enhancing autonomy of disabled people

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Nutzen Sie Ihre Behinderung, um innovative Lösungen zu entwickeln!

Sebastian Tobler
Lecturer for Vehicle Construction at Bern University of Applied Sciences & CEO of GBY SA

BFH-researchXchange, 26.11.2021

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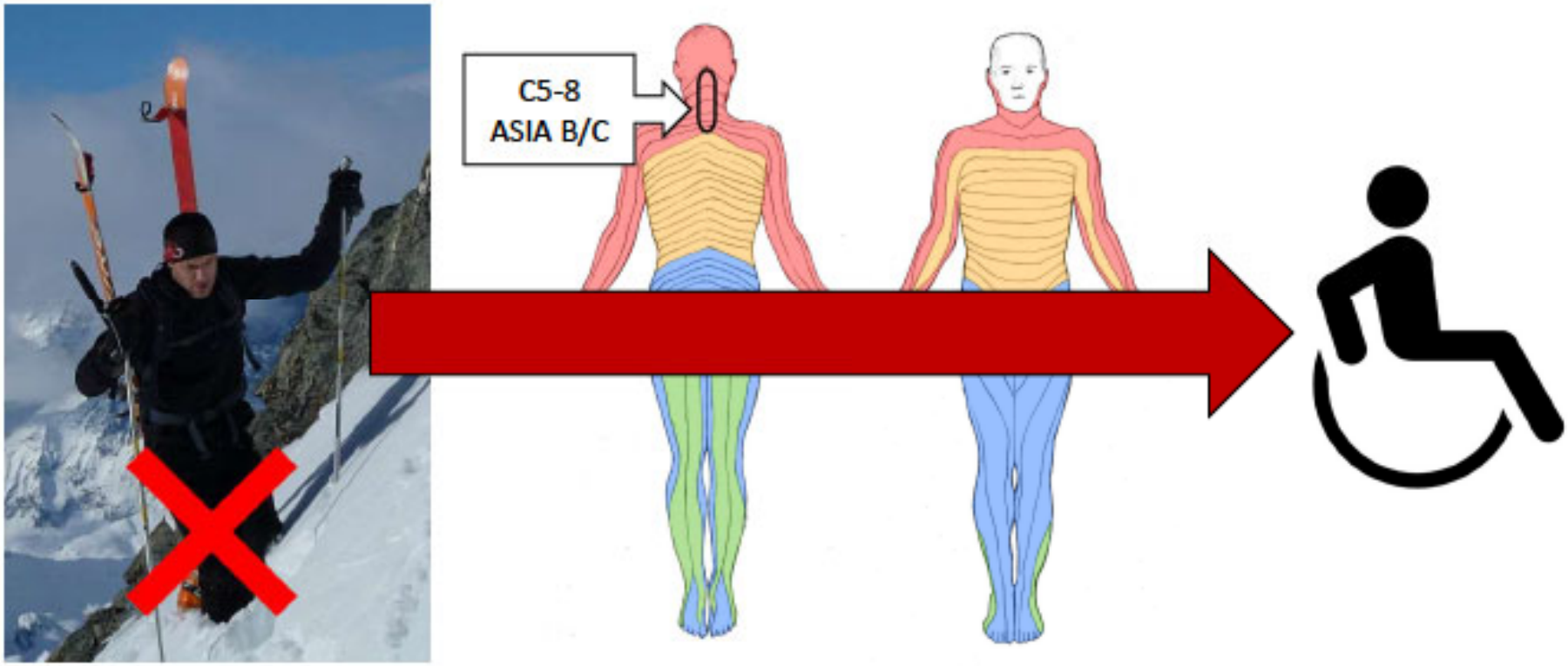
of Applied Sciences

Spinal cord injury: implications…



Sport vs Health

motomed

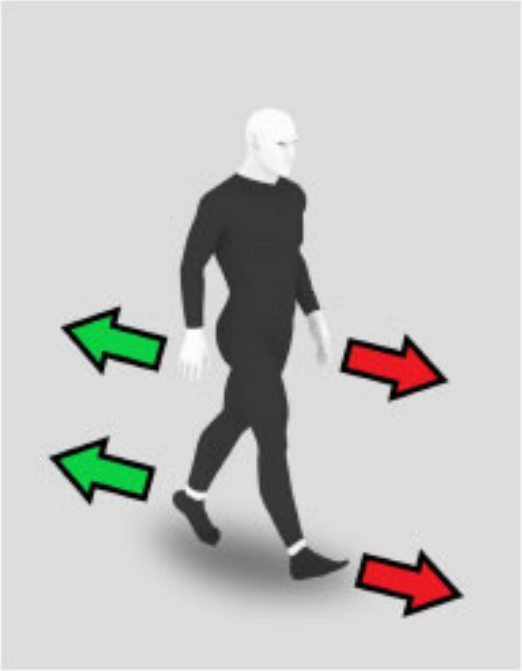
Nustep

MD Giger

«Biomechanics»

«Biomechanics»

Genesis of the Go-Tryke



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Genesis of the Go-Tryke

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Publications

J Neurophysiol 99: 2946–2955, 2008.
First published April 30, 2008; doi:10.1152/jn.00020.2008.

Shaping Appropriate Locomotive Motor Output Through Interlimb Neural Pathway Within Spinal Cord in Humans

Noritaka Kawashima,[1,2,3] Daichi Nozaki,[1,4] Masaki O. Abe,[1,5] and Kimitaka Nakazawa[1]
[1]*Department of Rehabilitation for the Movement Functions, Research Institute of the National Rehabilitation Center for Persons with Disabilities, Tokorozawa;* [3]*Japanese Society for the Promotion of Science;* [4]*Department of Physical and Health Education, Graduate School of Education, University of Tokyo, Tokyo, Japan;* [2]*Lyndhurst Centre, Toronto Rehabilitation Institute, Toronto, Ontario, Canada; and* [5]*Department of Kinesiology, Pennsylvania State University, University Park, Pennsylvania*

Submitted 8 January 2008; accepted in final form 16 April 2008

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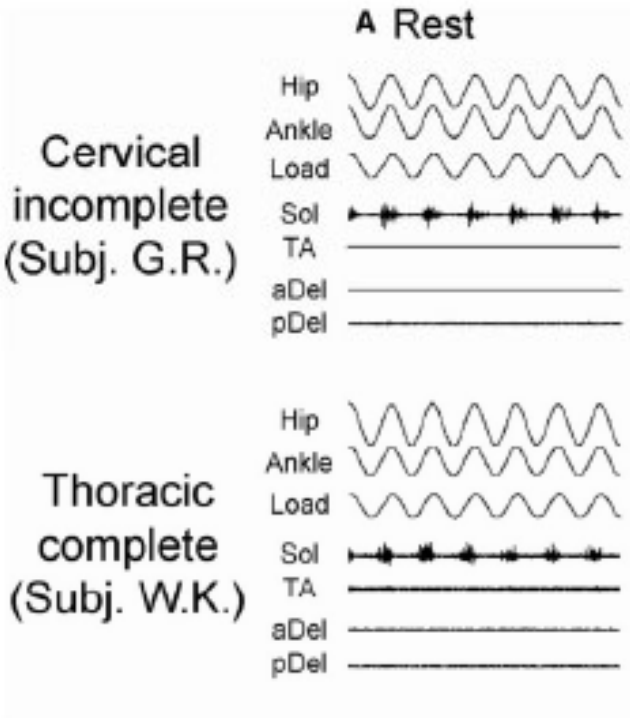
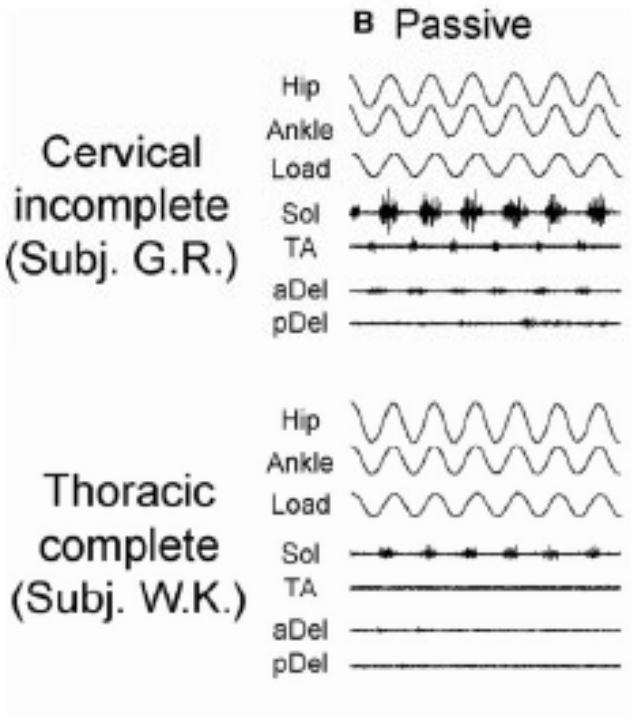
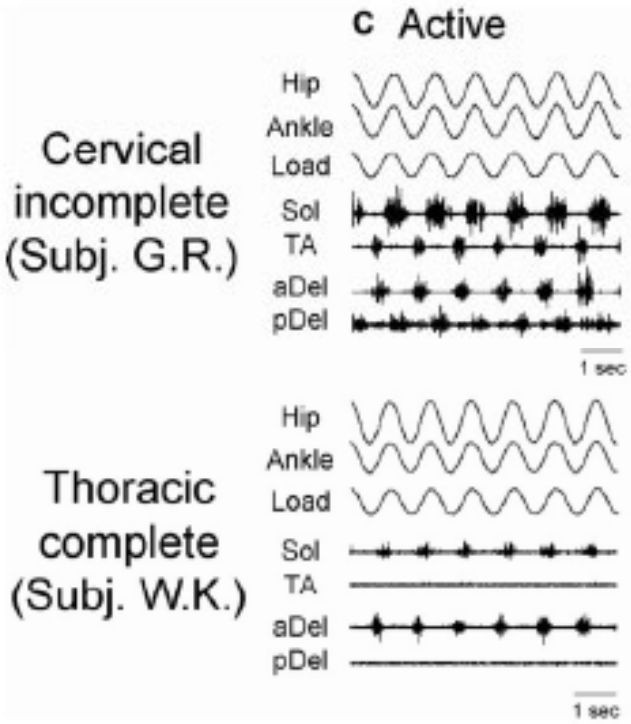
Publications



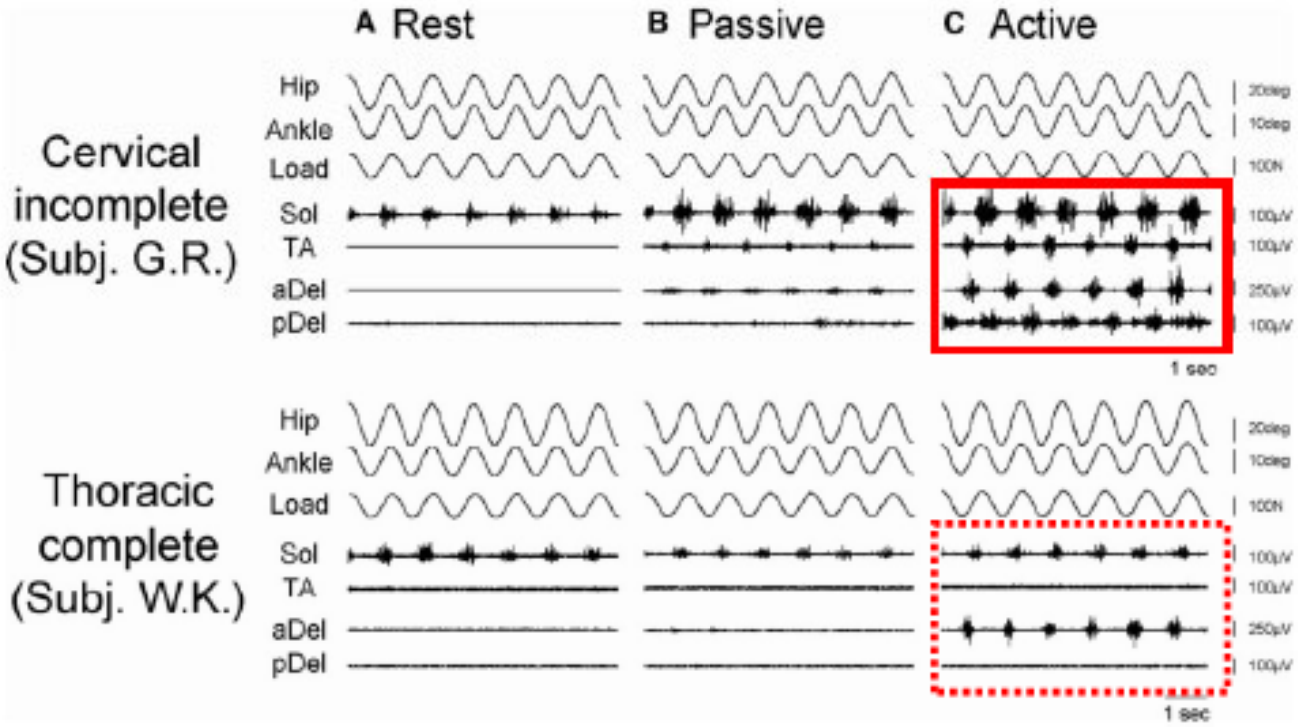
Publications



Publications



Publications



GBY Test

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Publications

J Neurophysiol 119: 2194–2211, 2018.
First published January 24, 2018; doi:10.1152/jn.00569.2017.

RESEARCH ARTICLE | *Neural Circuits*

Non-gait-specific intervention for the rehabilitation of walking after SCI: role of the arms

Rui Zhou,[1,3] Laura Alvarado,[1,3] Robert Ogilvie,[2,3] Su Ling Chong,[2,3] Oriana Shaw,[2,3] and Vivian K. Mushahwar[1,2,3]

[1]*Neuroscience & Mental Health Institute, Faculty of Medicine & Dentistry, University of Alberta, Edmonton, Alberta, Canada;* [2]*Division of Physical Medicine & Rehabilitation, Department of Medicine, Faculty of Medicine & Dentistry, University of Alberta, Edmonton, Alberta, Canada; and* [3]*Sensory Motor Adaptive Rehabilitation Technology (SMART) Network, University of Alberta, Edmonton, Alberta, Canada*

Submitted 31 July 2017; accepted in final form 23 January 2018

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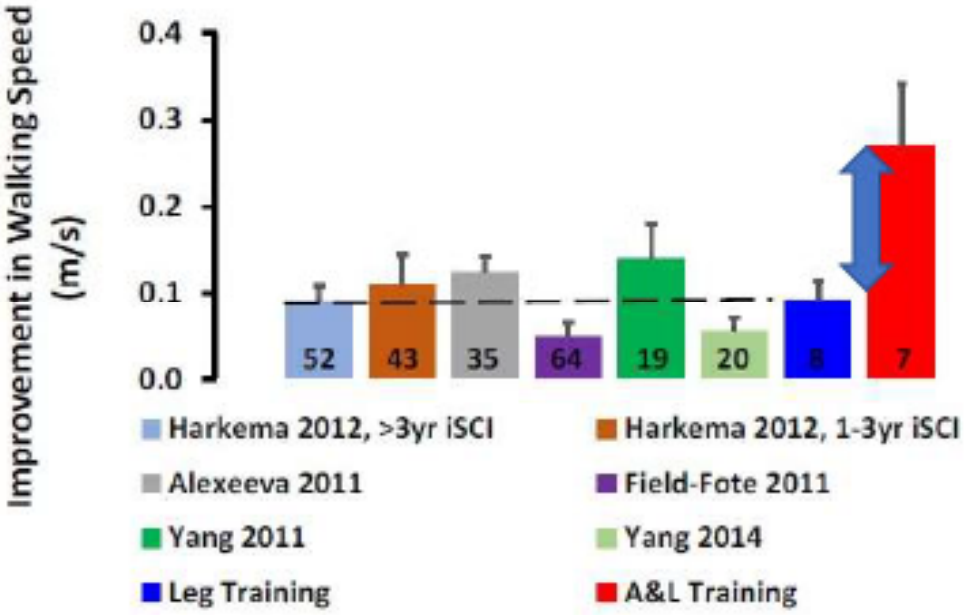
Publications



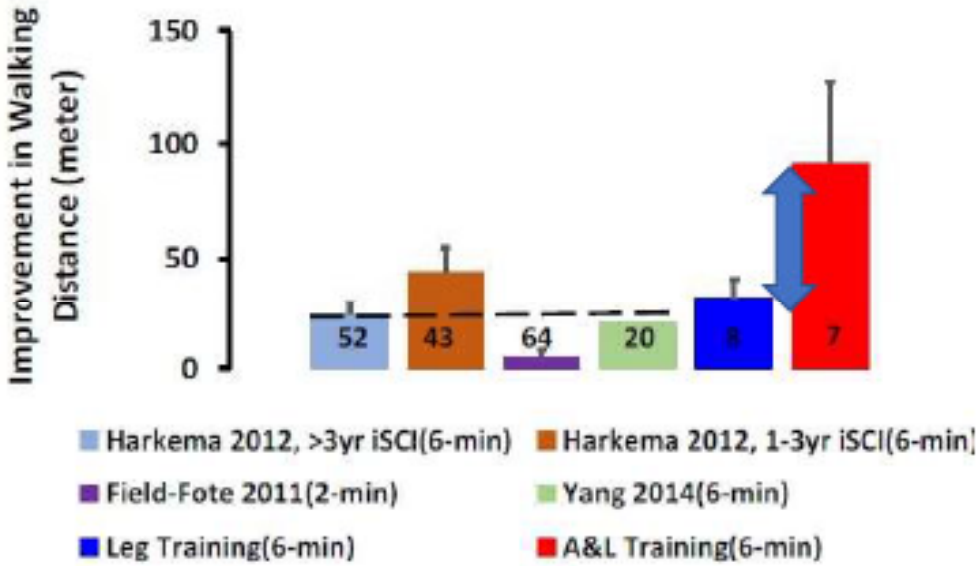
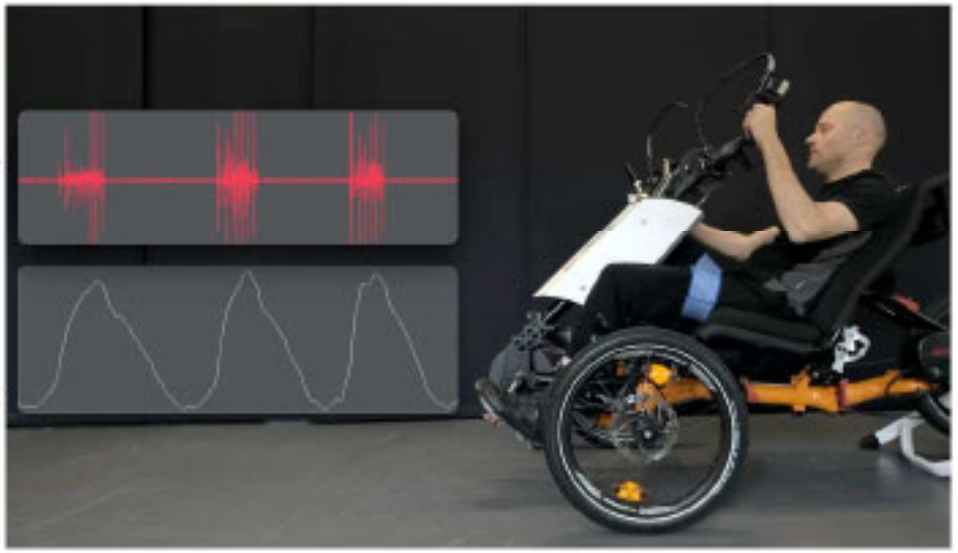


Figure 2.11. Comparisons of the improvement in walking.

No muscle activity?

FES: Functional Electrical Stimulation

EES: Epidural Electrical Stimulation



PATENTED

Master of Science Thesis

INTEGRATION OF WIRELESS FUNCTIONAL ELECTRICAL STIMULATION IN A RECUMBENT THERAPY TRIKE

Bern University of Applied Sciences

by

Thomas Falk

of Lyss, Bern

Supervisor
Prof. Dr. Kenneth James Hunt

Institution
Institute for Rehabilitation and Performance Technology
Department of Engineering and Information Technology
Bern University of Applied Sciences

Examiners
Prof. Dr. Kenneth James Hunt and MSc Manuel Bracher

Burgdorf, May 2016

Figure 28: Wireless FES cycling sensor setup. Emergency stop, throttle, torque sensor, encoder and inductive proximity sensor mounted on the trike

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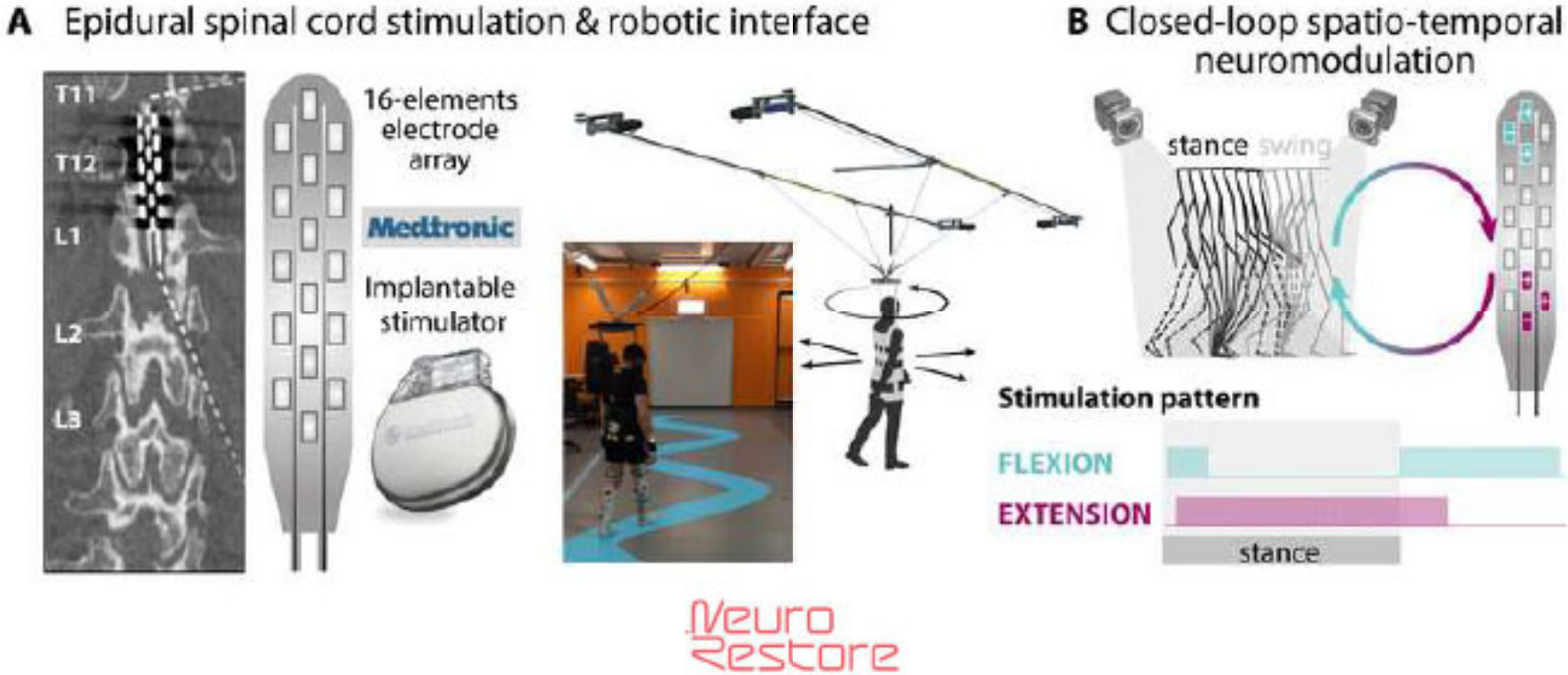
Stimo


A Epidural spinal cord stimulation & robotic interface
T11
T12
L1
L2
L3
16-elements electrode array
Medtronic
Implantable stimulator
B Closed-loop spatio-temporal neuromodulation
stance
swing
Stimulation pattern
FLEXION
EXTENSION
stance
NeuroRestore

Master Project in Life Sciences Engineering

Assisted Cycling with Force-Driven Closed-Loop Epidural Electrical Stimulation in Clinical and Ecological Settings for Rehabilitation after Spinal Cord Injury

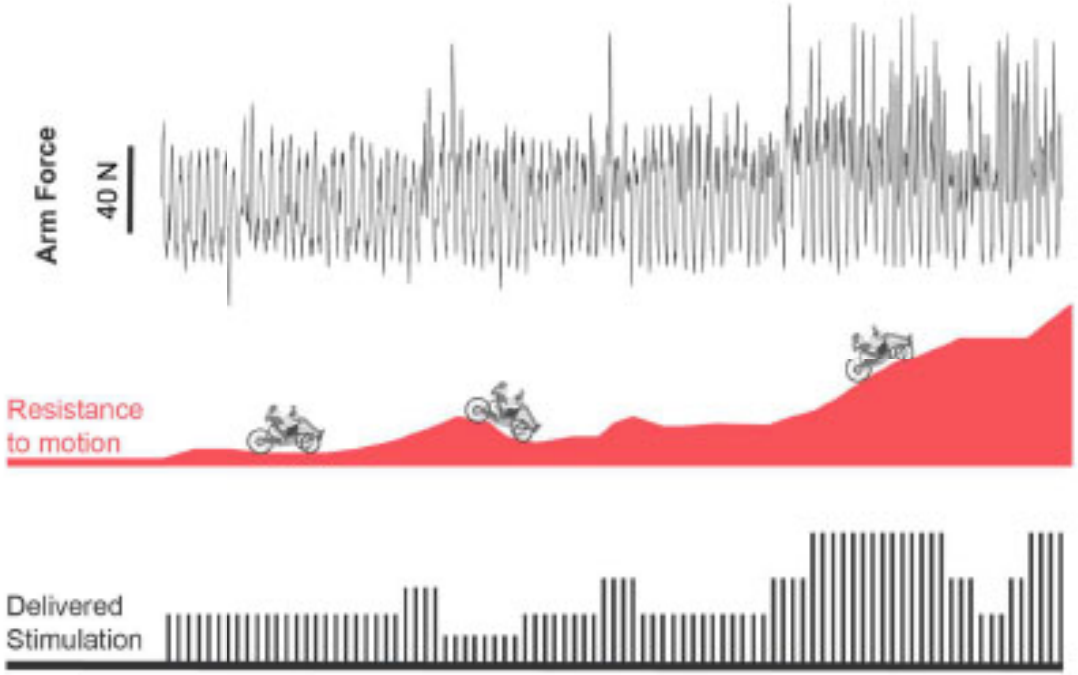
Margaux Roulet

Presented on August 31, 2021

Under the supervision of
Dr. Léonie Asboth, Sebastian Tobler and Nicolas Hankov

Under the direction of
Prof. Grégoire Courtine and Prof. Jocelyne Bloch

iEES GO-TRYKE FORCE
Working Principle



DUFFELL ET AL. ¦ FRONTIERS IN NEUROLOGY ¦ 2020
FERRIS ET AL. ¦ EXERCISE AND SPORT SCIENCES REVIEWS ¦ 2005
COURTINE & BLOCH ¦ NEURON ¦ 2015

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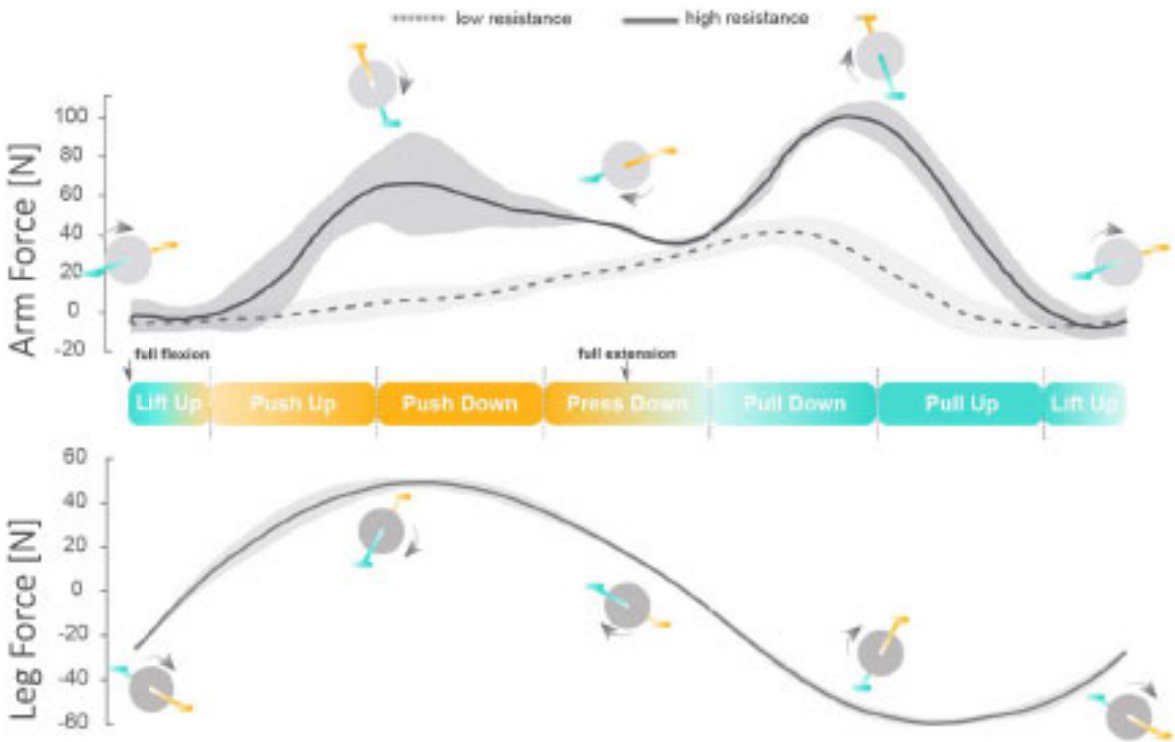
ARMS AND LEGS FORCE vs CRANK CYCLE PHASES

Without EES



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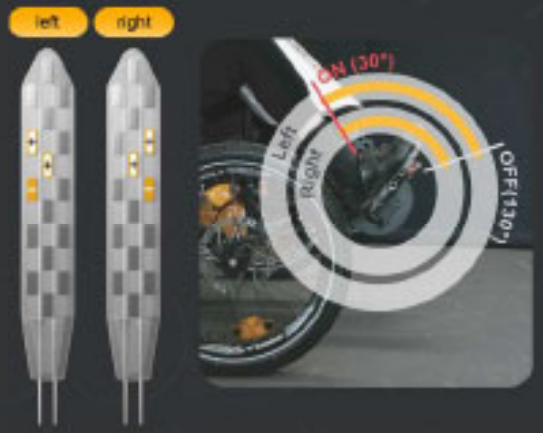
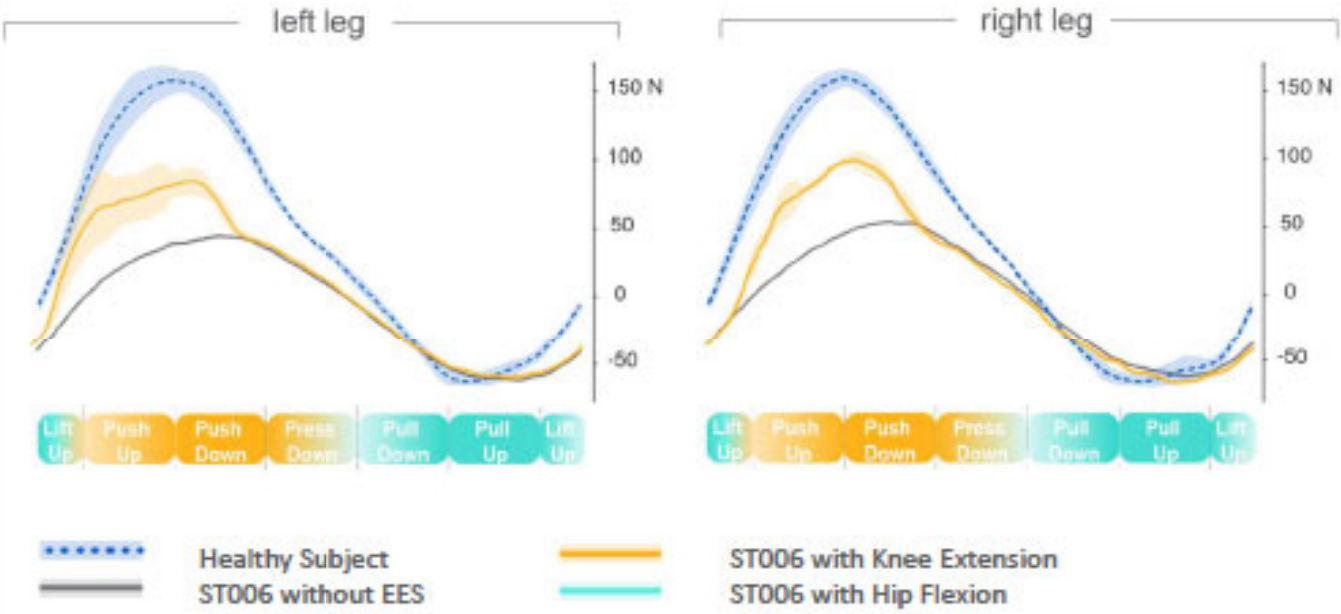
CYCLING WITH AND WITHOUT EES

Effects of EES on Legs Tangential Force

Target knee extension during push phase





EES of knee extension generates effective legs force to the cycling task

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ECOLOGICAL SETTINGS
TRYKE

To summarise:

- ✓ Exploring your disability
- ✓ Understanding your disability
- ✓ Making the most of your disability
- ✓ Working with specialists
- ✓ Connecting specialists
- ✓ Launching studies
- ✓ Developing solutions

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Teamwork !

NeuroRestore

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Swiss Paraplegic Research

SCI-Mobility

www.bfh.ch/de/forschung/forschungsbereiche/labor-sci-mobility/

Inauguration
24.03.2022

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Thank you !!!

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Head of the SCI-Mobility Lab at BFH-TI, 2501 Bienne

CEO at GBY SA, 1696 Vuisternens-en-Ogoz

Generator of projects and studies with
BFH-TI Bienne, BFH-TI Burgdorf, UNIL, Neurorestore (EPFL/CHUV), SPF

Patient for studies
Neurorestore (EPFL/CHUV), UNIL, SPF

Interested in working on a project with us?

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