthetic therapy (under development)



Lesion

- Traffic accident
- Falls
- Bleeding



Spinal Cord Surgery

- Place epidural lead + pulse generator
- Test muscle responses



Intensive rehab training

- Initial mapping phase
- 5mo, 5x/wk, 2h/d BWS training to promote neuroplasticity

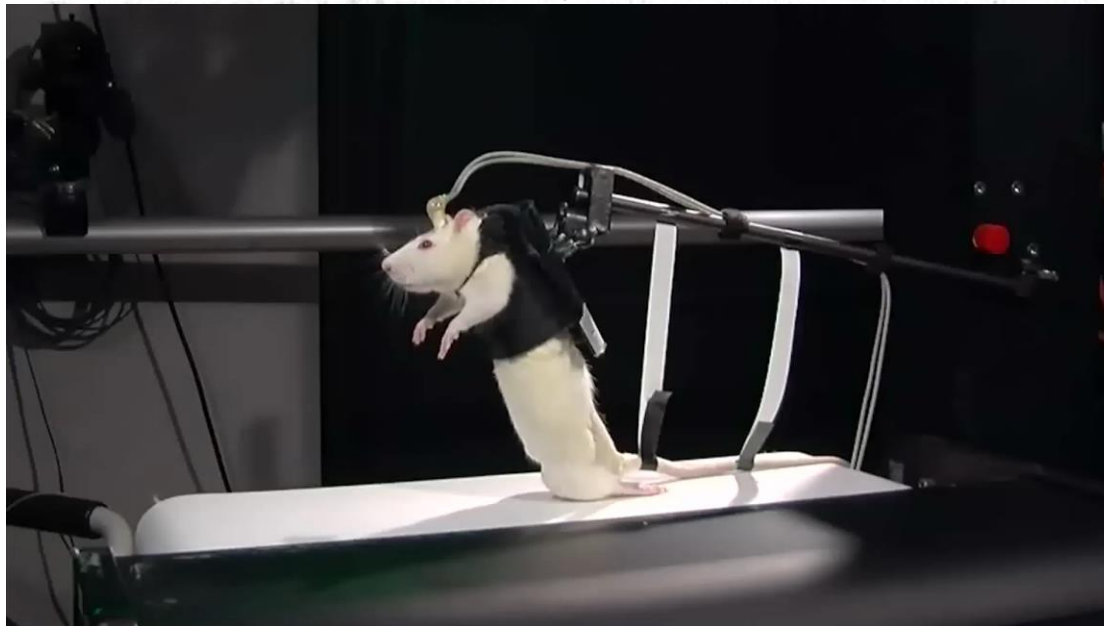


Restored function

- Unsupervised use at home

Based upon solid scientific understanding

The New York Times



In a study, a group of rats lost the use of their hind legs but learned to walk again after an intensive training course.

In Rat Experiment, New Hope for Spine Injuries

By BENEDICT CAREY

Rats with a spinal cord injury that left their hind legs completely paralyzed learned to walk again on their own after an intensive training course that includ-

a quarter to a third — of people whose injuries are severe enough to confine them to a wheelchair.

"This is a very exciting study, and my first thought is that it is a proof of princi-

two to three weeks of 30-minute daily sessions, the rats began to take their first voluntary steps. After six weeks, all of the rats could walk on their own, and some could run and climb stairs.



Breakthroughs Prof Courtine, EPFL

Nature 2018, 2016

Science 2015, 2012

Neuron 2016, 2015

Science Trans Med 2017, 2015, 2014

Nature Medicine 2016, 2012, 2008, 2007

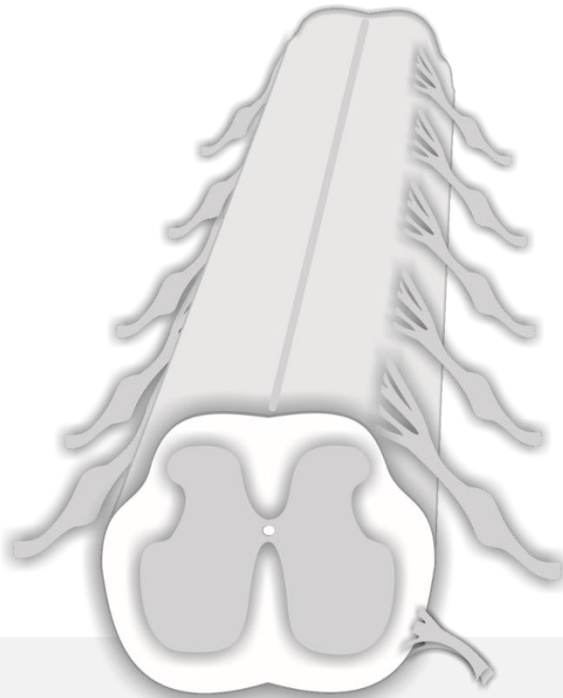
Nature Neuroscience 2018, 2010, 2009

Cell 2014

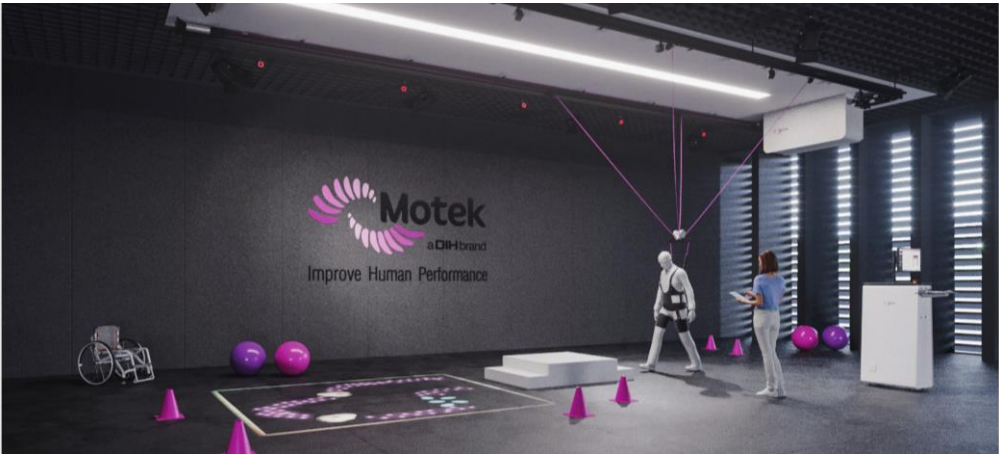
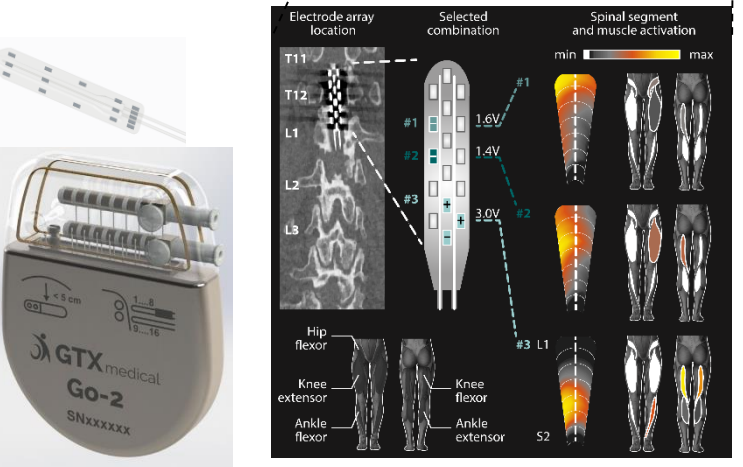
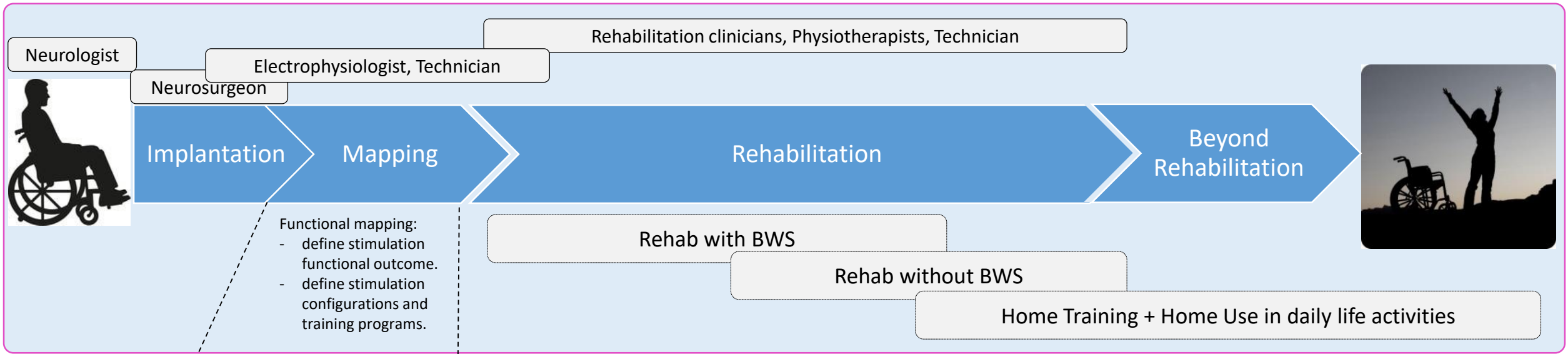
The Lancet 2011



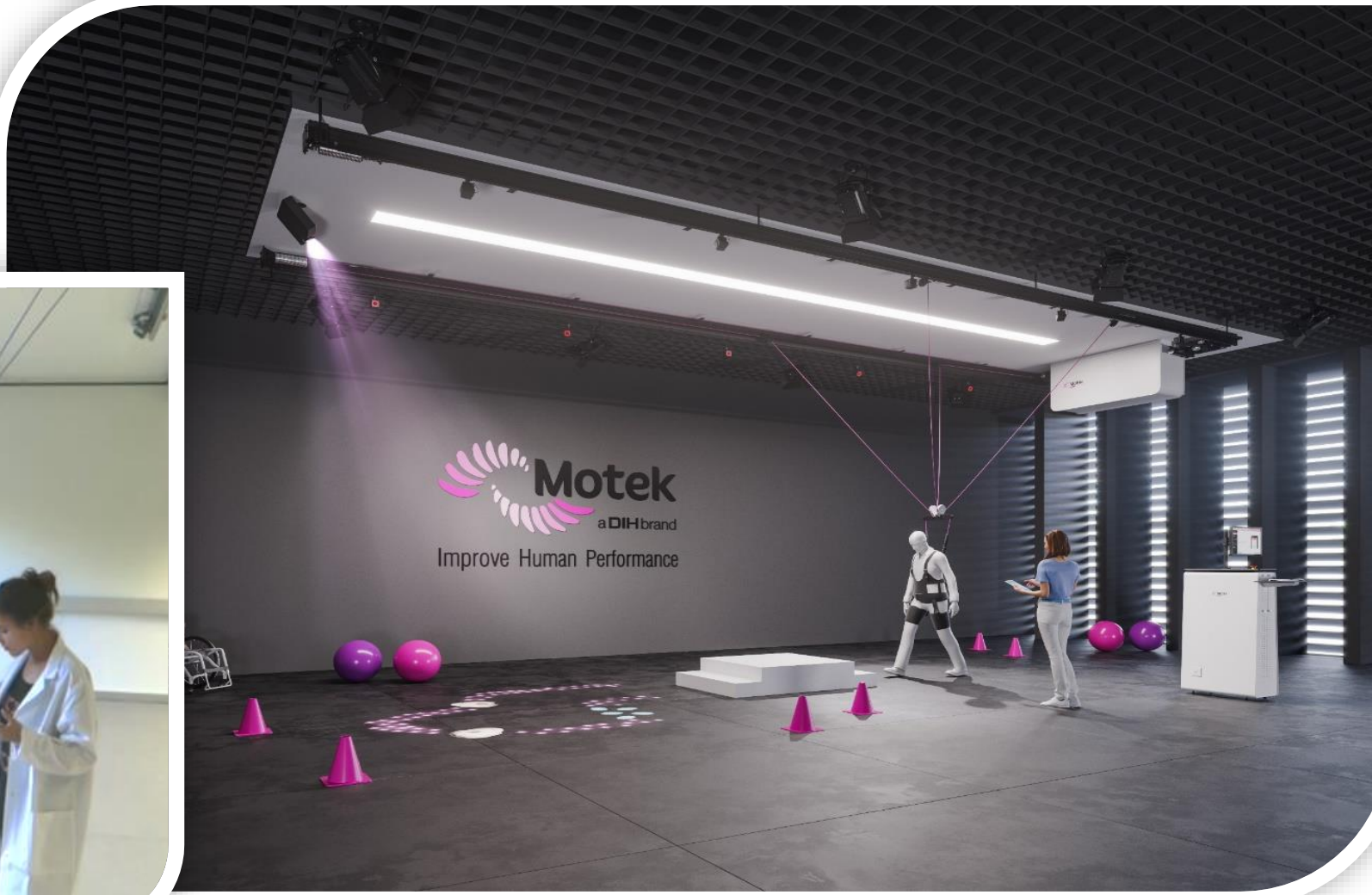
THE SPINAL CORD IS **PART OF THE BRAIN** NOT ITS SERVANT



Developing a new therapy

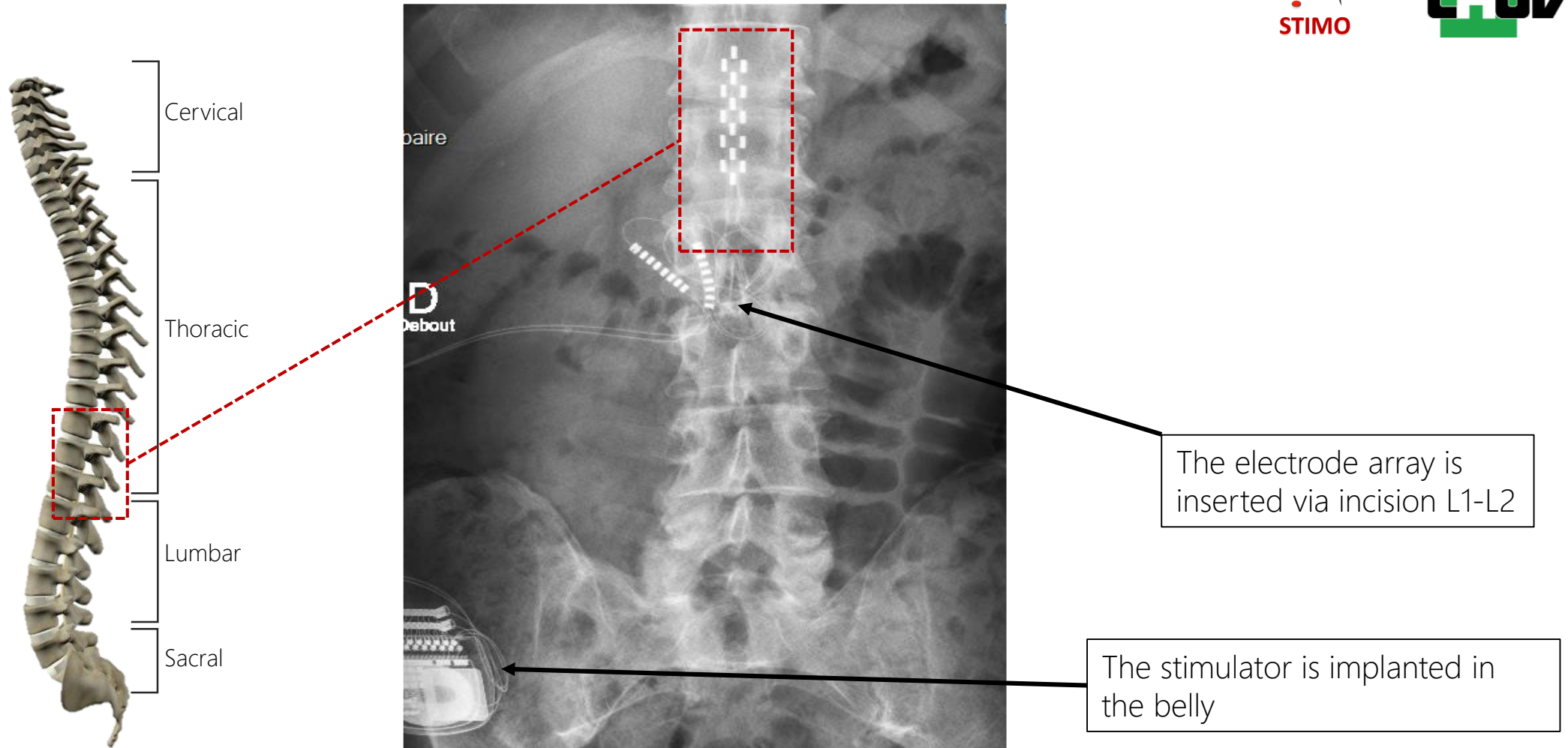


Intensive body weight supported training activates neuroplasticity



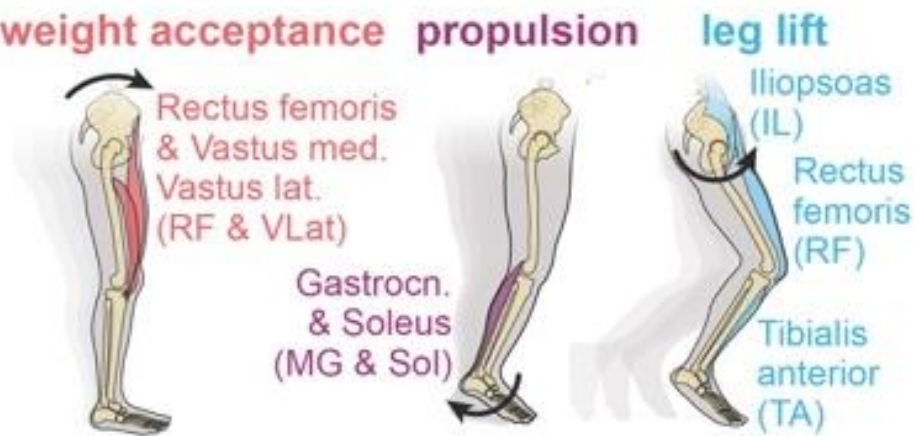
Rysen 3D
overground Body
Weight Support
system
for flexible rehab
training.
Partnering with
MOTEK
(Amsterdam)

Implantation surgery of lead and INS

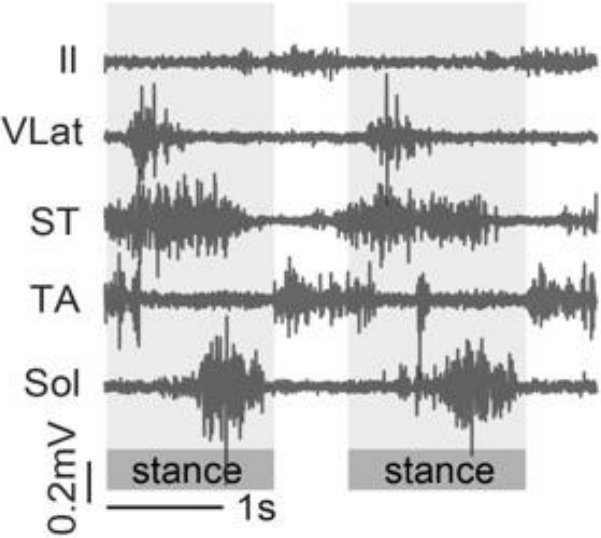


Stimulating at the right time & place (Courtine, Nature 2018)

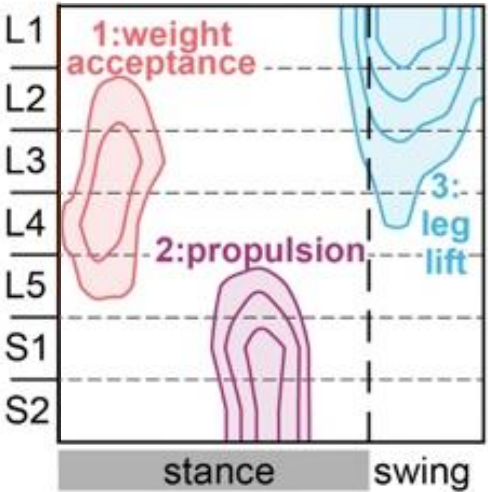
Muscle activity during gait cycle in healthy persons



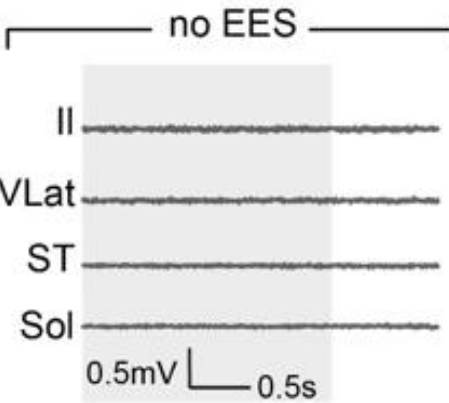
Corresponding electrical recordings



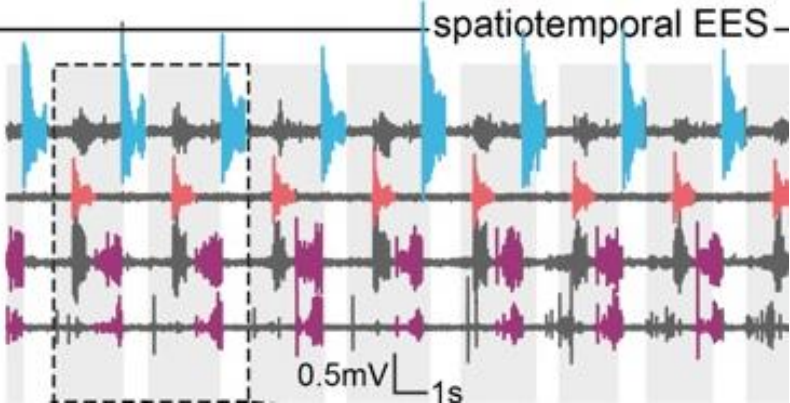
Neuromotor hotspots



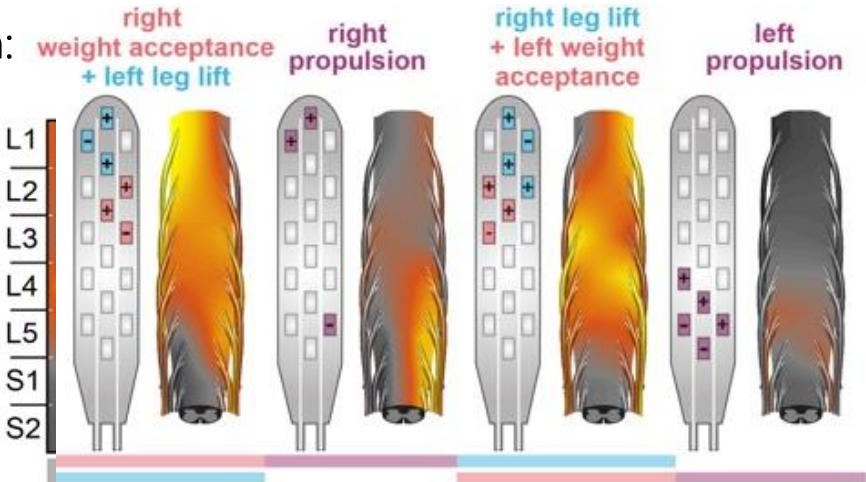
Muscle activity in SCI patient



Muscle activity using stimulation

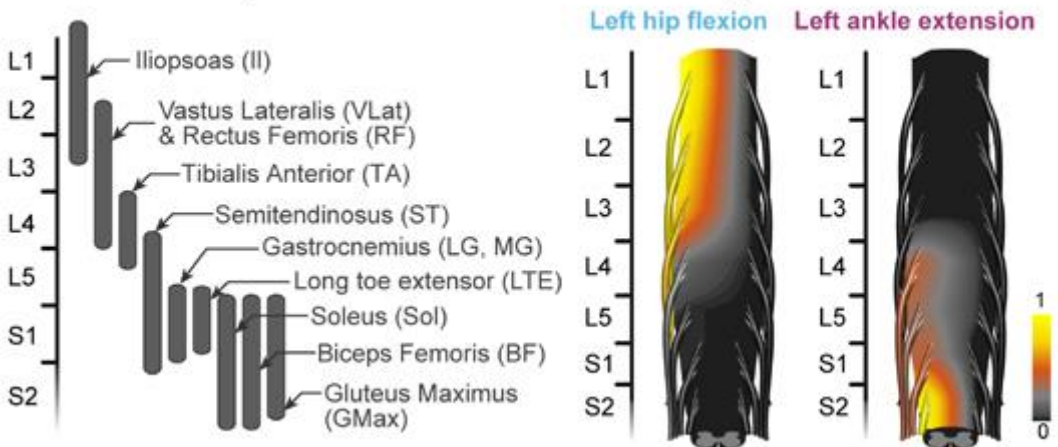


Stimulation:

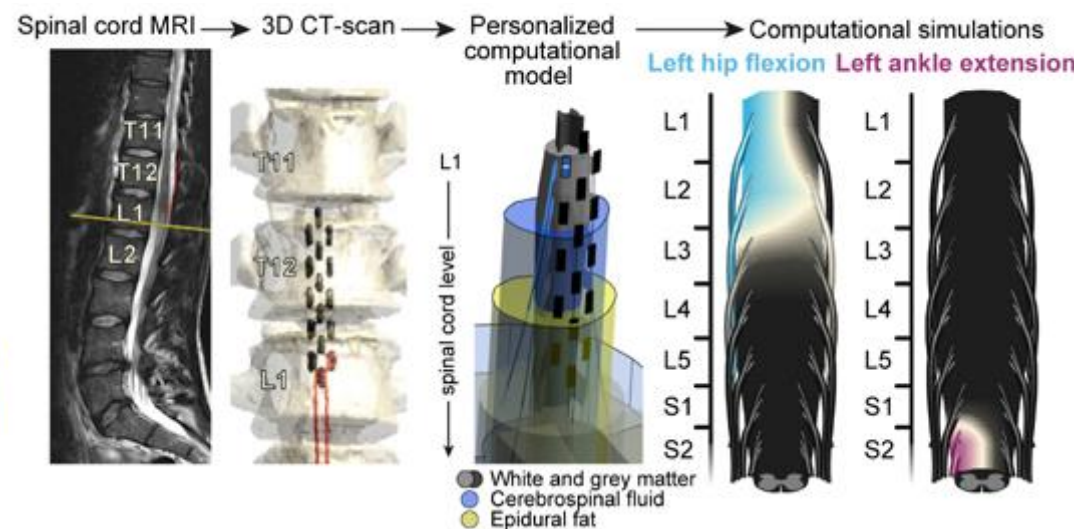


Simulations predict muscle mappings (Courtime, Nature 2018)

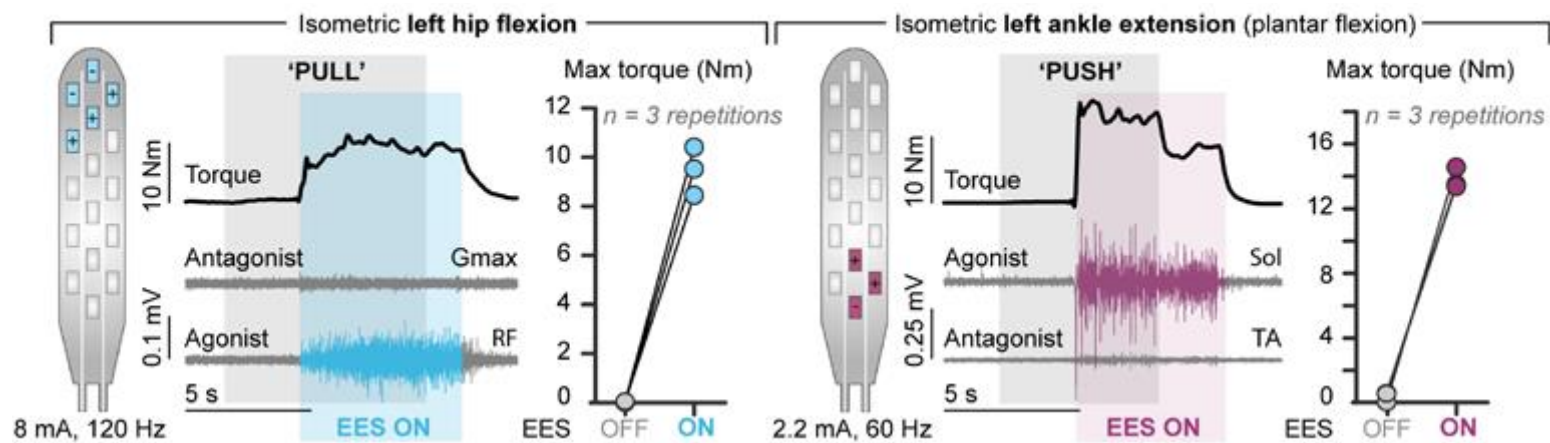
Muscle mappings and stimulation patterns in healthy persons



Individualised simulations predict similar stimulation patterns



Targeted stimulation can separate between left hip flexion and left ankle extension





Thank you