# Interventions in restoring function in spinal injury with chronic paralysis

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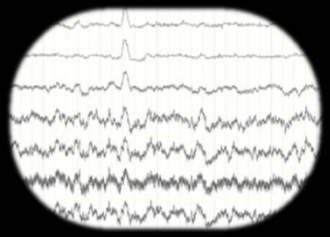
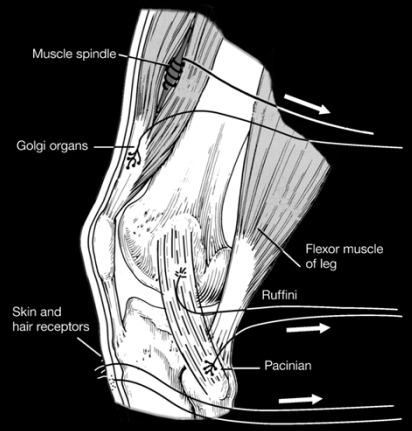
Compares expected movement with real movement

Think about performing a movement



## How can we restore movement?




Sensors in muscles and joints

Activate muscles and generates movement

# Traditional rehabilitation approaches

# Physical therapy

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Harness ET et al. (2008). *Spinal Cord.* ***46: 733-7.***

# Exoskeletons

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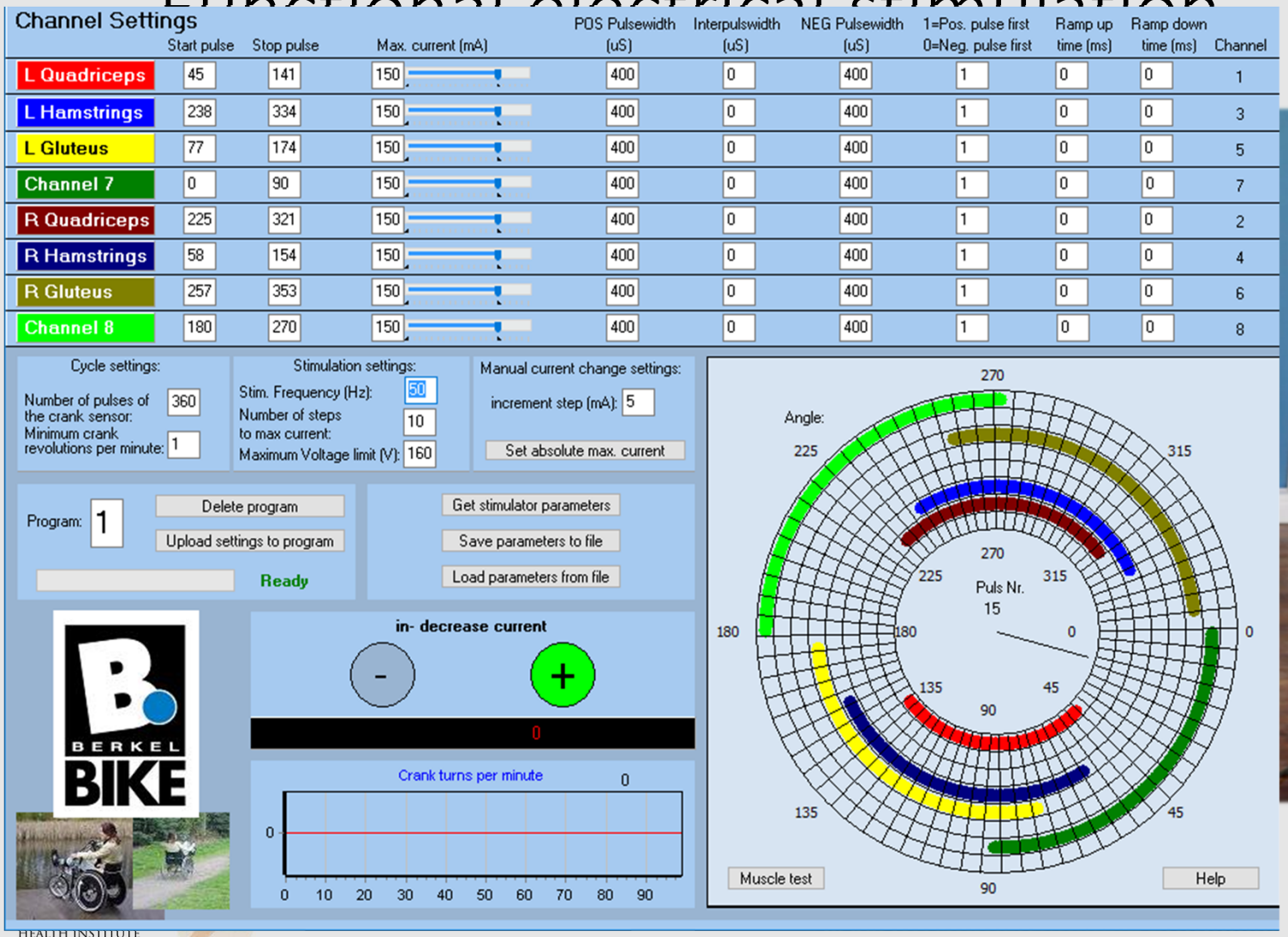
Mehrholz J et al. (2017). *Spinal Cord*. **55**: 722.

# Functional electrical stimulation

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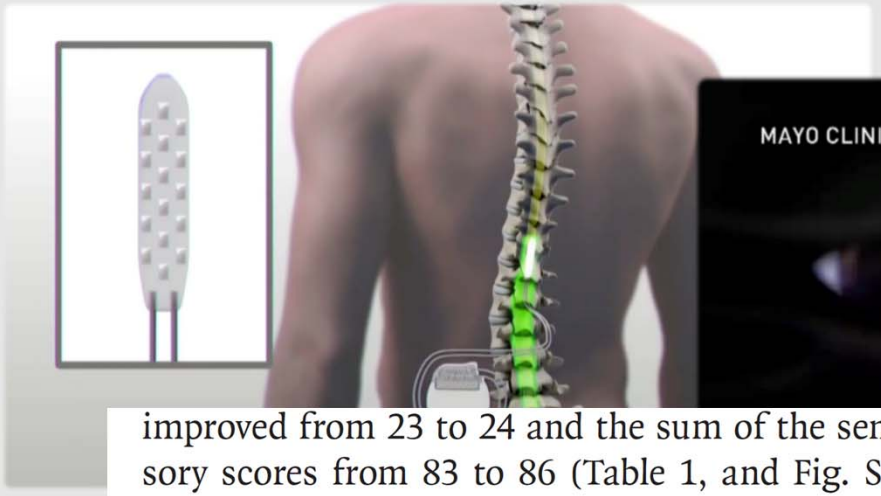
# New rehabilitation approaches

# Electrical stimulation of the spinal cord




improved from 23 to 24 and the sum of the sensory scores from 83 to 86 (Table 1, and Fig. S1 in the Supplementary Appendix).

Participant 1 had a spontaneous hip fracture (he was stepping on the treadmill with body-weight support) after 1 week of training, without a fall, and resumed training 1 year later. He had a total of 176 sessions over a period of 62 weeks,

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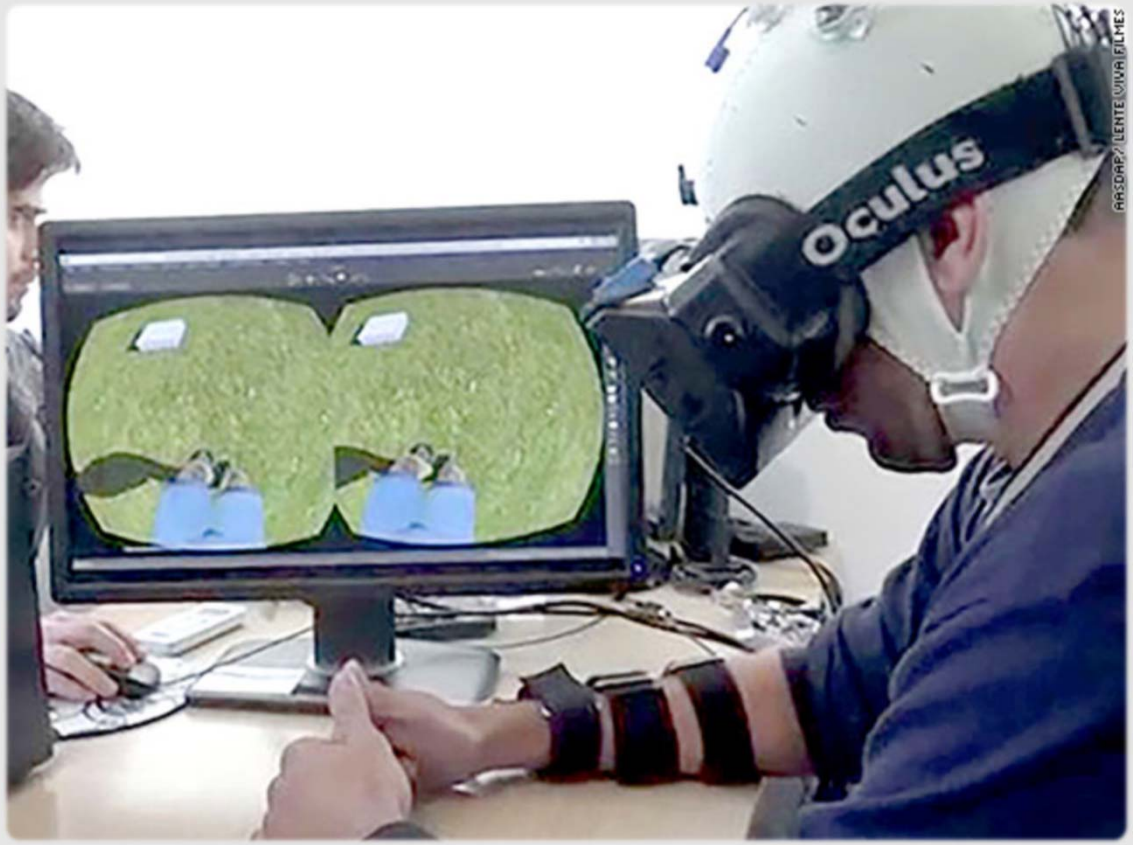
Gill ML et al. (2018). *Nat Med*. **24**: 1677-1682.
Angeli CA et al. (2018). *N Engl J Med*. **379**: 1244-1250.

# Thought-controlled rehabilitation

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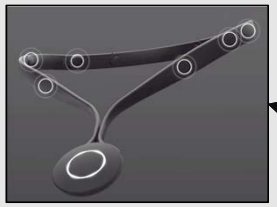
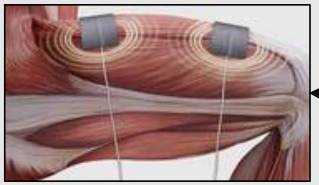
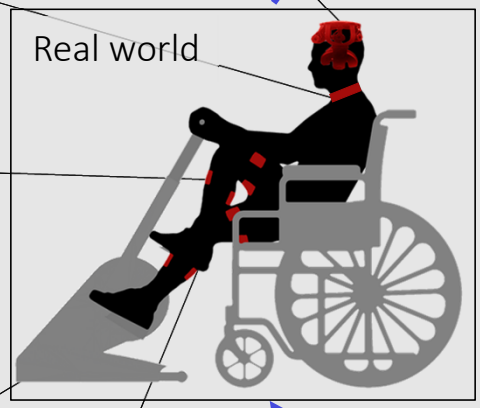
Donati AR et al. (2016). *Sci Rep*. **6**: 30383.

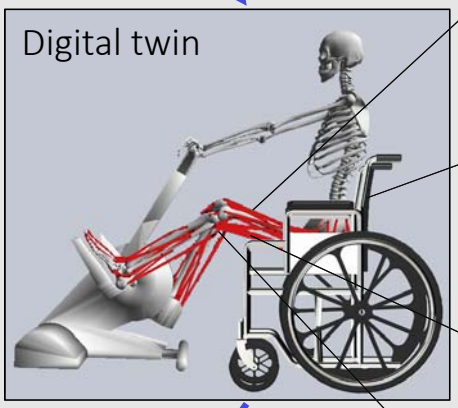
# BioSpine:
# safe and simple to use



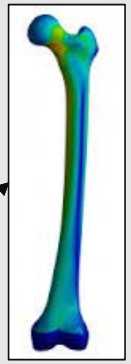


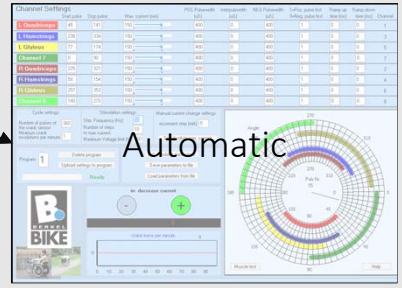
Measured data

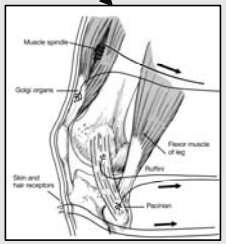



Control devices



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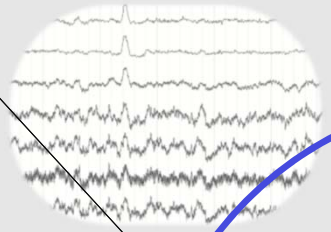
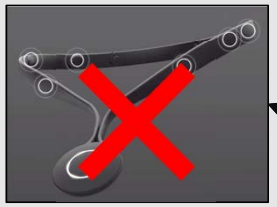
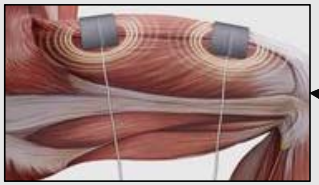
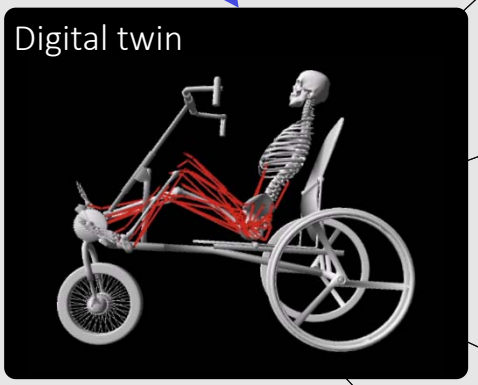
# BioSpine: first prototype

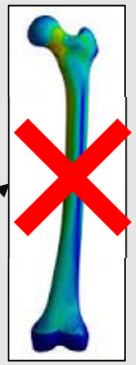


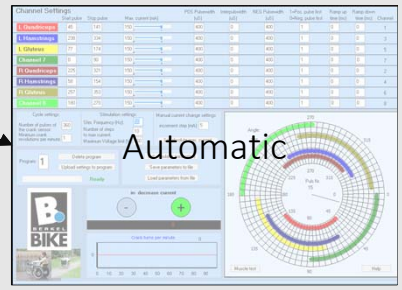
Measured data



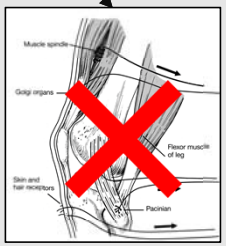







Control devices

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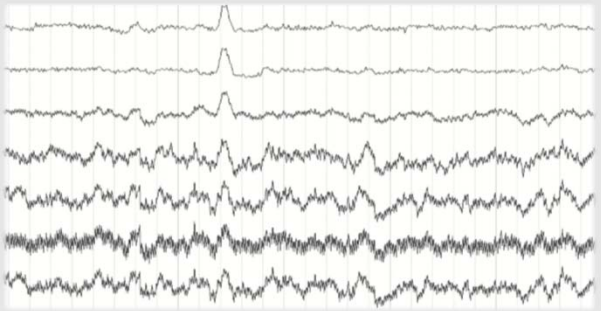
# BioSpine: improving thought-control



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