

Interventions in restoring function in spinal injury with chronic paralysis

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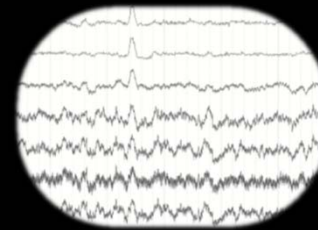
The Hopkins Centre, Menzies Health Institute Queensland, Australia

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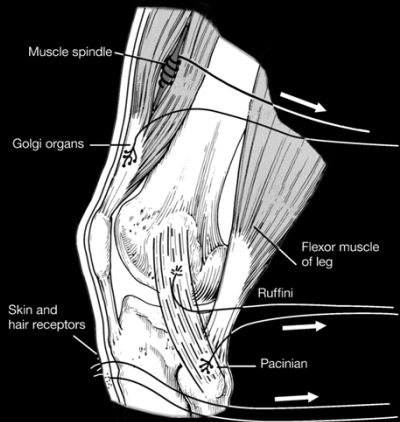


Compares expected movement with
real movement

Think about performing a movement



How can we restore movement?



Sensors in
muscles and
joints

Activate
muscles and
generates
movement

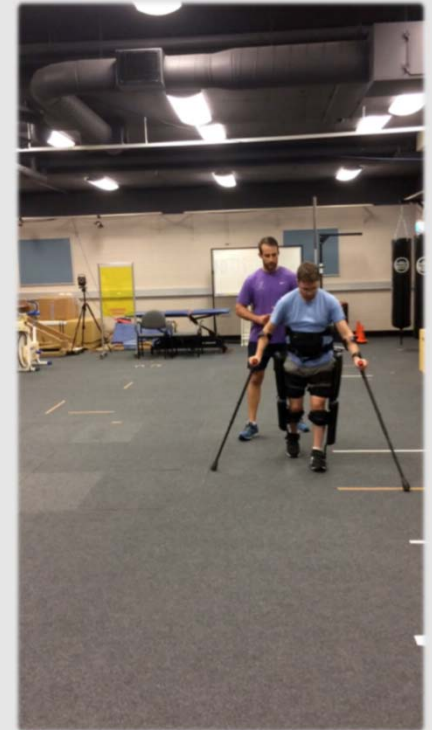


Traditional rehabilitation approaches

Physical therapy



Exoskeletons



Functional electrical stimulation

Channel Settings	Start pulse	Stop pulse	Max. current (mA)	POS Pulsewidth (uS)	Interpulwidth (uS)	NEG Pulsewidth (uS)	1=Pos. pulse first 0=Neg. pulse first	Ramp up time (ms)	Ramp down time (ms)	Channel
L Quadriceps	45	141	150	400	0	400	1	0	0	1
L Hamstrings	238	334	150	400	0	400	1	0	0	3
L Gluteus	77	174	150	400	0	400	1	0	0	5
Channel 7	0	90	150	400	0	400	1	0	0	7
R Quadriceps	225	321	150	400	0	400	1	0	0	2
R Hamstrings	58	154	150	400	0	400	1	0	0	4
R Gluteus	257	353	150	400	0	400	1	0	0	6
Channel 8	180	270	150	400	0	400	1	0	0	8

Cycle settings:

Number of pulses of the crank sensor:

Minimum crank revolutions per minute:

Stimulation settings:

Stim. Frequency (Hz):

Number of steps to max current:



Maximum Voltage limit (V):

Manual current change settings:

increment step (mA):

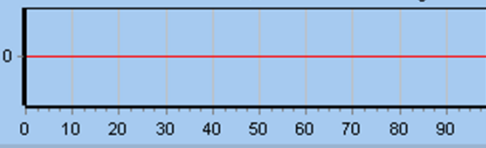
Program:

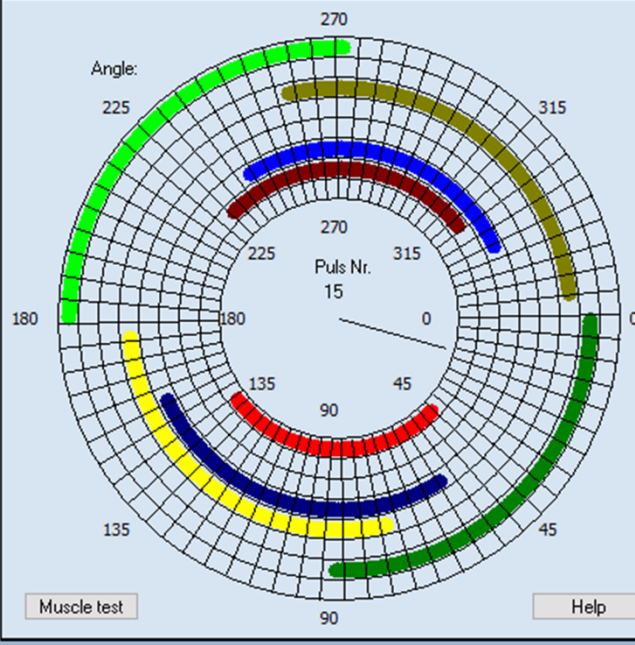
Ready

in- decrease current

Crank turns per minute 0

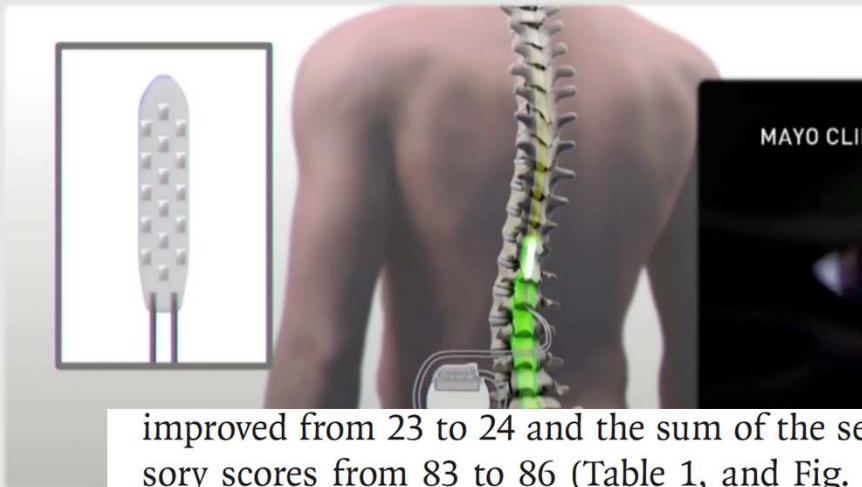




Muscle test Help

New rehabilitation approaches

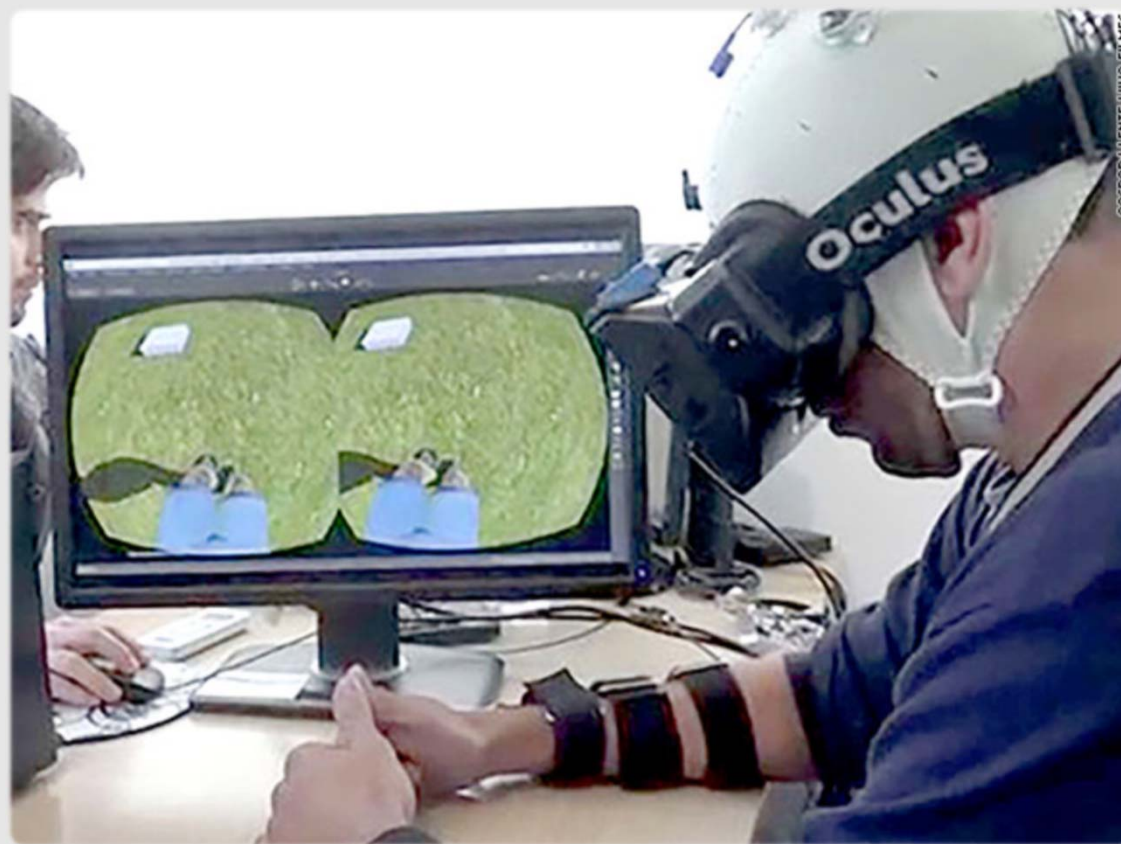
Electrical stimulation of the spinal cord



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,

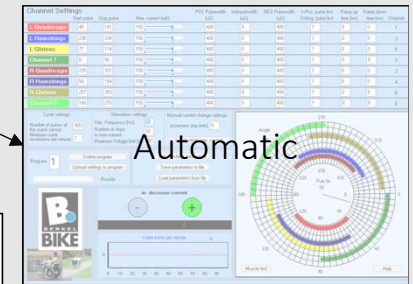
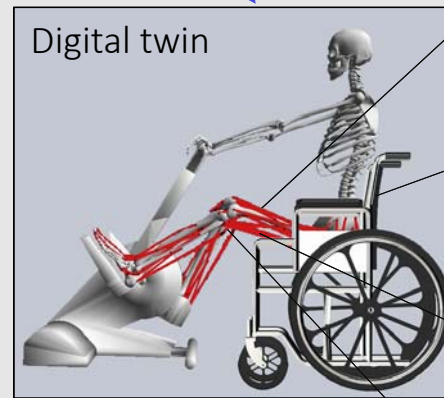
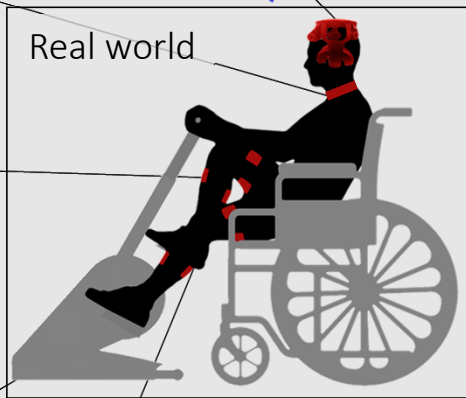
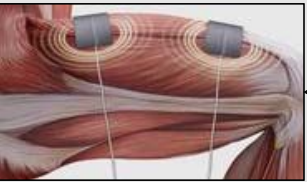
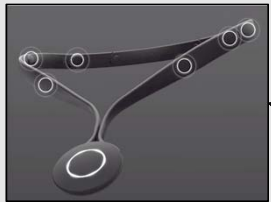
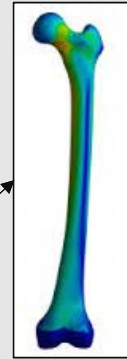
Thought-controlled rehabilitation



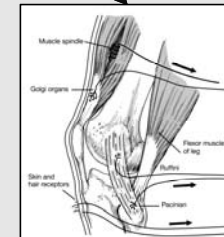
BioSpine: safe and simple to use



Measured data



Control devices

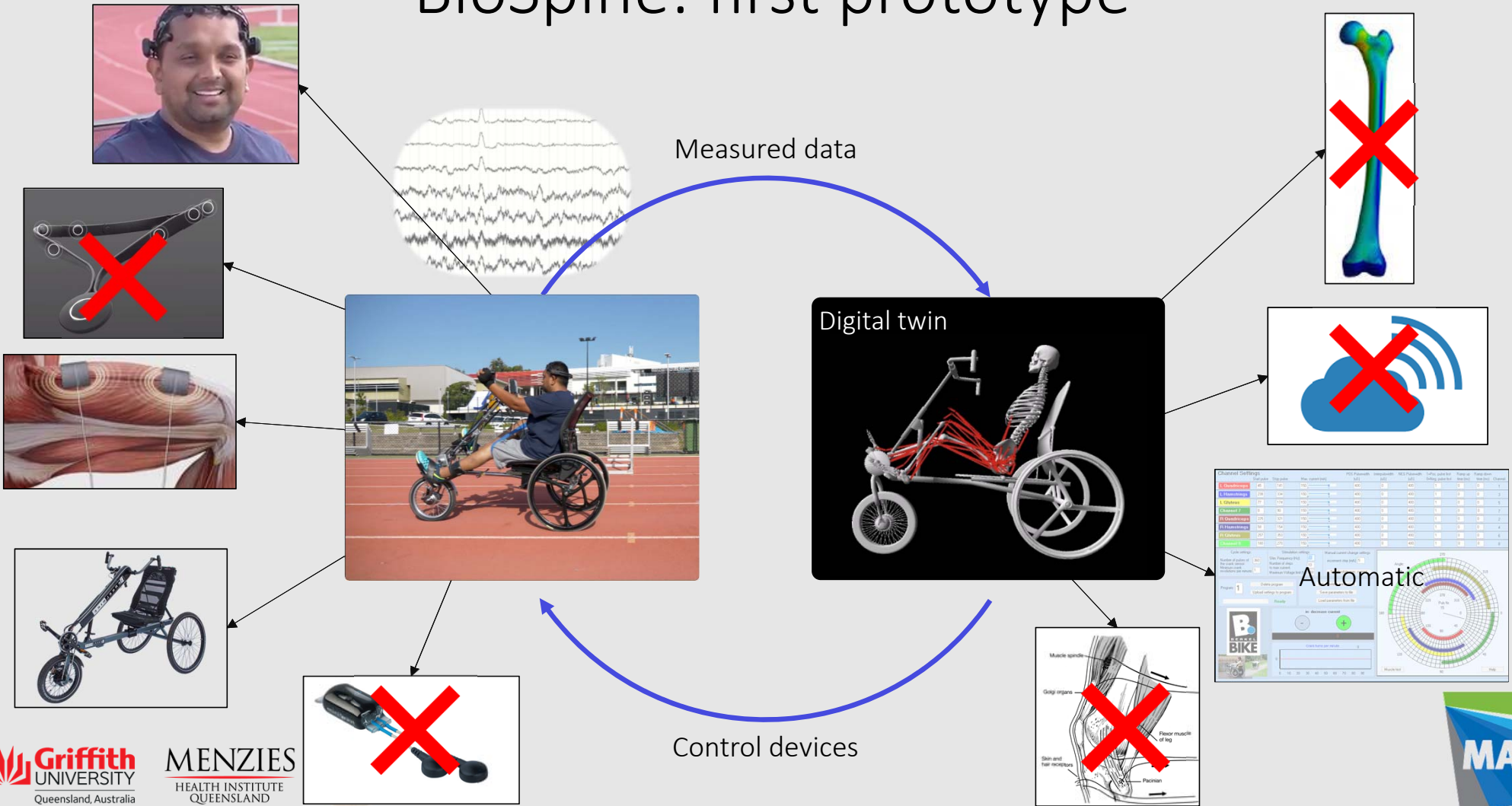


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BioSpine: first prototype



BioSpine: improving thought-control

