




 2nd Annual Sara J. Mulroy Spinal Cord Injury Symposium

Stimulating Functional Restoration:
 augmenting use-driven plasticity with clinically accessible neuromodulation

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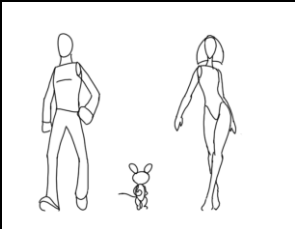
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"...financial and environmental access to appropriate exercise facilities and equipment is often a barrier to exercise for individuals with SCI..."
 ~ Sara Mulroy
 Commentary in *Spinal Cord*, 2020 58:731-732

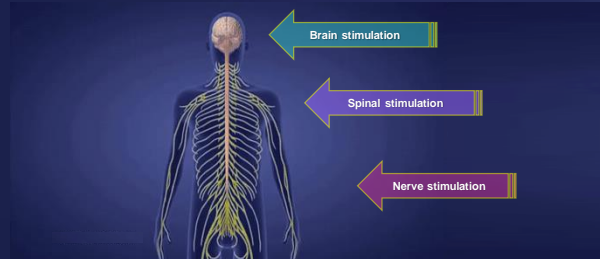
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Neural activation via training is the key for functional restoration after SCI



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We can amplify training-related neural via stimulation at all levels of the neuraxis




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Somatosensory (Afferent) Stimulation is a Powerful Tool

- **Top down: S1 Output**
- Activates M1
- Guides motor output
- Activates spinal motor networks

Bottom Up: Sensory Input

- Tunes spinal excitability
- Activates supraspinal centers




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Augmenting Locomotor Training




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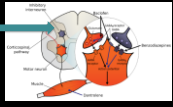




Does training + activation of spinal circuits promote walking function after SCI ?


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Human subacute SCI: Pragmatic clinical trial transcutaneous spinal stim (TSS) to augment locomotor training

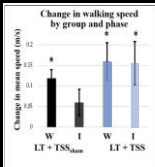
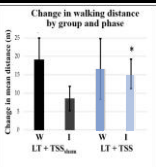
TSS+ Training vs Sham-TSS + Training



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Human subacute SCI: Pragmatic clinical trial – TSS to augment locomotor training

W: Wash-in (2 wks)
LT only
both groups

I: Intervention (2 wks)
LT+TSSsham
vs
LT+TSS

Estes...Field-Fote *J Clin Med*, 2021


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So many interventions directed at improving walking




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Limitations of Locomotor Training

- Error Constraint
Emken, et al. *J NeuroEng Rehabil* 2007
- ↓ Intensity
Fenuta & Hicks. *BioMed Res Int* 2014
- High Cost
Jones, et al. *APMR* 2012
- Limited Specificity
Lee & Hider. *J Appl Physiol* 2008

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Can we develop an accessible intervention to improve walking after SCI ?

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Motor Skill Training (MST) Circuit

- 1 Accessible
- 2 Cyclic Movements
- 3 Full Weight-Bearing
- 4 High-Velocity
- 5 Physiologically Intensive

Evans

NIDILRR

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Participant performing MST circuit activities

14

Motor skill training circuit improves speed & distance – no additional benefit with tDCS

Evans & Field-Foto, *J Neurol Phys Ther*, 2022

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Is the same training right for everyone?

Shepherd Center


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Augmenting Hand Training

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Does activating cortical circuits directly vs indirectly best augment hand training ?

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The Caudal End

Accessible movement training is the key to functional restoration ①

② Clinically accessible stimulation can be a powerful adjunct to training

③ Specificity of training must consider task requirements beyond kinematics

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Thank You



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See you soon!



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