

Activity-dependent spinal cord neuromodulation rapidly restores trunk and leg motor functions after complete paralysis

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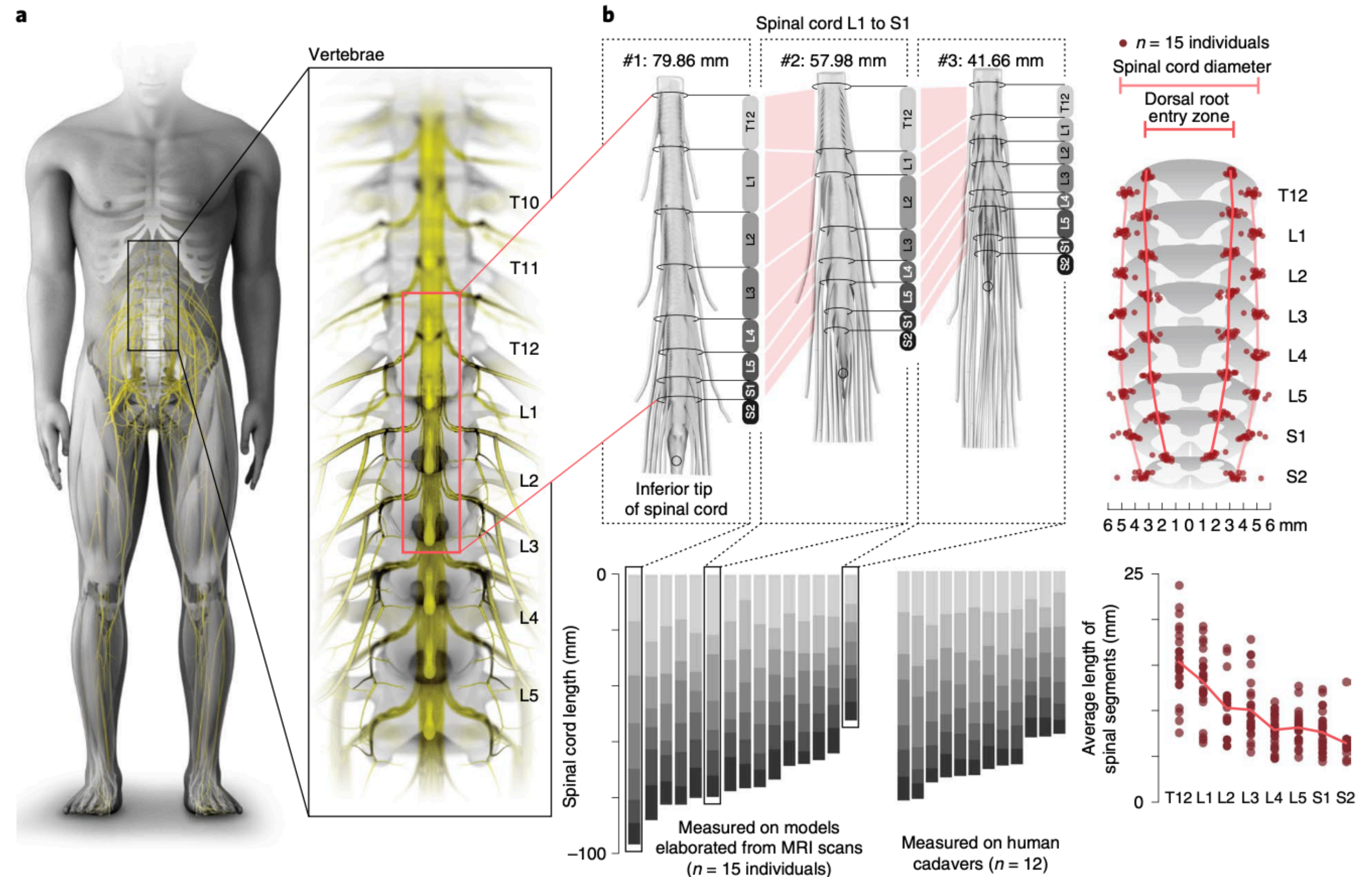
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presented by J. Realmuto, 1/12/2024

Big Picture

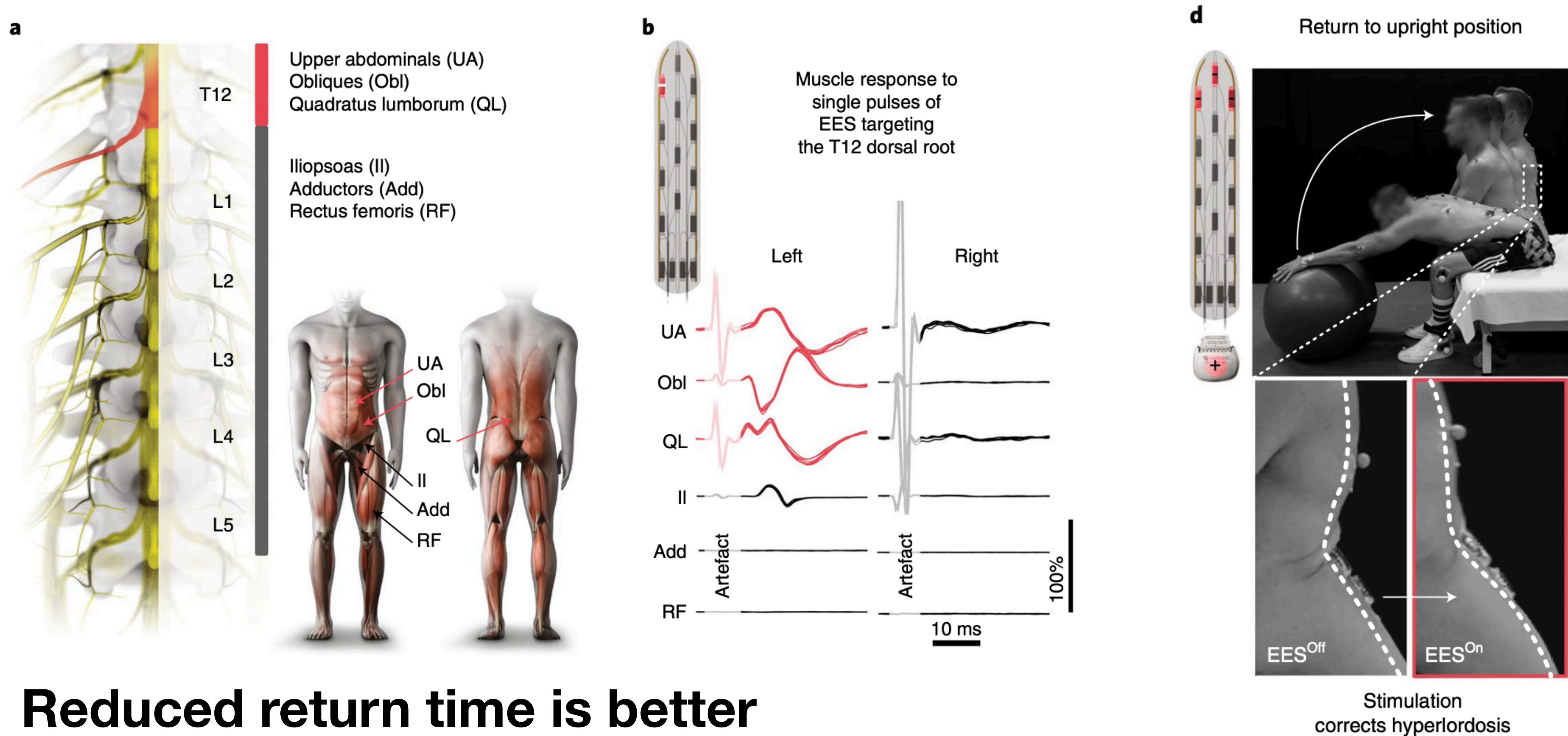
Epidural electrical stimulation is emerging as a treatment for complete spinal cord injury (SCI)

Hypothesis: a new arrangement of electrodes targeting the ensemble of dorsal roots involved in leg and trunk movements would result in superior efficacy, restoring more diverse motor activities after the most severe SCI.



Setup

Researcher apply spinal stimulation and measure time to return to upright position

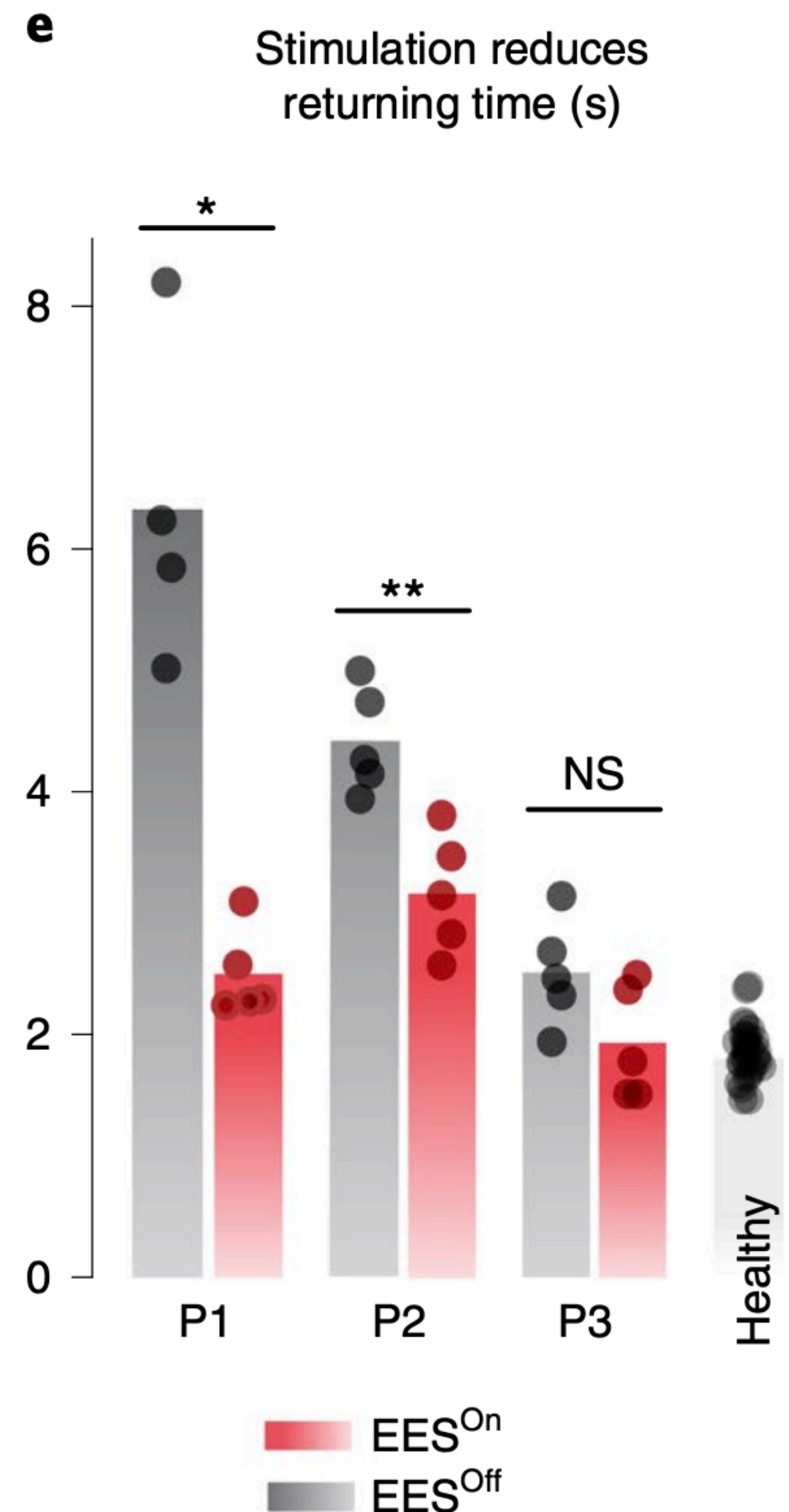


Reduced return time is better

Analysis and Results

bar plots: reporting the time necessary to complete the return phase (extension) of the flexion/extension sequence of trunk movements

- three participants compared to five healthy individuals
- (Mann–Whitney test, two tailed: P1, $P = 0.0159$; P2, $P = 0.0079$; P3: $P = 1429$; * $P < 0.05$; ** $P < 0.01$).
- Dots represent the number of repeated movements for each patient (N = 5 repetitions per patient and per stimulation condition).



Uncertainty

- Not explicitly shown in bar plots, but can infer uncertainty from the spread of samples
- Hypothesis testing (Mann-Whitney test) is a way to determine uncertainty which is summarized with p-value
- no mention of “errors” or “uncertainty” in discussion

Comments

- The study was interesting because the researchers were able to restore some motor function after near complete spinal cord injury, which is amazing
- The study could be improved by increasing the number of participants (N=3) is quite low for clinical evaluation
- We can learn from the statistical approach (Mann-Whitney test) — this test is used to evaluate a hypothesis but when the underlying sample populations are *not normally distributed*. The result of the test gives a p-value which can be interpreted as an estimate on uncertainty