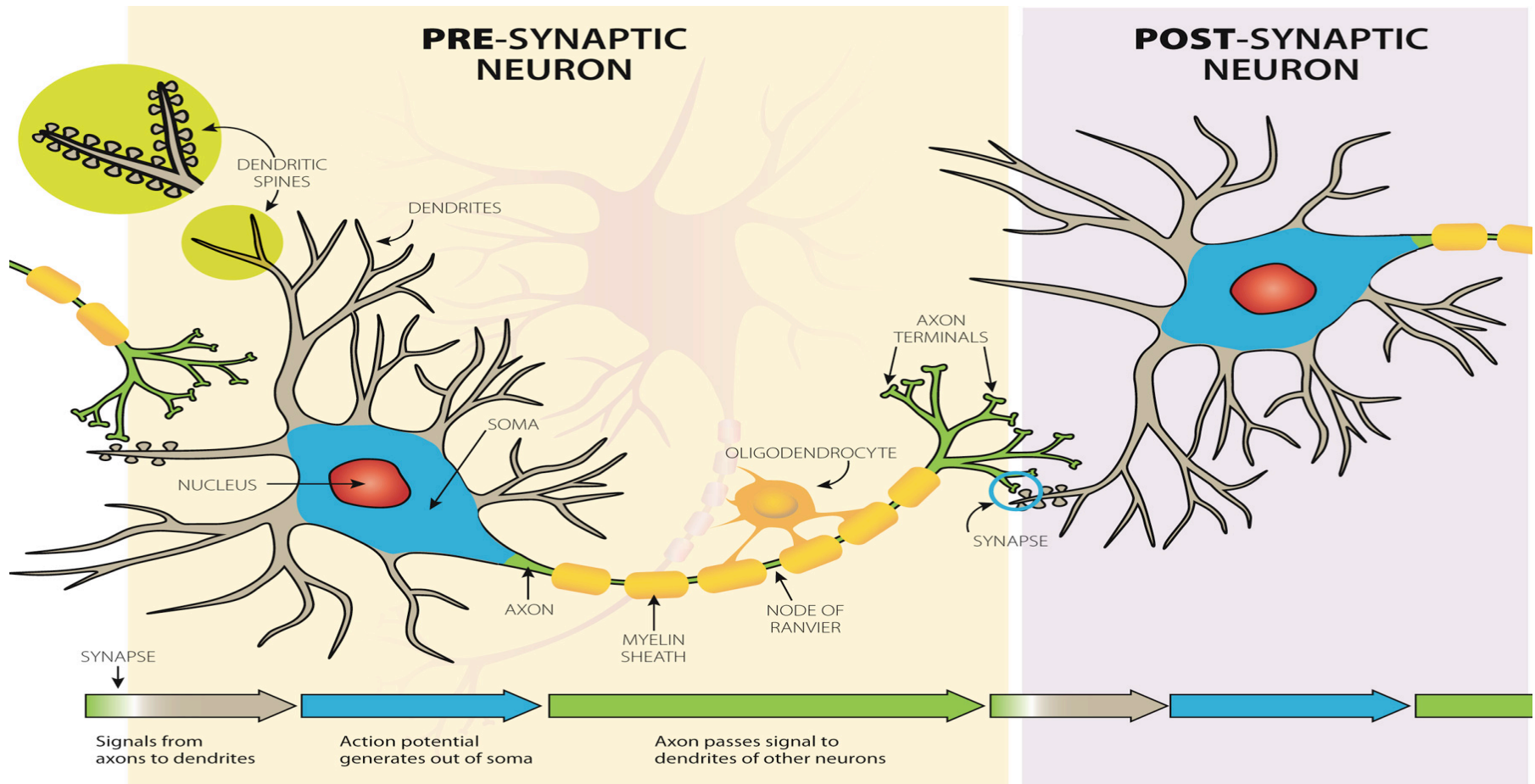


Non-invasive Spinal stimulation to improve sensory-motor rehabilitation

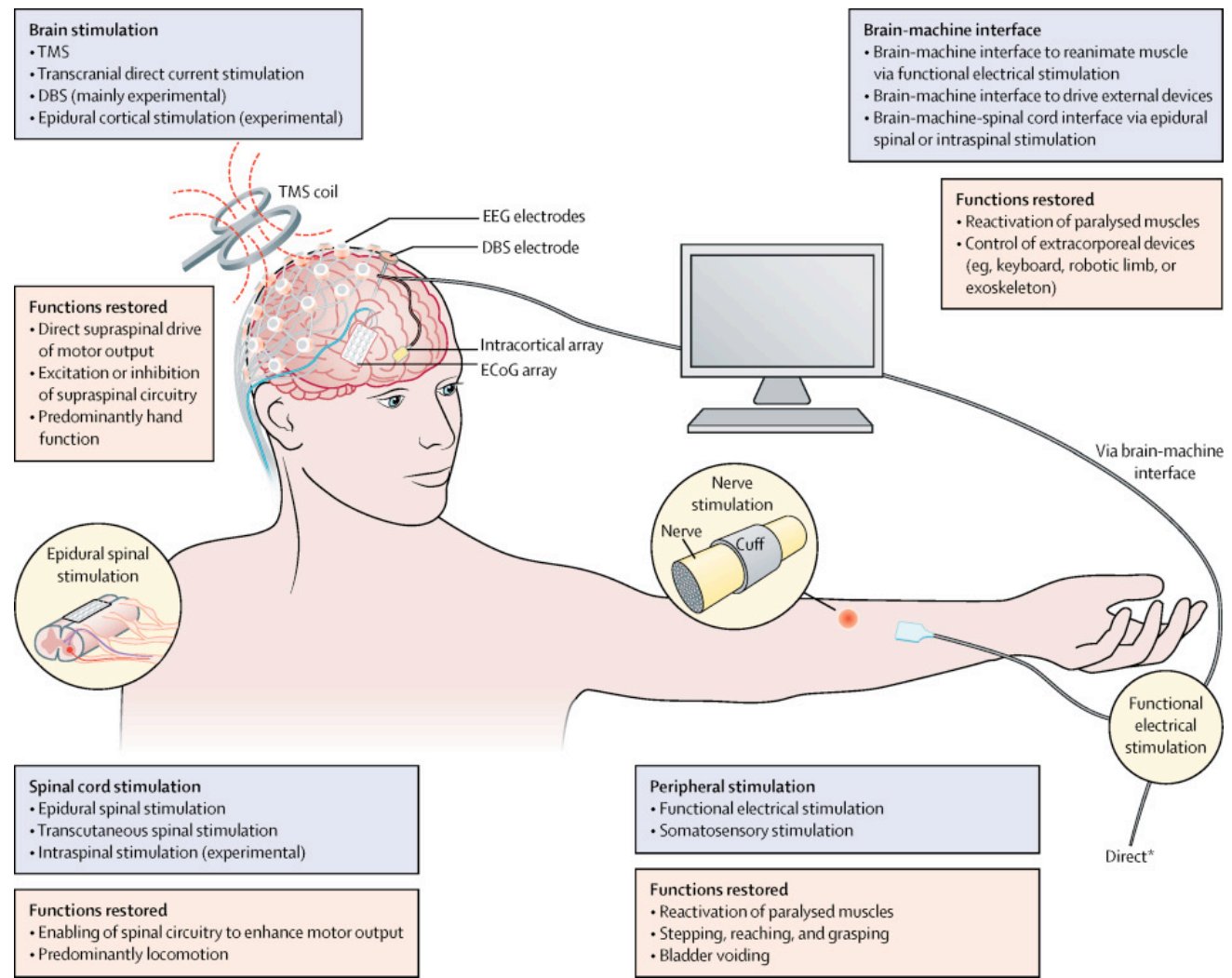
Hatice KUMRU,MD, PhD

Neurology and Neurophysiology

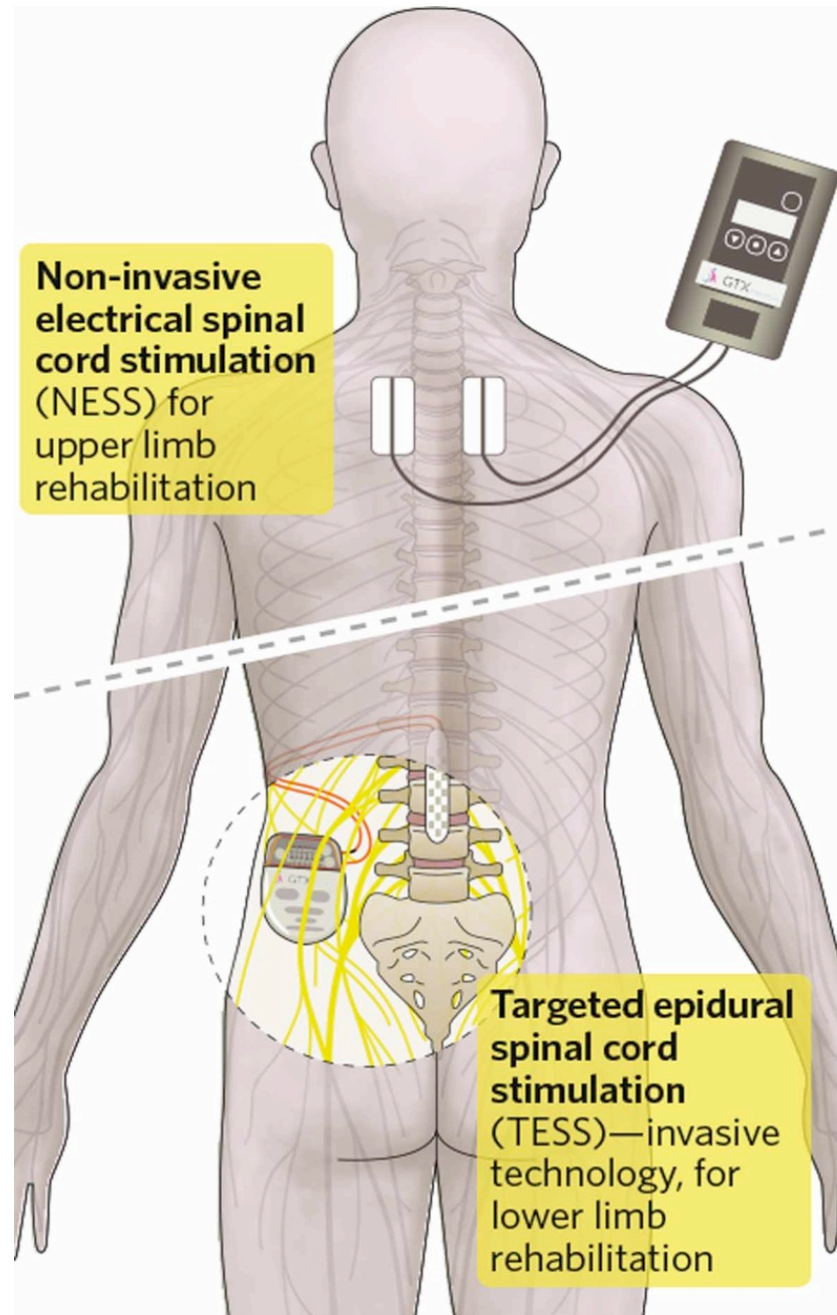
Neural plasticity is the ability of the nervous system to change its activity in response to intrinsic or extrinsic stimuli by reorganizing its structure, functions, or connections.



Synaptic plasticity is involved in learning and memory, brain development and, sensorial training, and recovery from brain or spinal cord lesions.



INVASIVE AND NON-INVASIVE SPINAL CORD STIMULATION



EPIDURAL SPINAL CORD STIMULATION



Epidual Spinal Stimulation in complete spinal cord injury



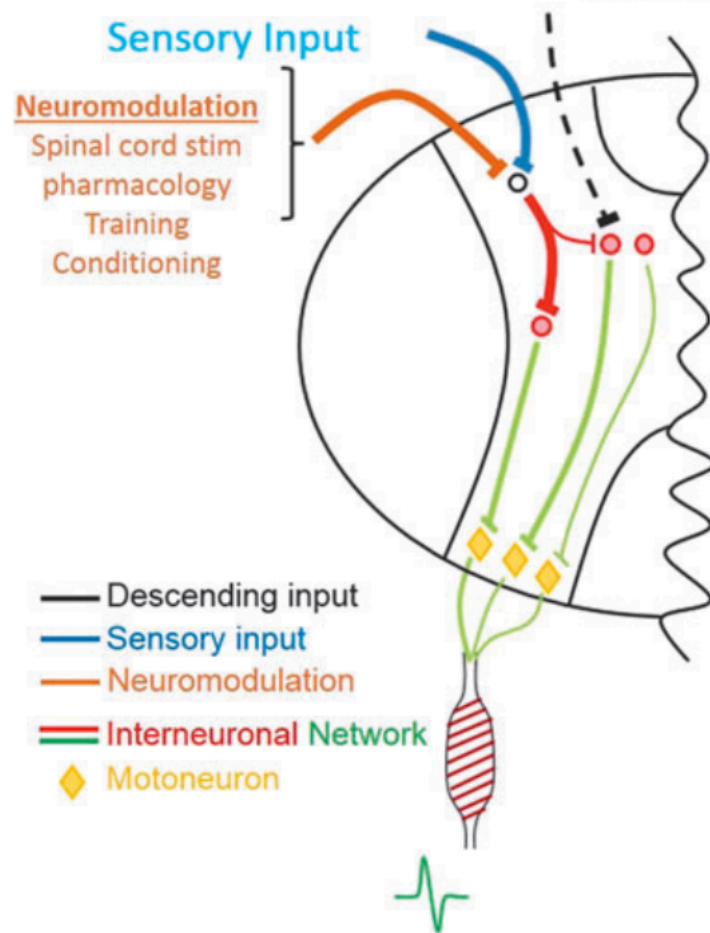
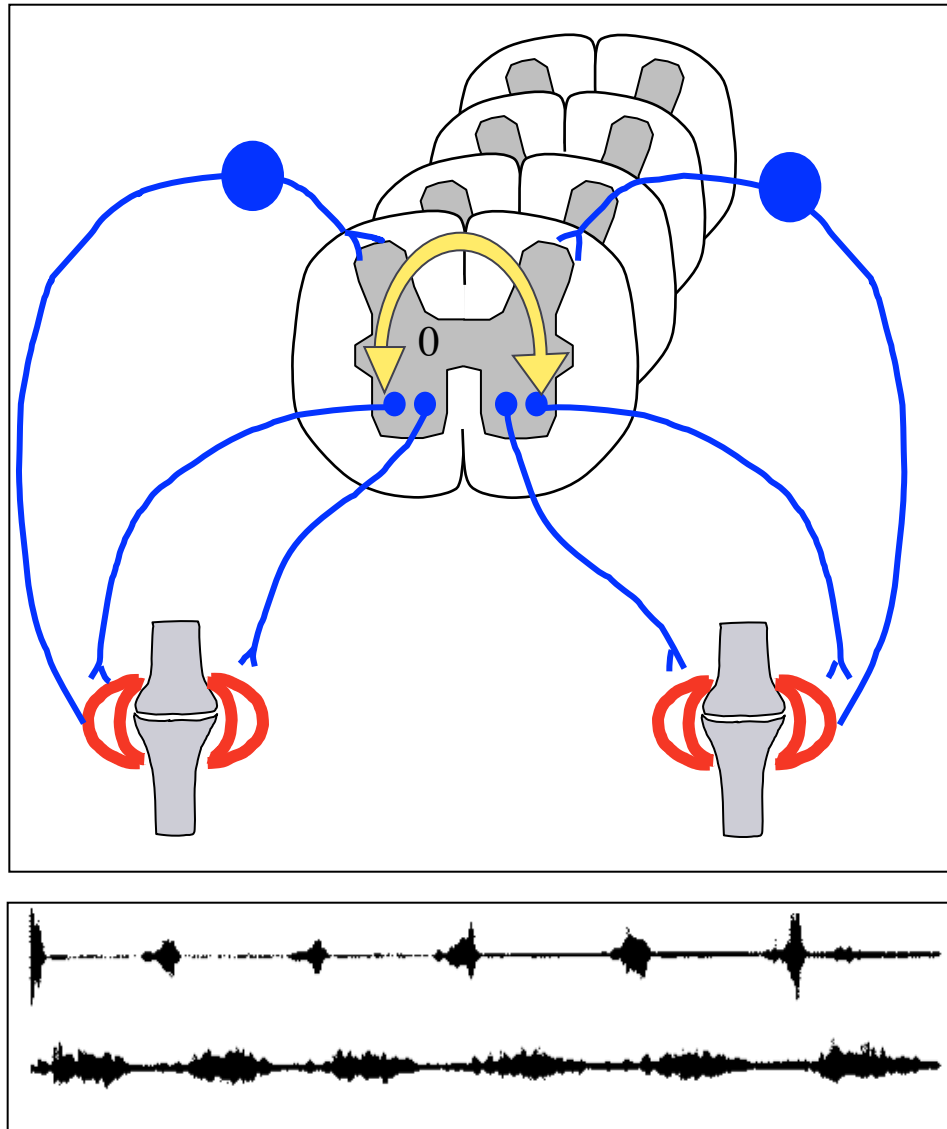


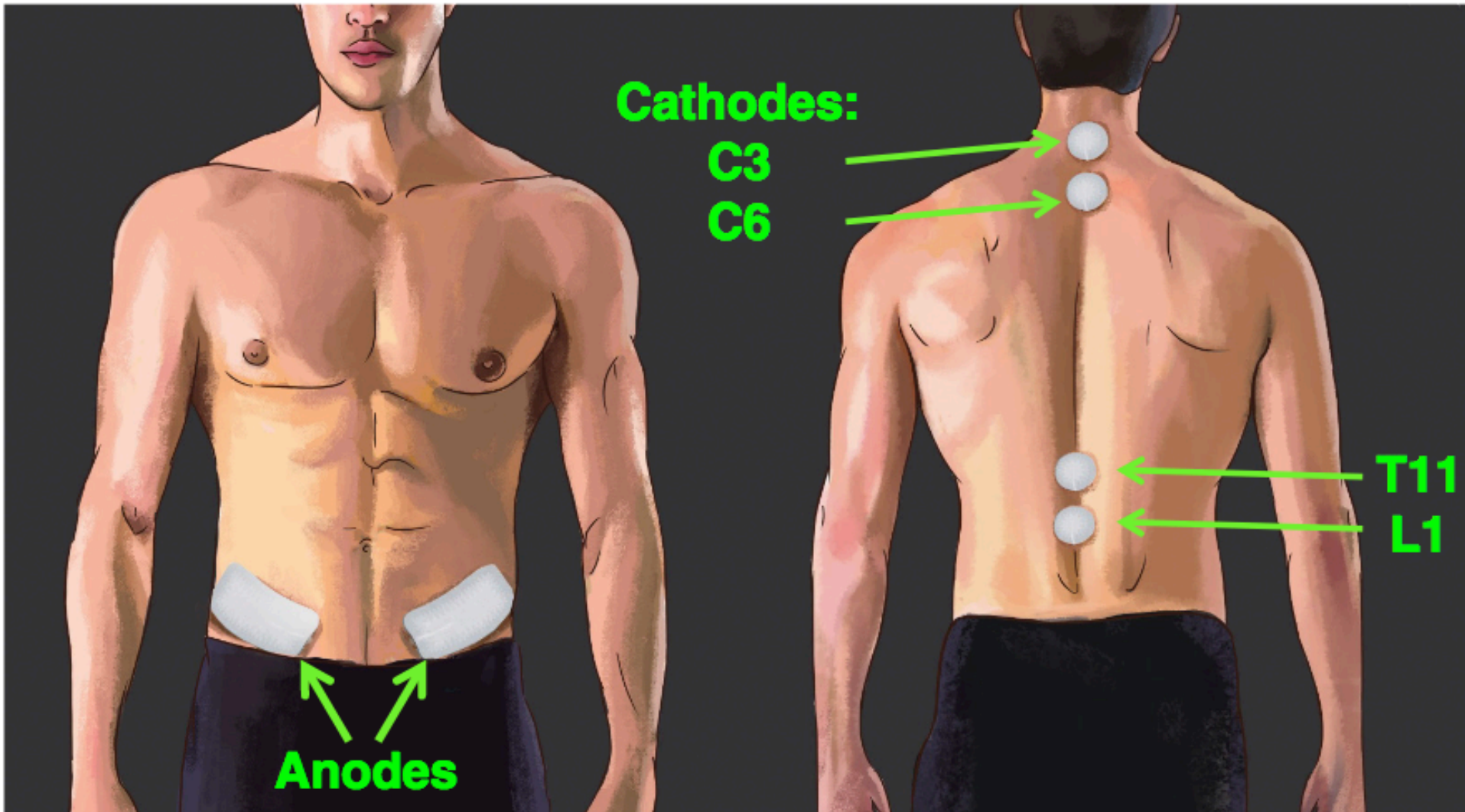
Diagrama del mecanismo hipotético de la neuromodulación

Gerasimenko YP, Lu DC, Modaber M, et al.
Noninvasive Reactivation of Motor Descending Control after Paralysis. J Neurotrauma. 2015.

The central pattern generator of locomotion



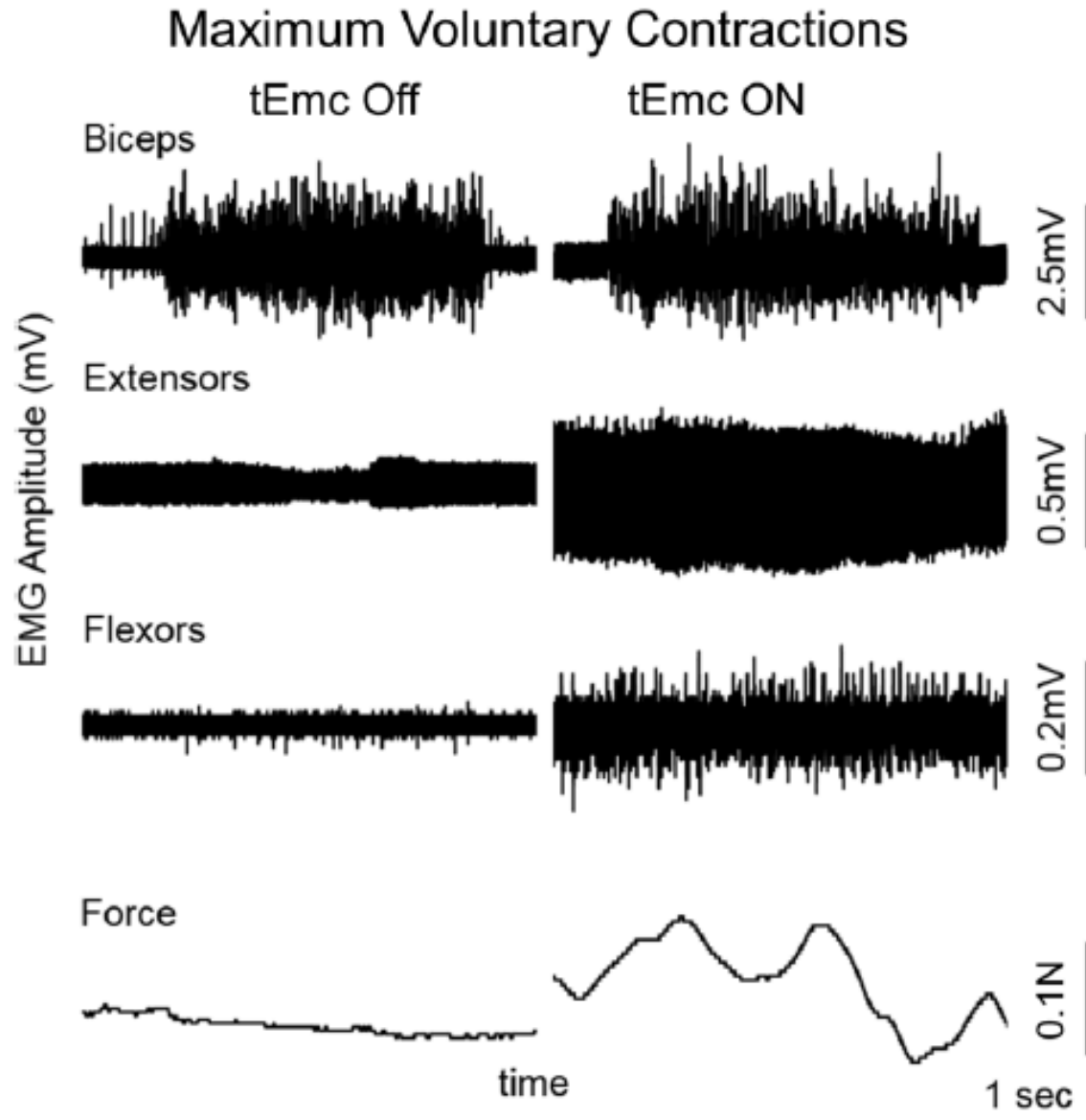
Non-invasive spinal cord stimulation=trancutaneous SCS



Transcutaneous Spinal Cord Stimulation at cervical level



Noninvasive activation of cervical spinal networks after severe paralysis



EXPERIENCE IN OUR LAB



TRANSCUTANEOUS
CERVICAL
SPINAL CORD
STIMULATION

IN THE HEALTHY SUBJECTS

tcSCS
only

Training
only

tcSCS +
training



How do they work together?





TRANSCUTANEOUS
CERVICAL
SPINAL CORD
STIMULATION

IN THE HEALTHY SUBJECTS

tcSCS
only

WHICH TECHNIC IS BETER FOR HAND
FUNCTION?

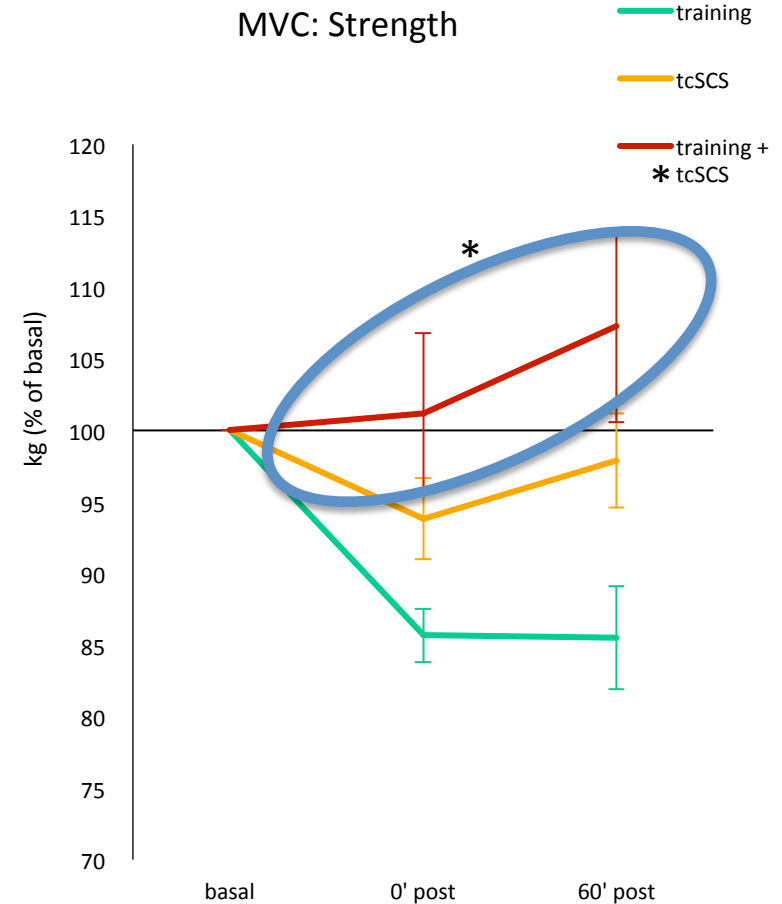
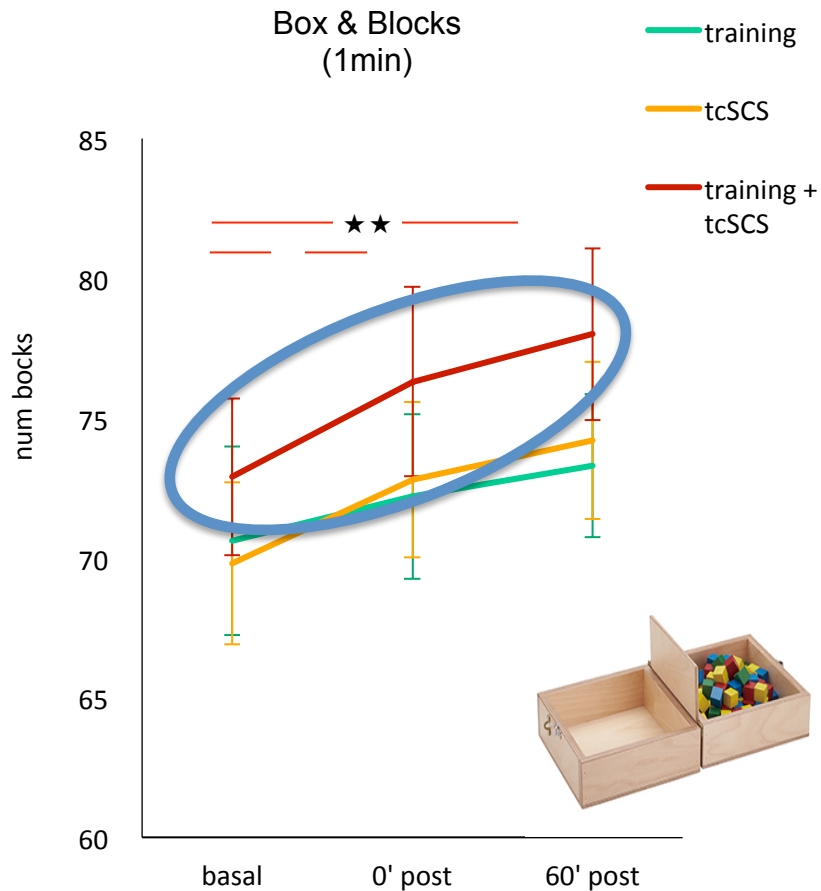
tcSCS +
training

they work together?



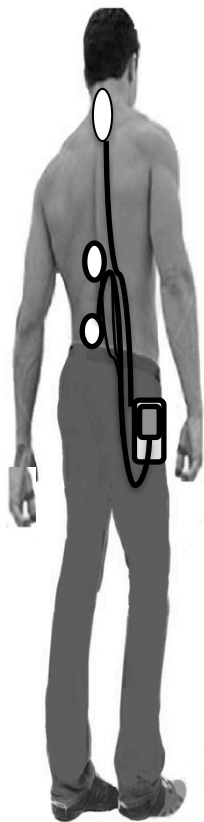
Cervical transcutaneous spinal cord stimulation in healthy subjects

Hand motor functional tests



Combining interventions work better than each intervention alone

GAIT FUNCTION AND LOWER EXTREMITY IN SPINAL CORD INJURY Following Transcutaneous Spinal Cord Stimulation

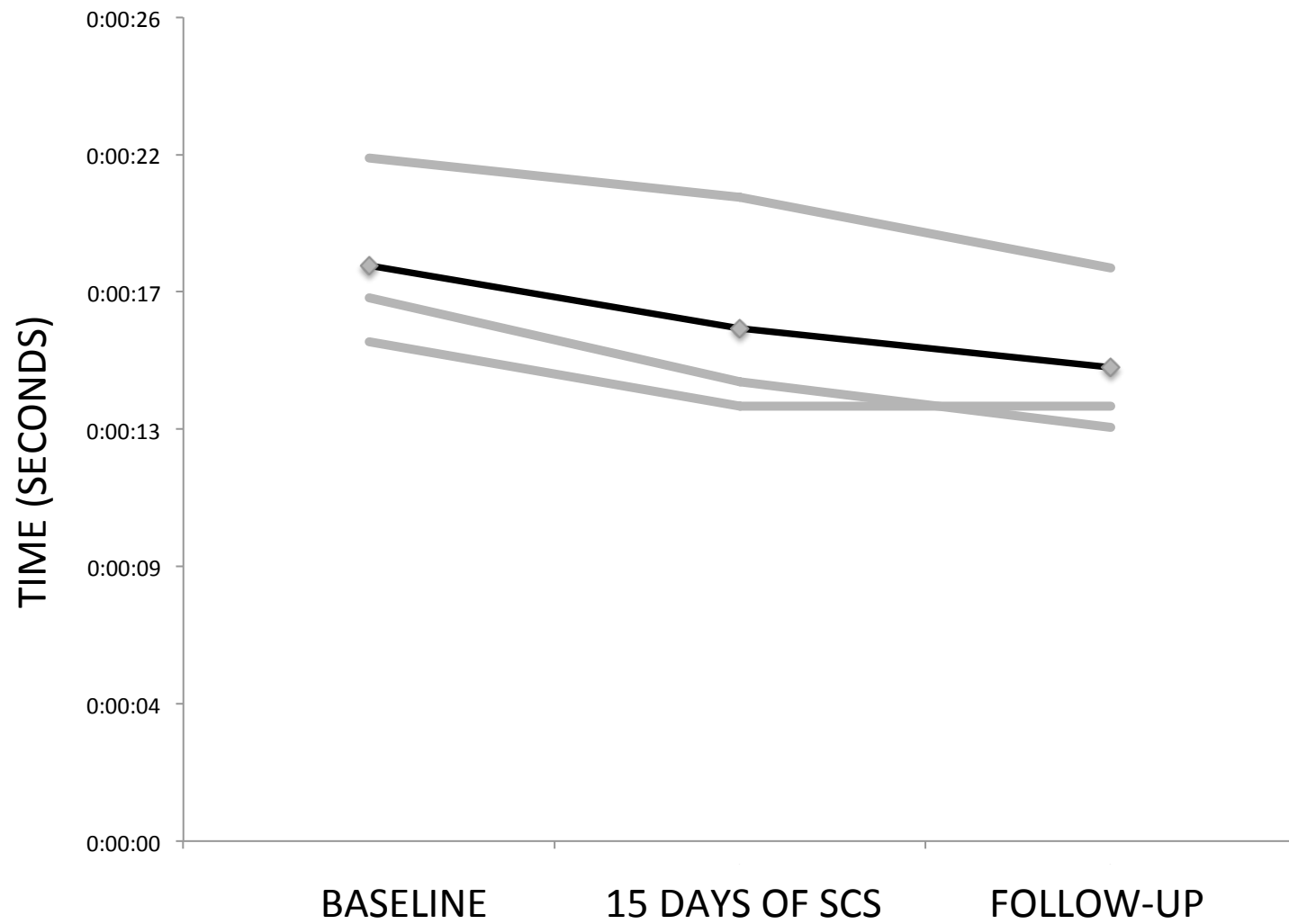


tSCS: Cervical 5-Lumbar 2-Coxic

With gait training



TIME UP AND GO TEST

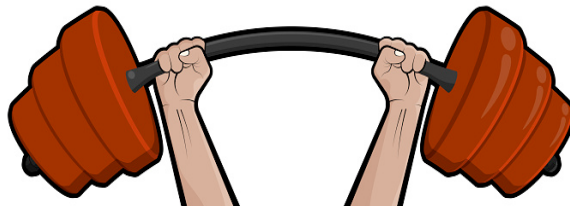




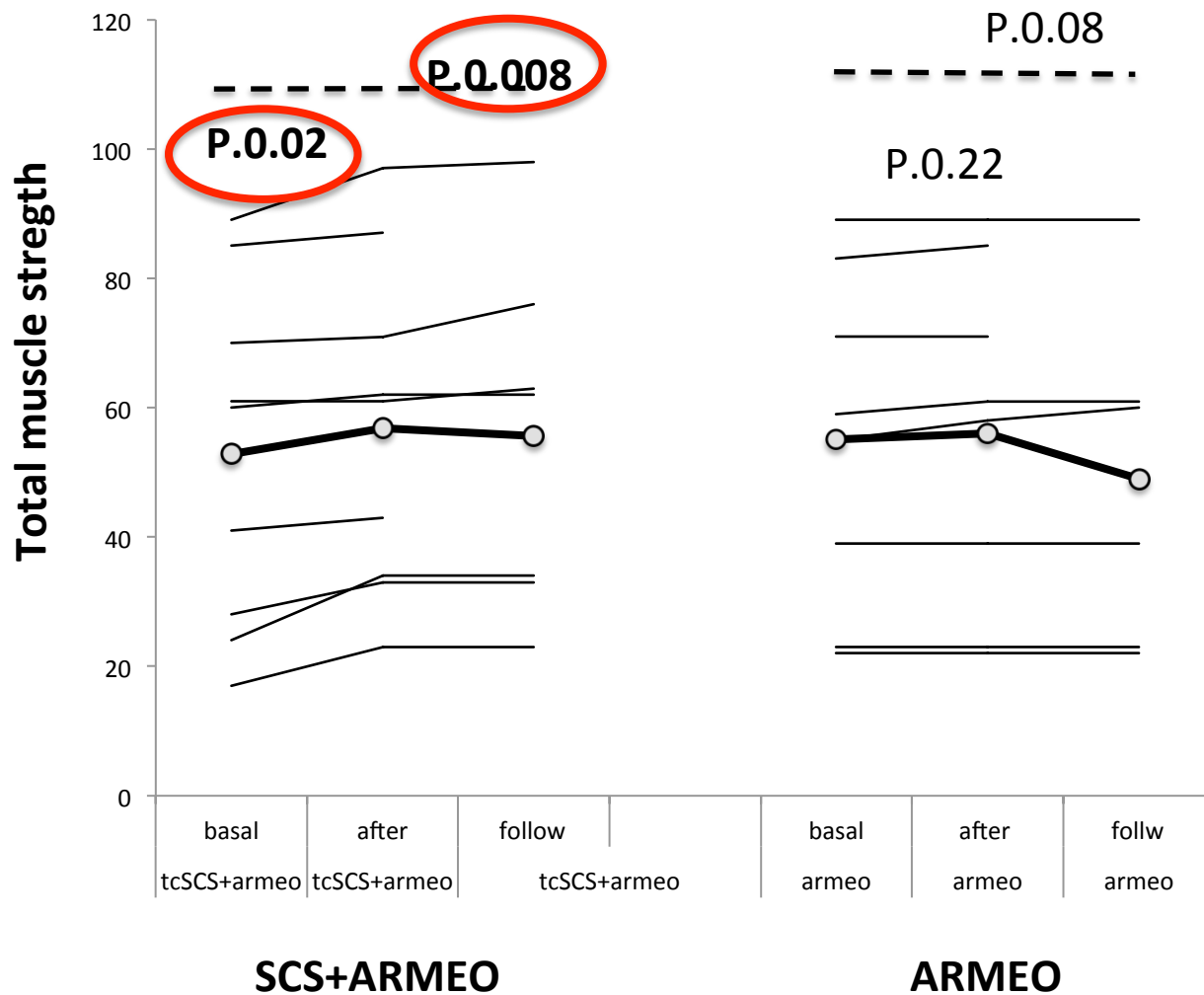
TRANSCUTANEOUS CERVICAL SPINAL CORD STIMULATION COMBINED WITH ARMEO ARM TRAINING

FOR ARM FUNCTION RECUPERATION





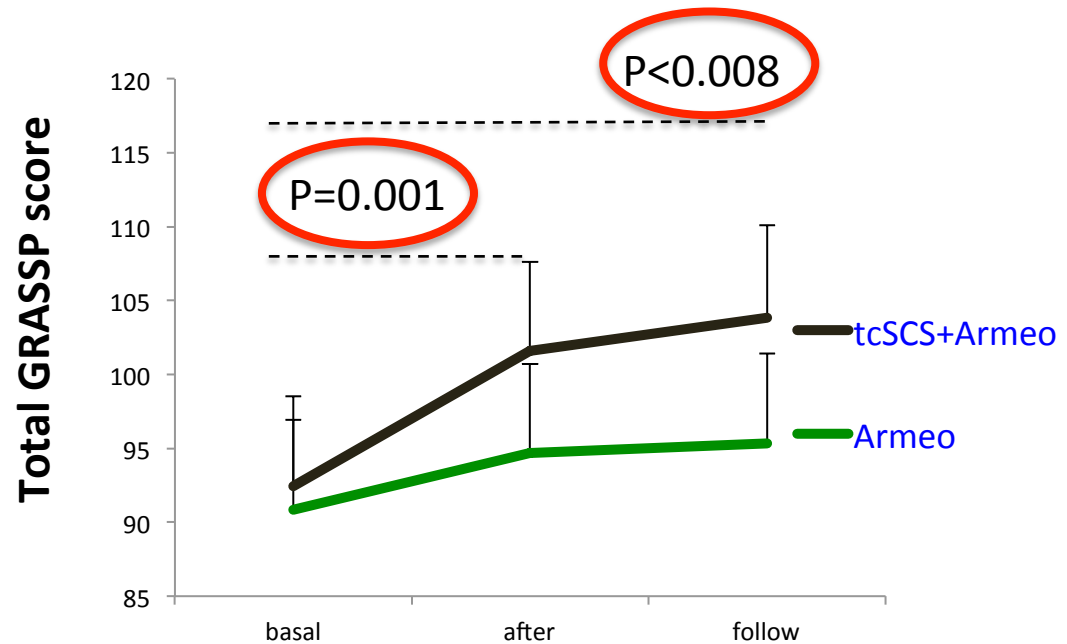
GRASSP UPPER LIMB STRENGTH





TRANSCUTANEOUS CERVICAL SPINAL CORD STIMULATION COMBINED WITH ARMEO ARM TRAINING

GRASSP OF UPPER EXTREMITY SCORE



TRANSCUTANEA SPINAL CORD STIMULATION FOR RESPIRATORY FUNCTION

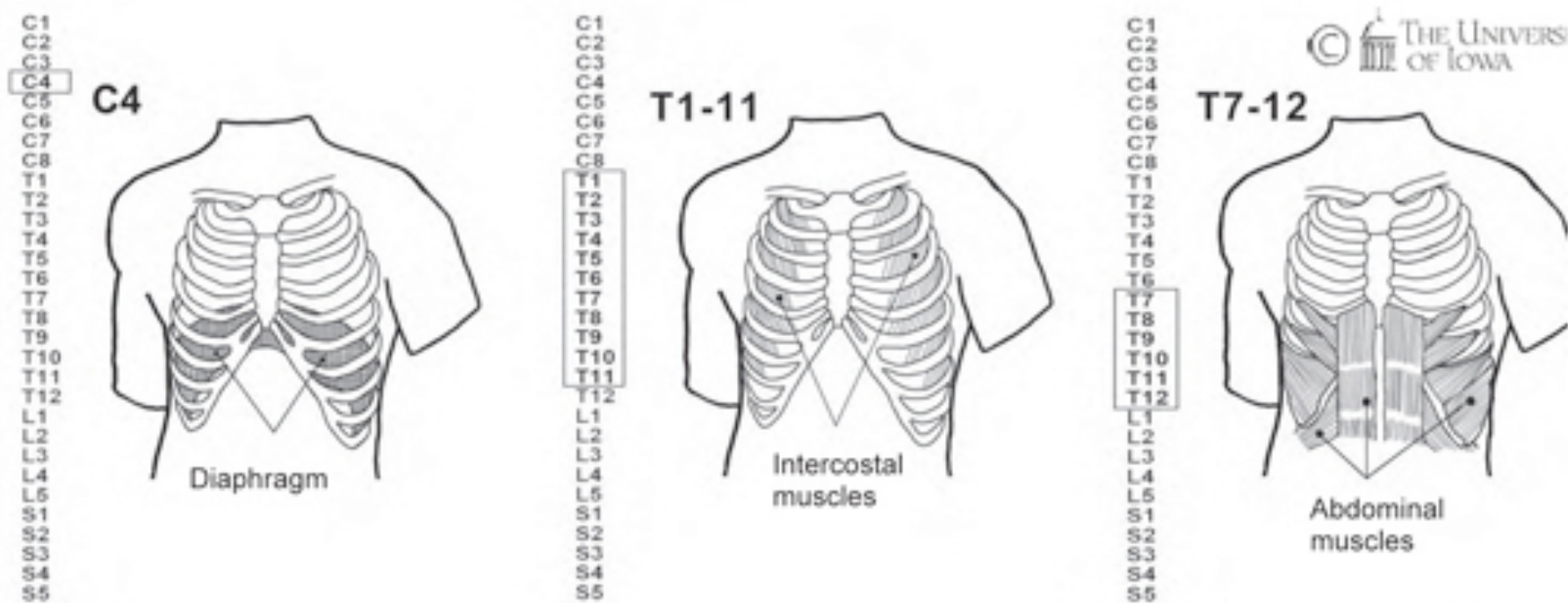
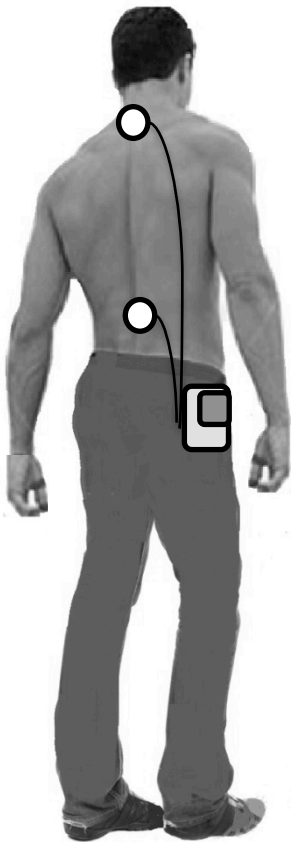
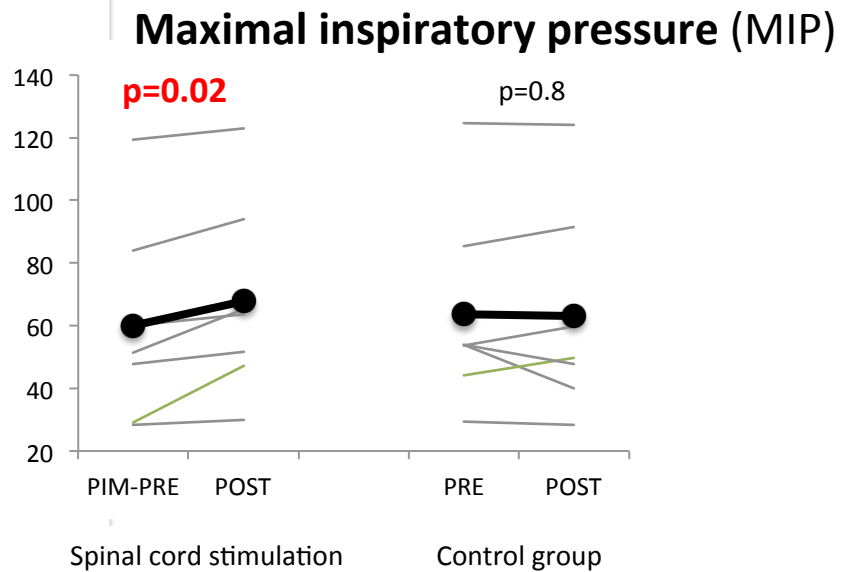
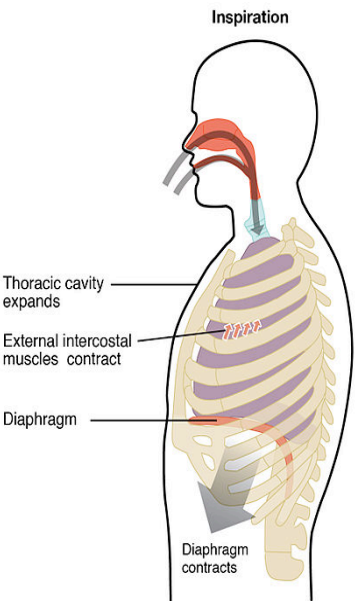
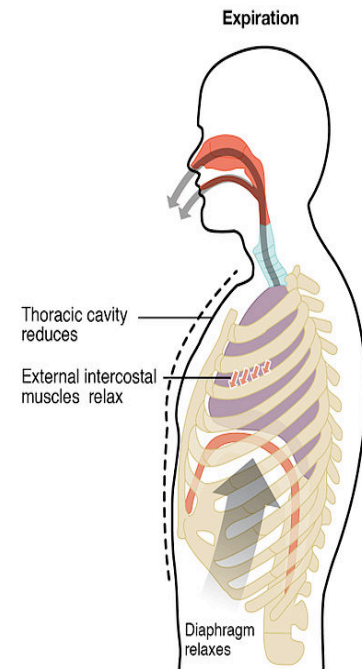
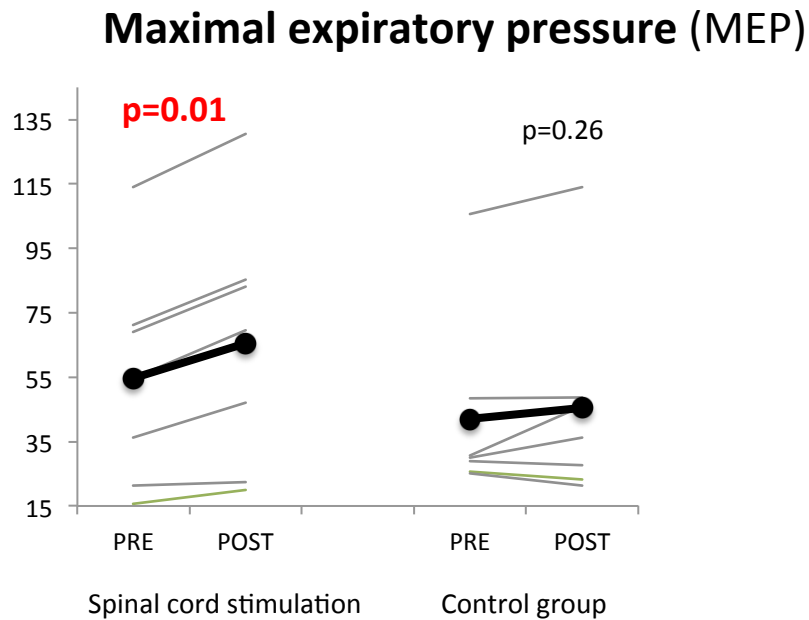
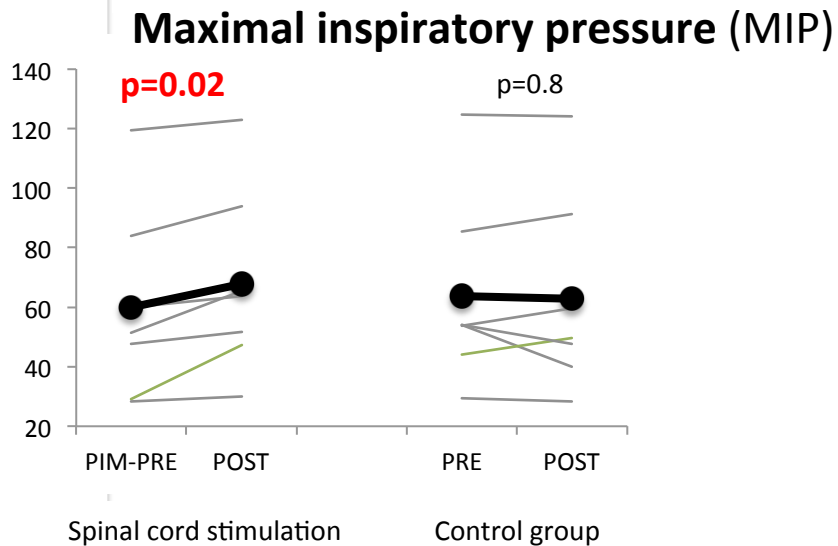
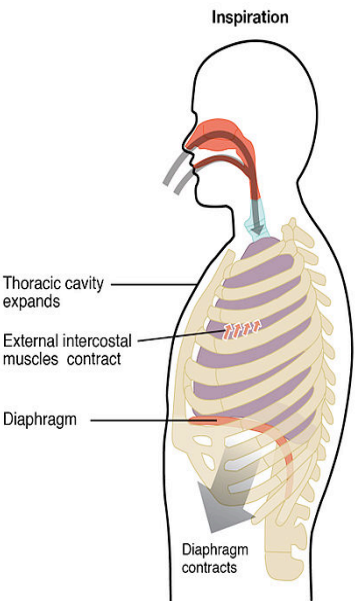


Figure 23. Spinal injury levels and the breathing muscles affected

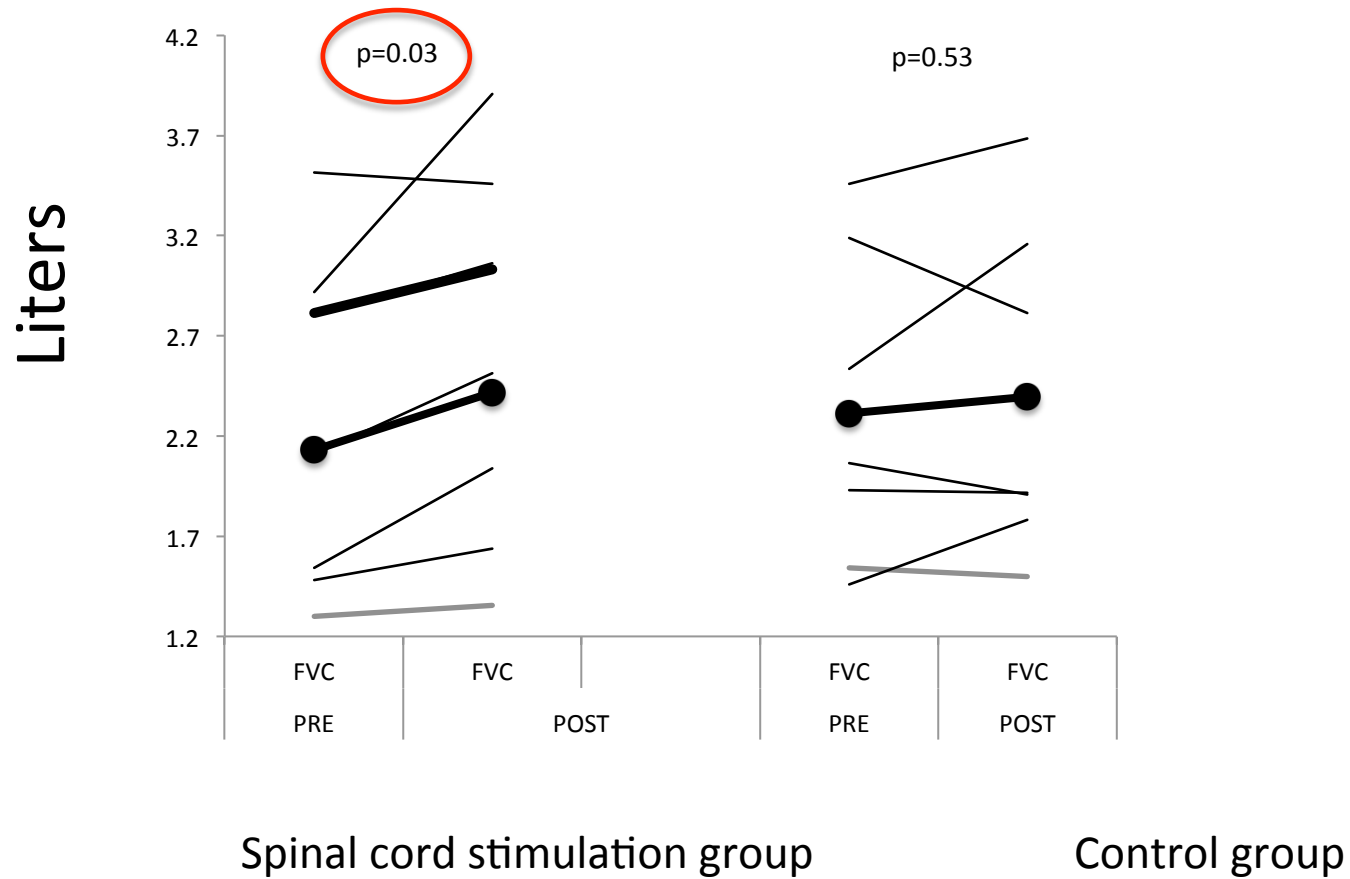
tSCS combined with respiratory rehabilitation

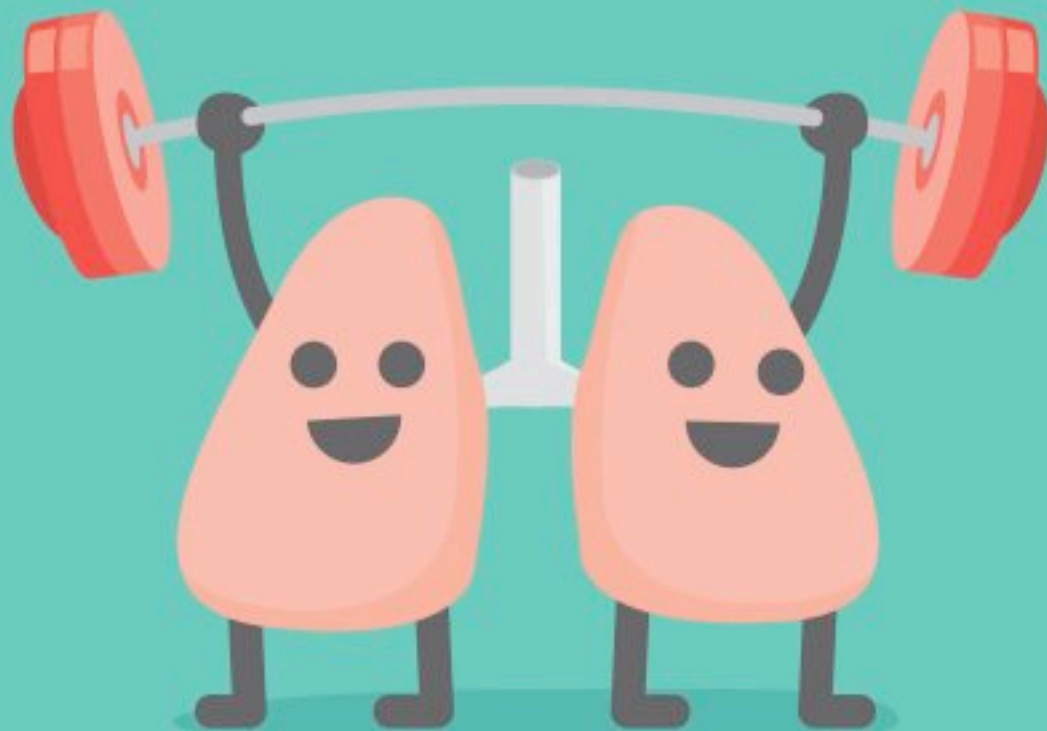






FVC (Forced vital capacity)









THANK YOU FOR YOUR ATTENTION

 Institut
Guttman

HOSPITAL DE NEUROREHABILITACIÓ
Institut Universitari adscrit a la **UB**