Brief Introduction to spinal electrical stimulation

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MIAMI

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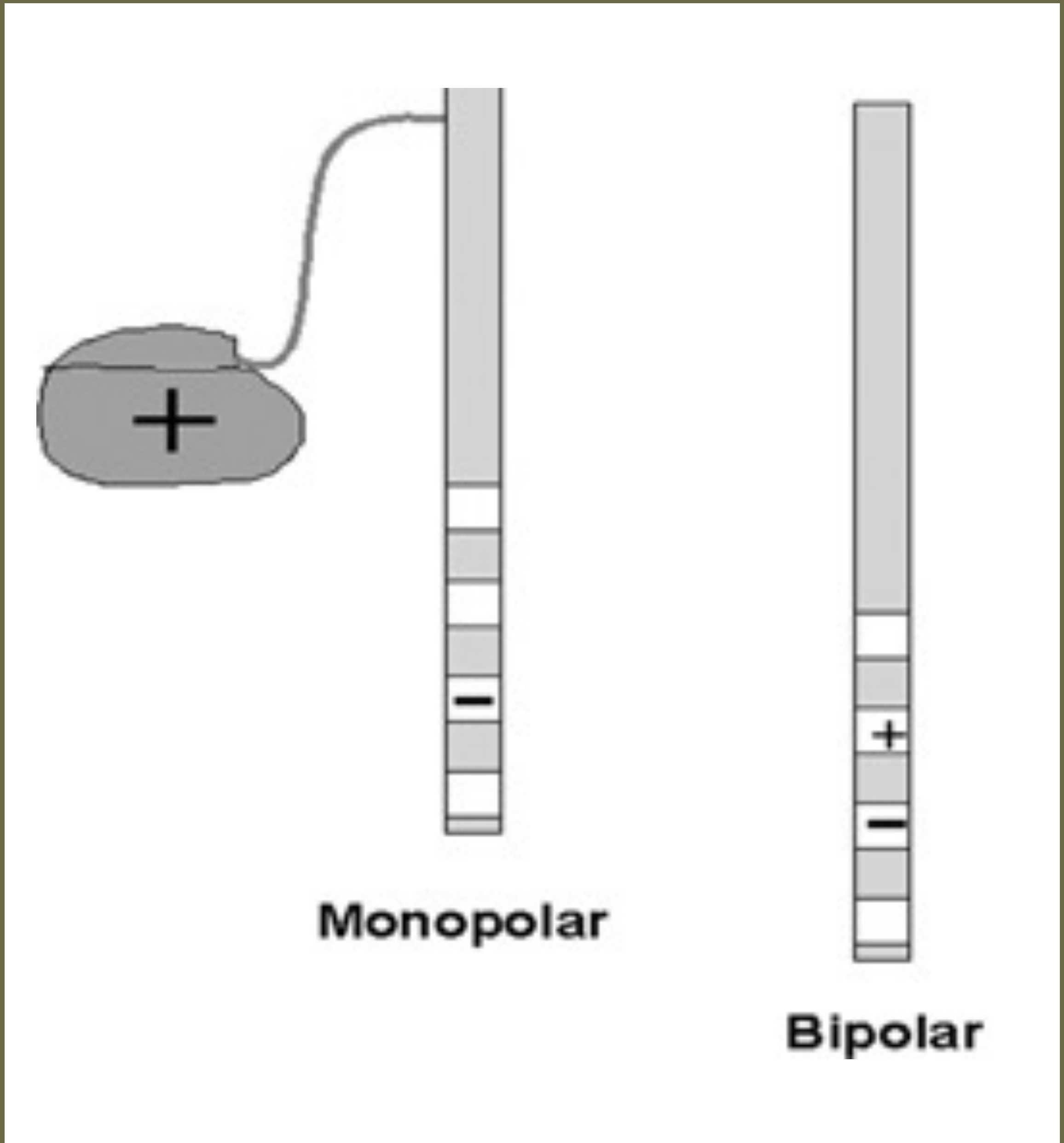
THE MIAMI PROJECT TO CURE PARALYSIS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Monopolar
+
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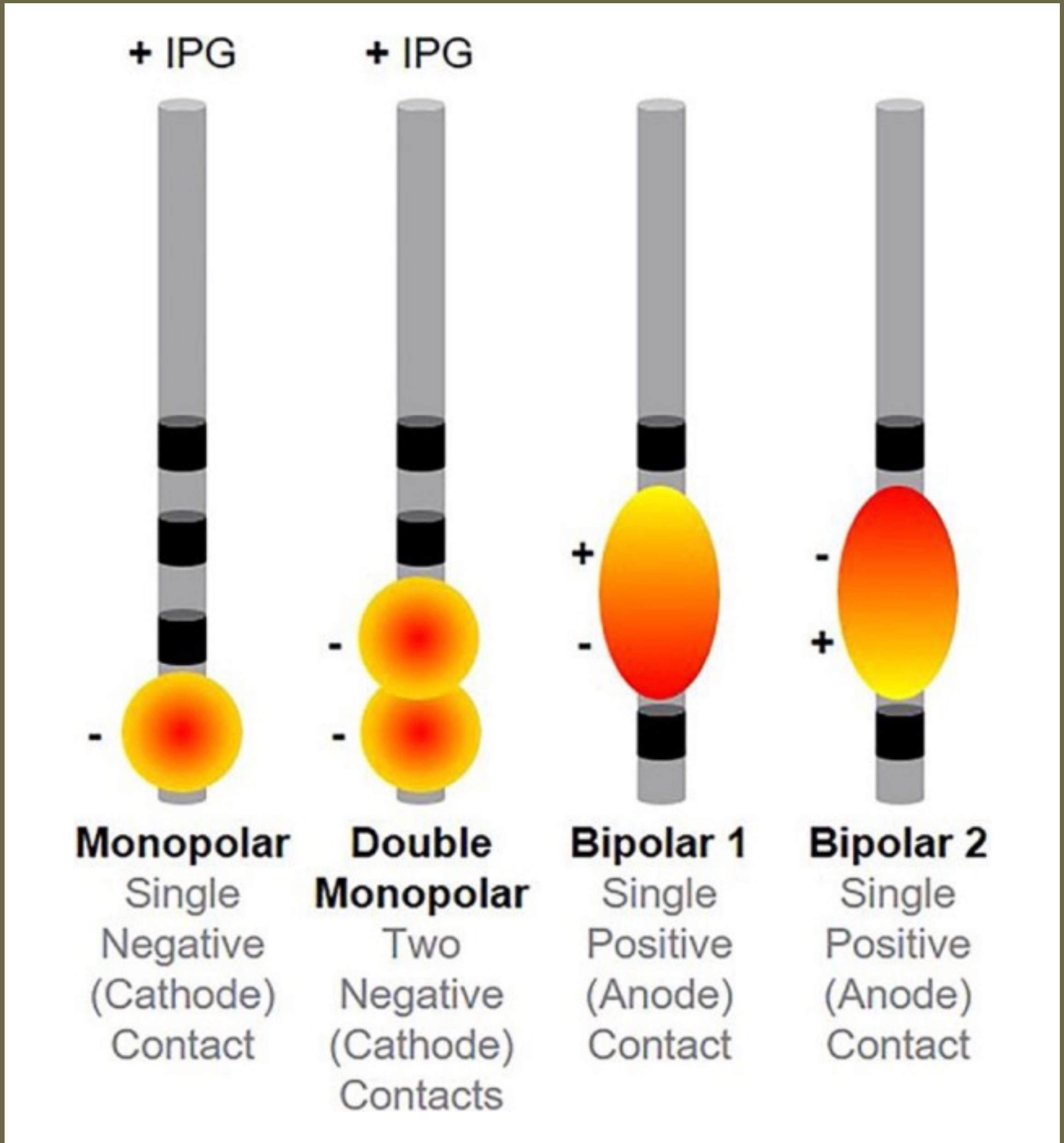
Bipolar


+ IPG
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Double Monopolar
Two
Negative
(Cathode)
Contacts
Bipolar 1
Single
Positive
(Anode)
Contact
Bipolar 2
Single
Positive
(Anode)
Contact

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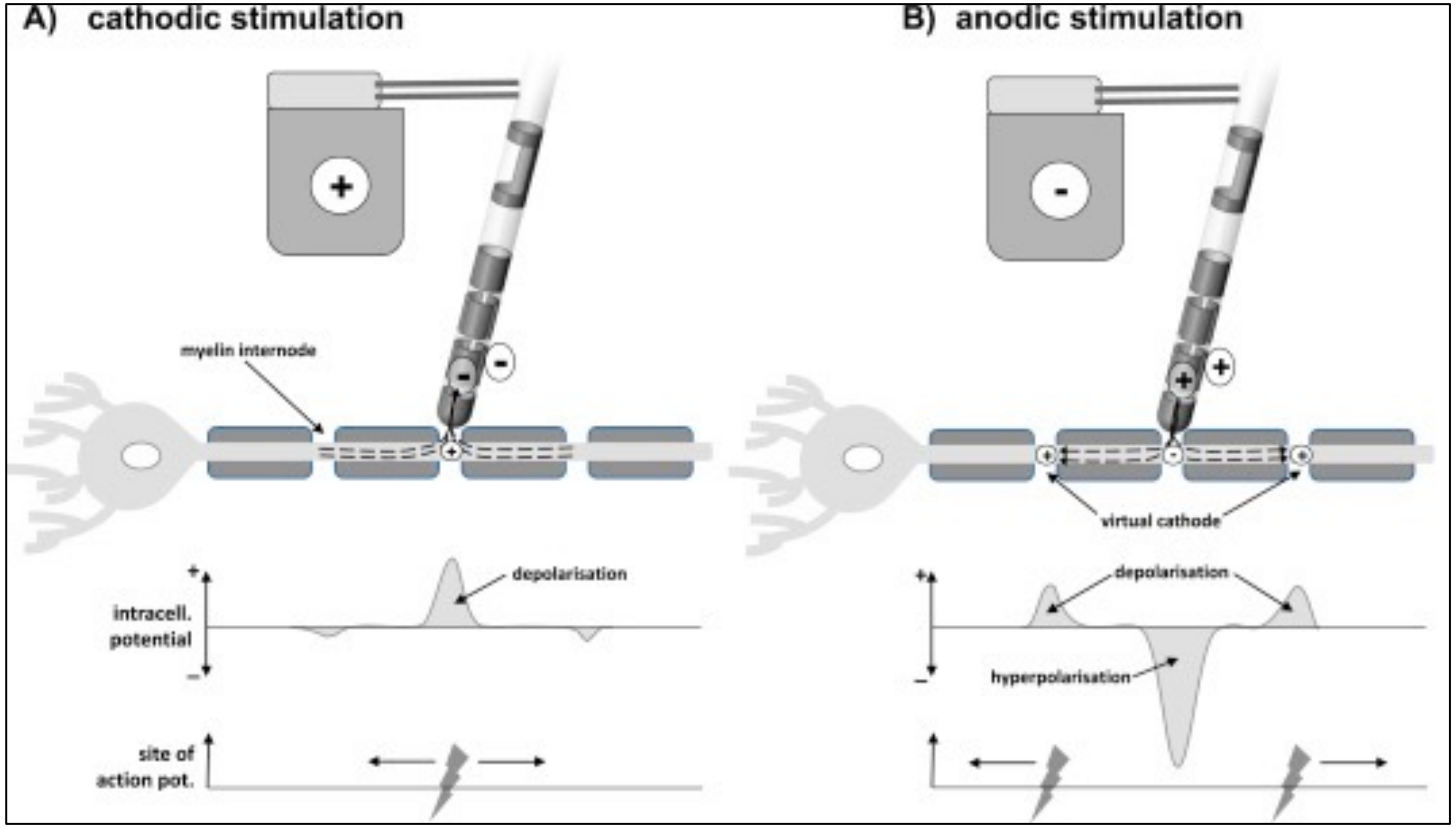
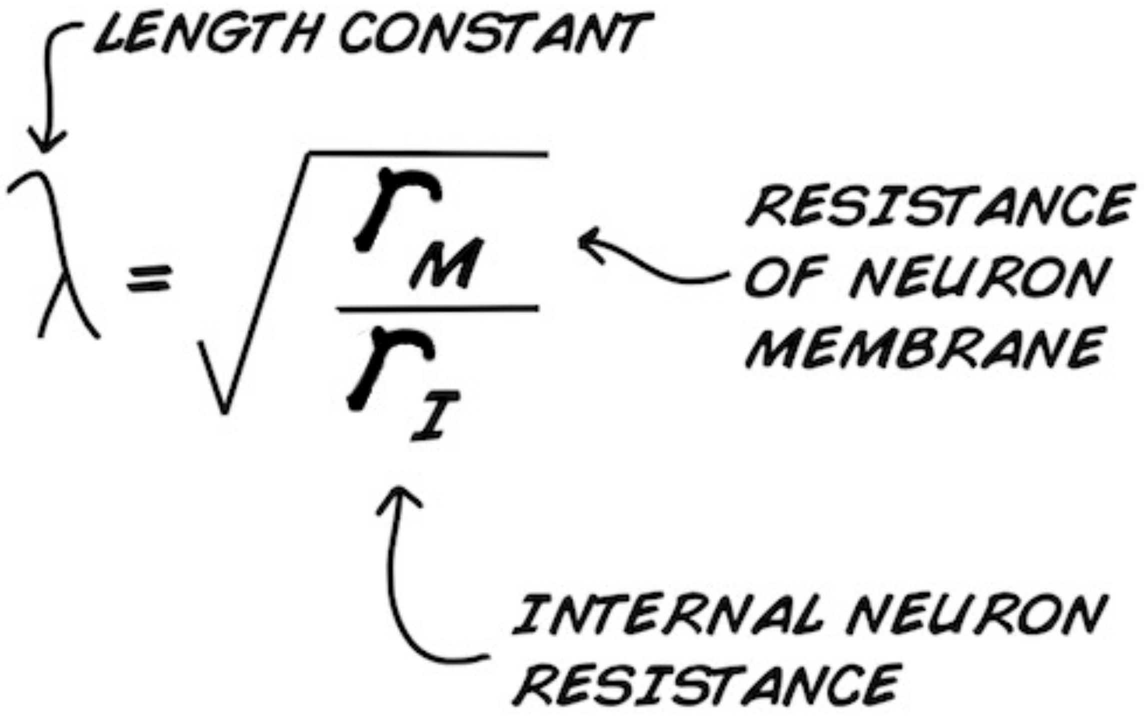
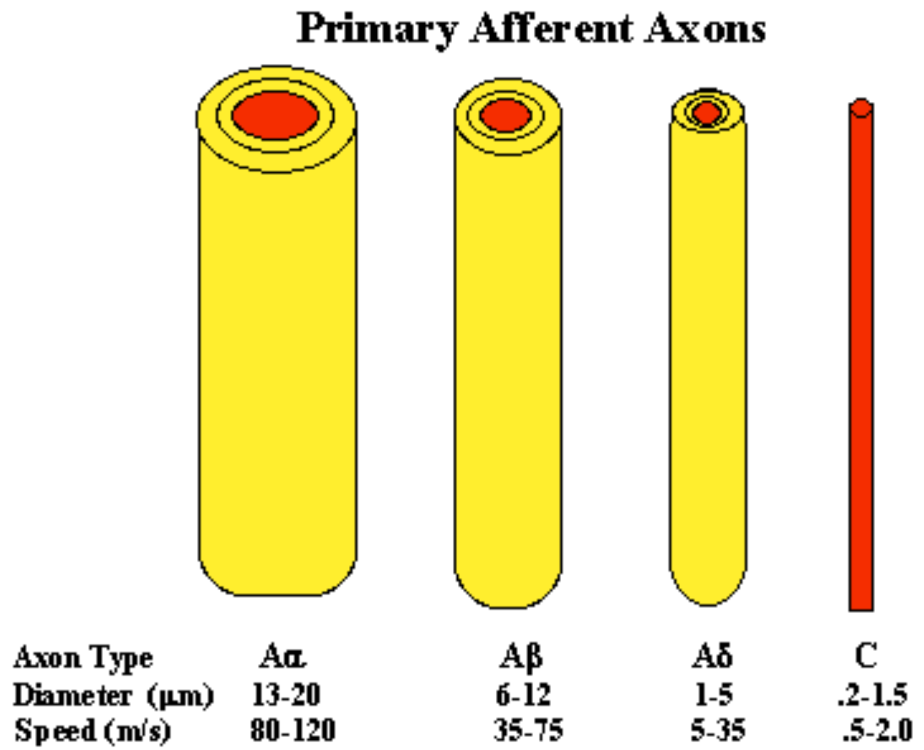
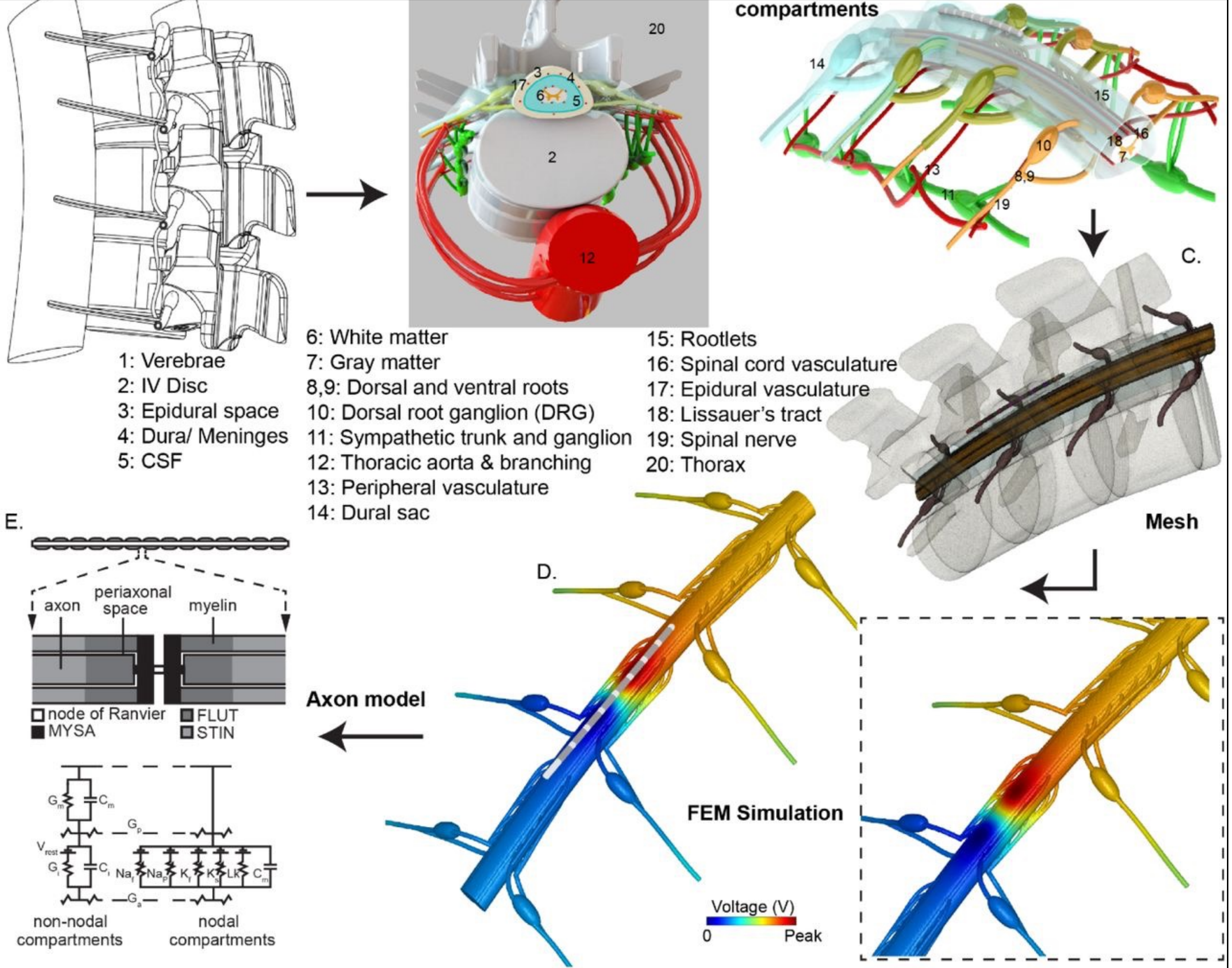


Basic Biophysics of Axons

- Membrane resistance (r_m) decreases with increasing radius (r)
- Axial resistance (R_i) decreases with r^2
- Length constant = Square root MR/AR







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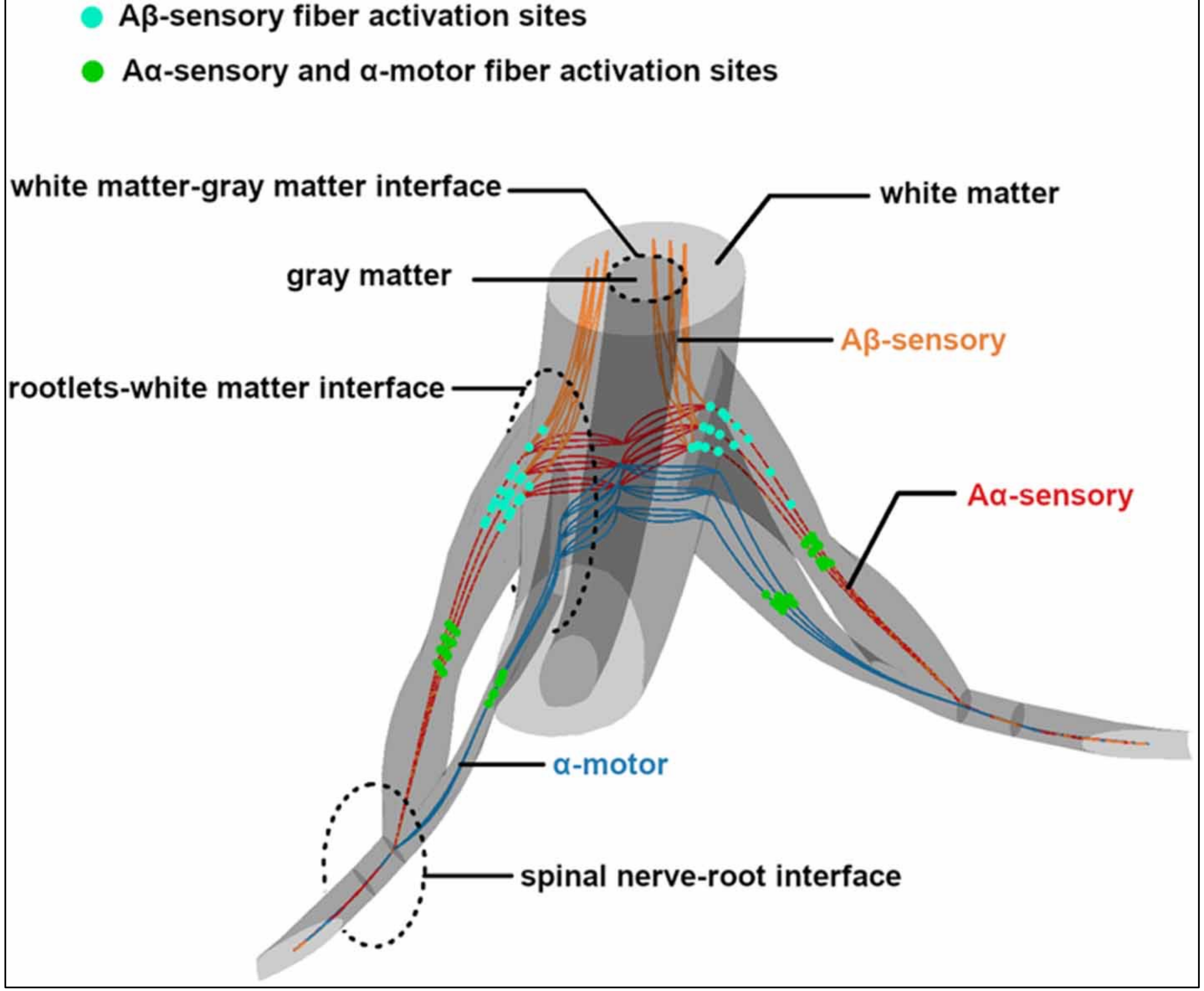

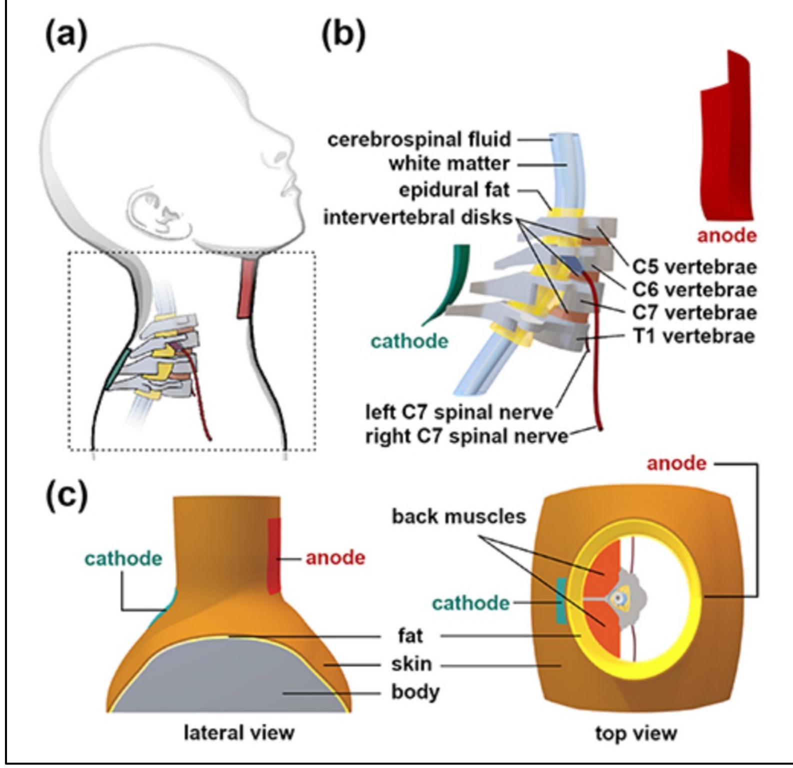

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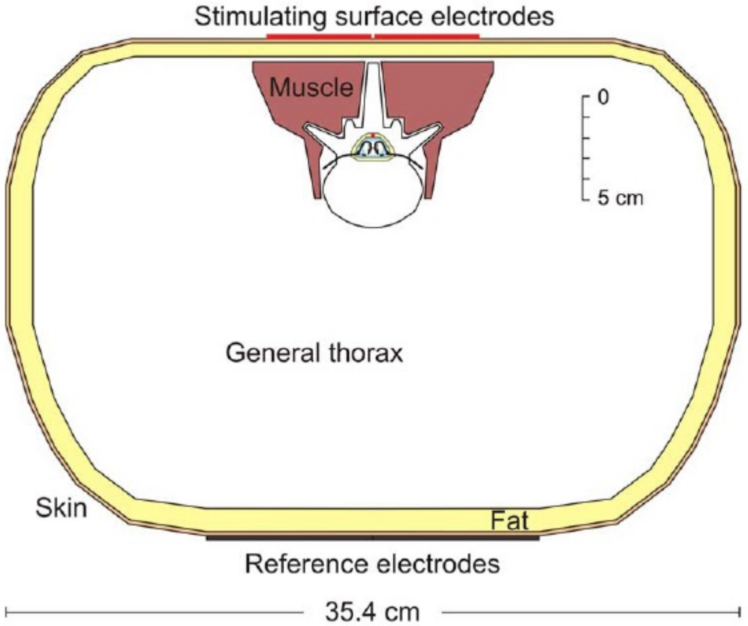
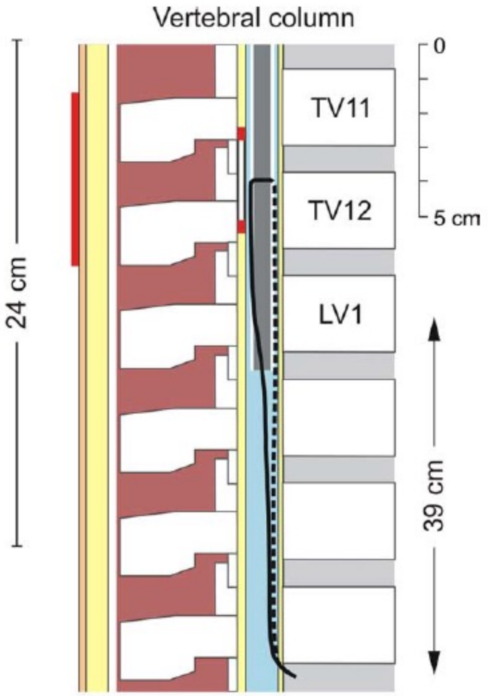




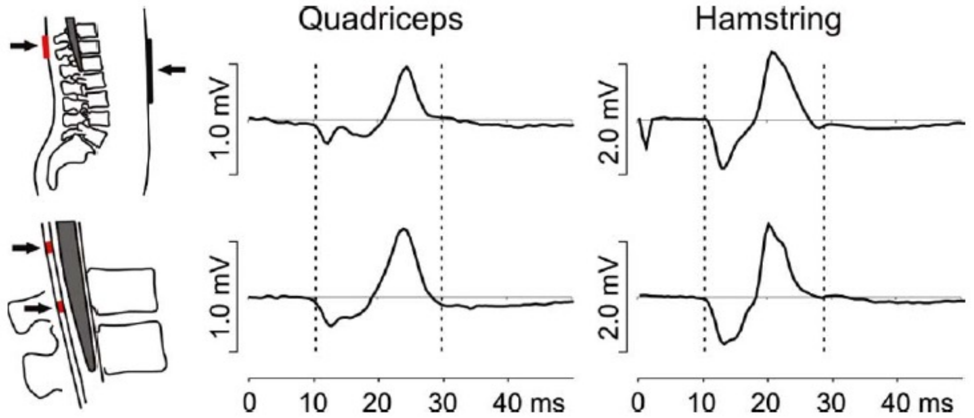
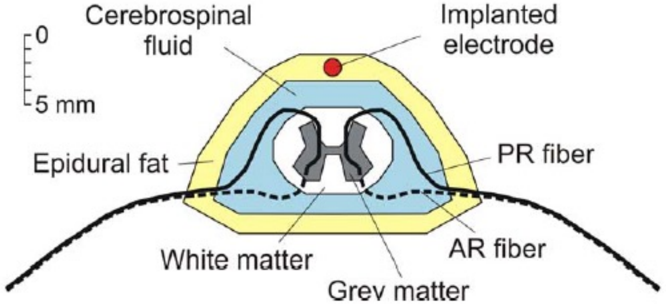
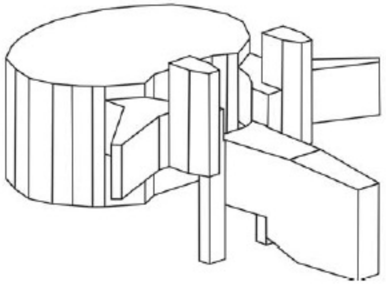
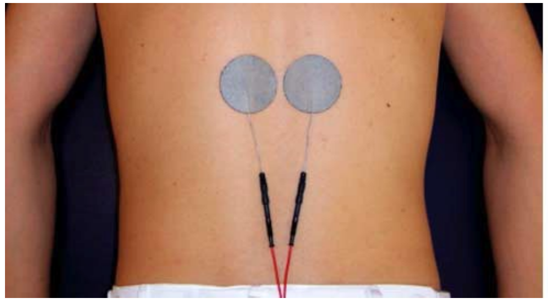


Fig. 1. Comparison of PRM reflexes in response to tSCS (top) and eSCS (bottom) elicited during the same EMG recording session in a spinal cord injured subject [13]. Dashed lines indicate on- and offsets of the EMG responses; arrows mark the electrodes.







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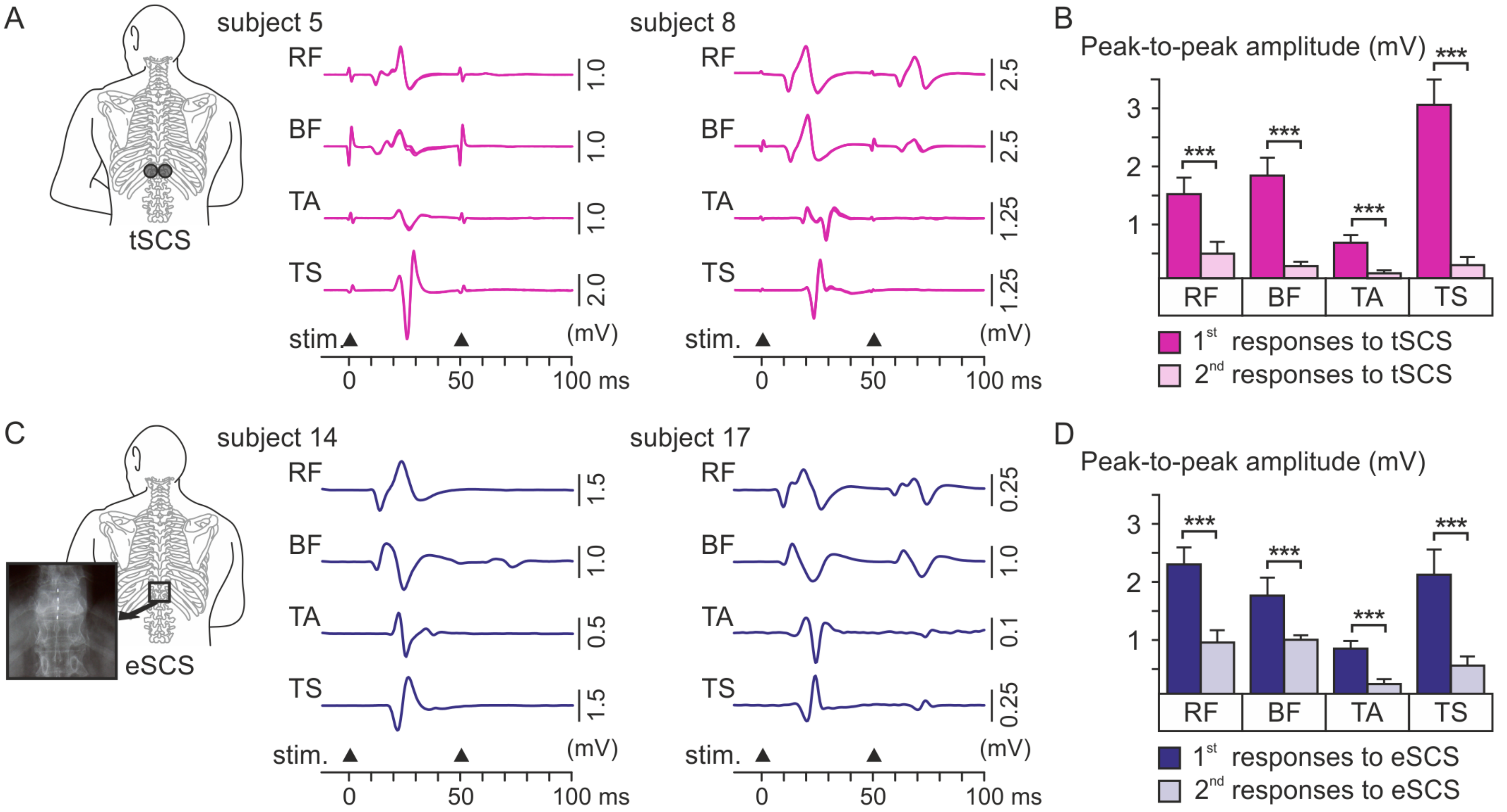
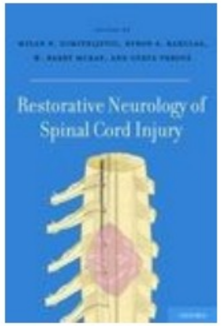


Hofstoetter, U. S., B. Freundl, H. Binder and K. Minassian (2018). "Common neural structures activated by epidural and transcutaneous lumbar spinal cord stimulation: Elicitation of posterior root-muscle reflexes." PLoS One **13**(1): e0192013.



Restorative Neurology of Spinal Cord Injury

Milan R. Dimitrijevic (ed.) et al.

https://doi.org/10.1093/acprof:oso/9780199746507.001.0001

Published: 2011 **Online ISBN:** 9780199918768 **Print ISBN:** 9780199746507

CHAPTER

10 Transcutaneous Lumbar Posterior Root Stimulation for Motor Control Studies and Modification of Motor Activity after Spinal Cord Injury

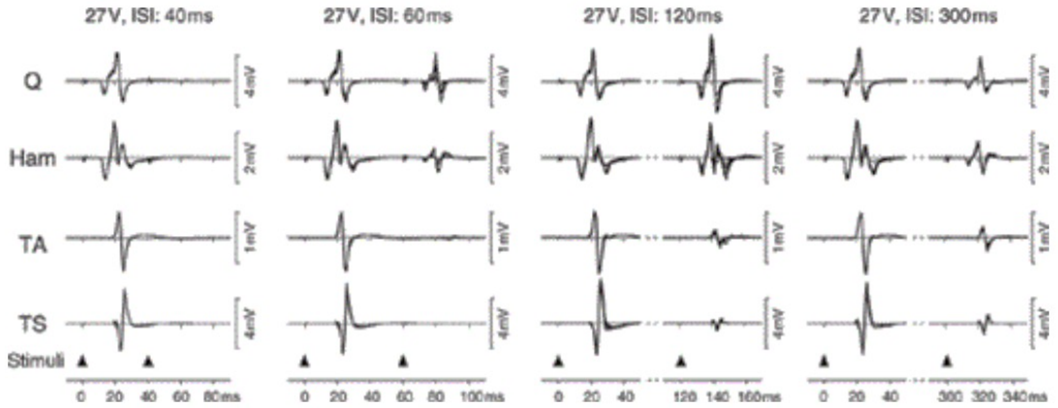
Karen Minassian, Ursula Hofstoetter, Frank Rattay

https://doi.org/10.1093/acprof:oso/9780199746507.003.0010 Pages 226–255

Published: December 2011

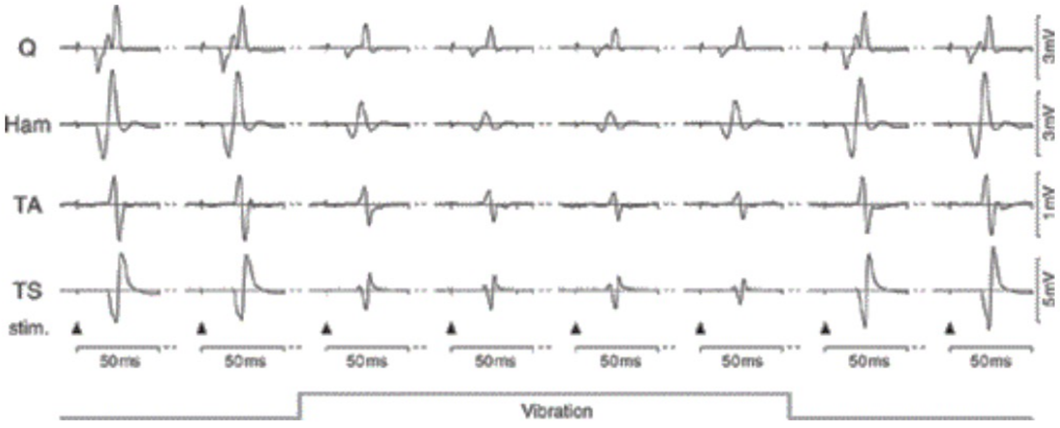
Posterior Root Motor Reflex

Figure 10–5



Posterior root-muscle reflexes of quadriceps (Q), hamstrings (Ham), tibialis anterior (TA), and triceps surae (TS) elicited by paired stimuli of same intensity delivered at different inter-stimulus intervals (ISI). Five stimulus-triggered traces are shown superimposed for each muscle and condition. Recordings derived from a subject with intact nervous system while supine.

Figure 10–6



Effect of Achilles tendon vibration on posterior root-muscle reflexes of ipsilateral quadriceps (Q), hamstrings (Ham), tibialis anterior (TA), and triceps surae (TS). Transcutaneous stimulation was applied over the T11–T12 interspinous space at a rate of 0.2 Hz and with constant stimulus intensity of 20 V. Recordings derived from a subject with intact nervous system in supine position. The examined lower limb was positioned with the Achilles tendon resting on the vibrator.

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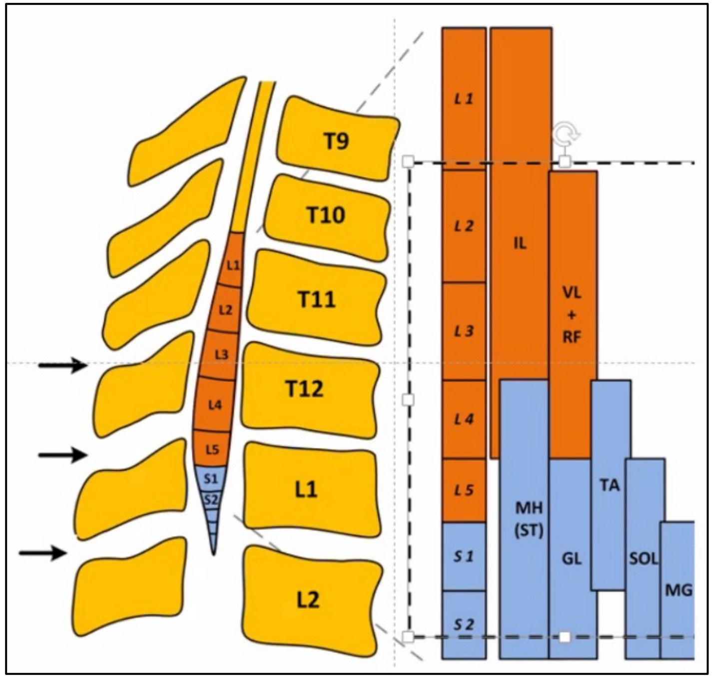
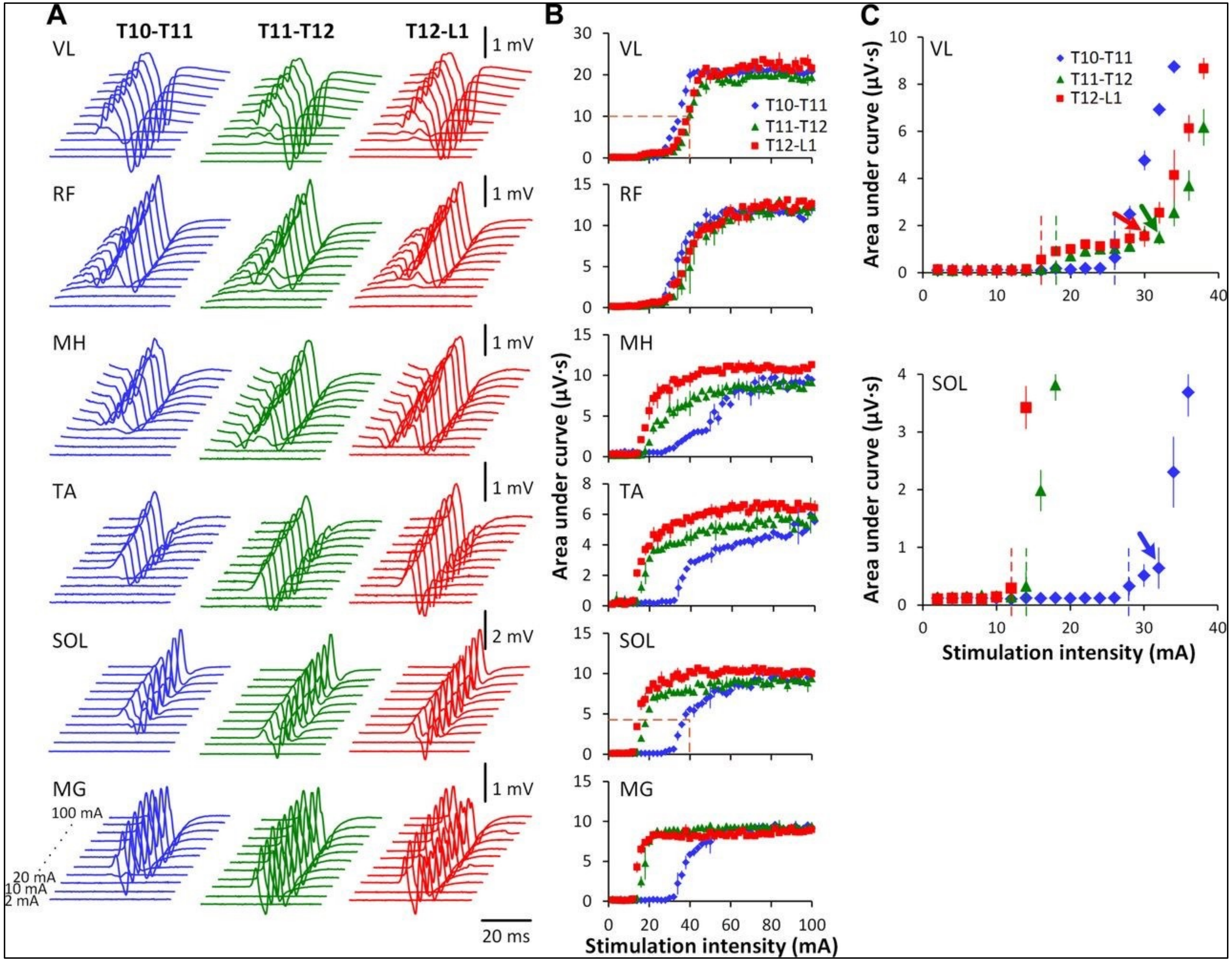
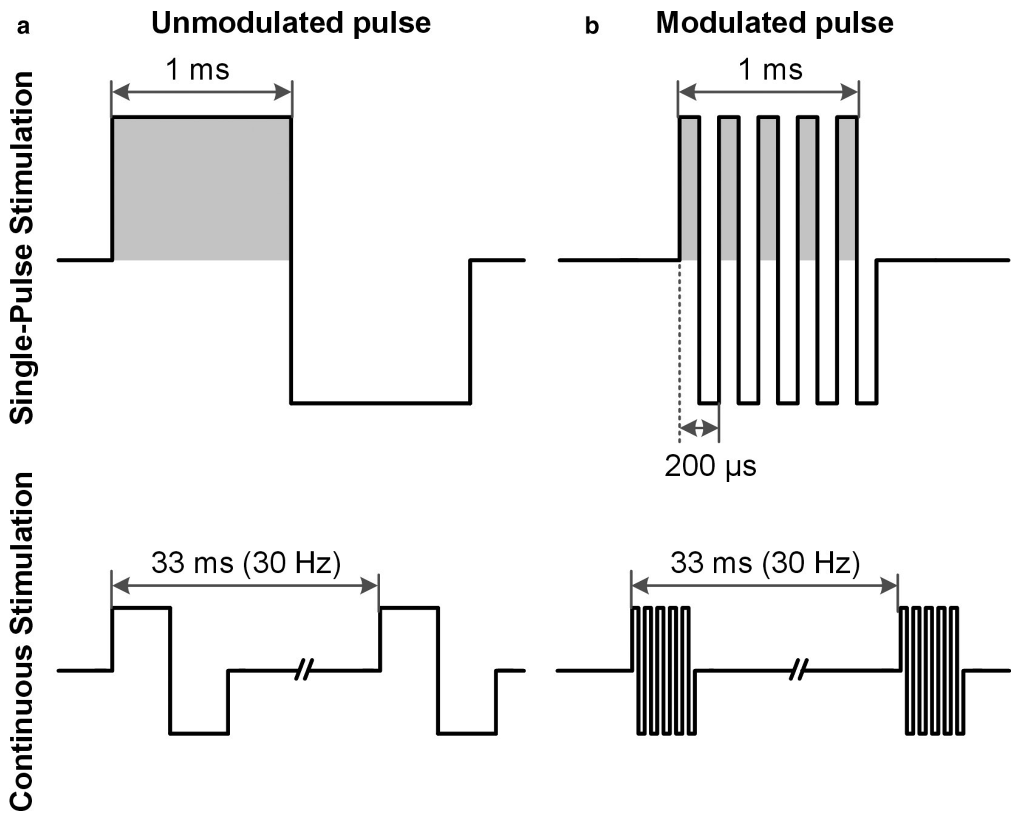
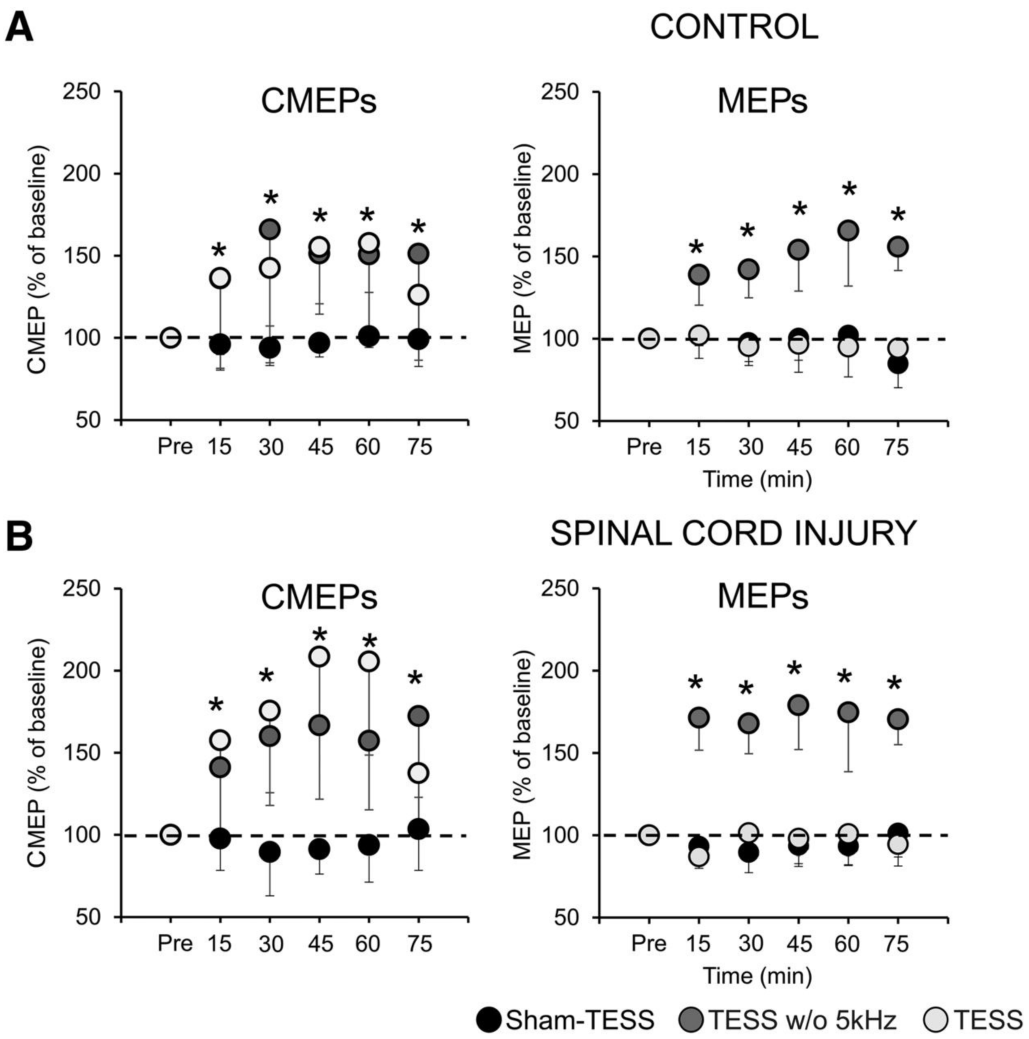






Physiological Reports, Volume: 8, Issue: 5, First published: 13 March 2020, DOI: (10.14814/phy2.14397)

Effect of different currents.



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