

Assessment of **Neuroplastic Changes** in the Peripheral Nervous System following **cervical Spinal Cord Injury** using Nerve Excitability Testing and MScanFit Motor Unit Number Estimation



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Question

Is it possible and feasible to assess peripheral nerve function in people with cervical Spinal Cord Injury (SCI) using QTRAC’s NET and MUNE tests?

Piloting participants	SCI 1	SCI 2	SCI 3	SCI 4	SCI 5	SCI 6	Average SCI	HC 1	HC 2	HC 3	HC 4	HC 5	Average HC
Age (years)	47	28	54	27	64	79	49.8±20.3	29	29	31	38	55	36.4±9.8
Sex	M	M	M	M	M	M	6M	M	F	M	F	M	3M/2F
Level of Injury	C6	C4	C2	C6	C5	C5	C2-C6						
Months since injury	176	53	6	6	2	2	41.8±68						

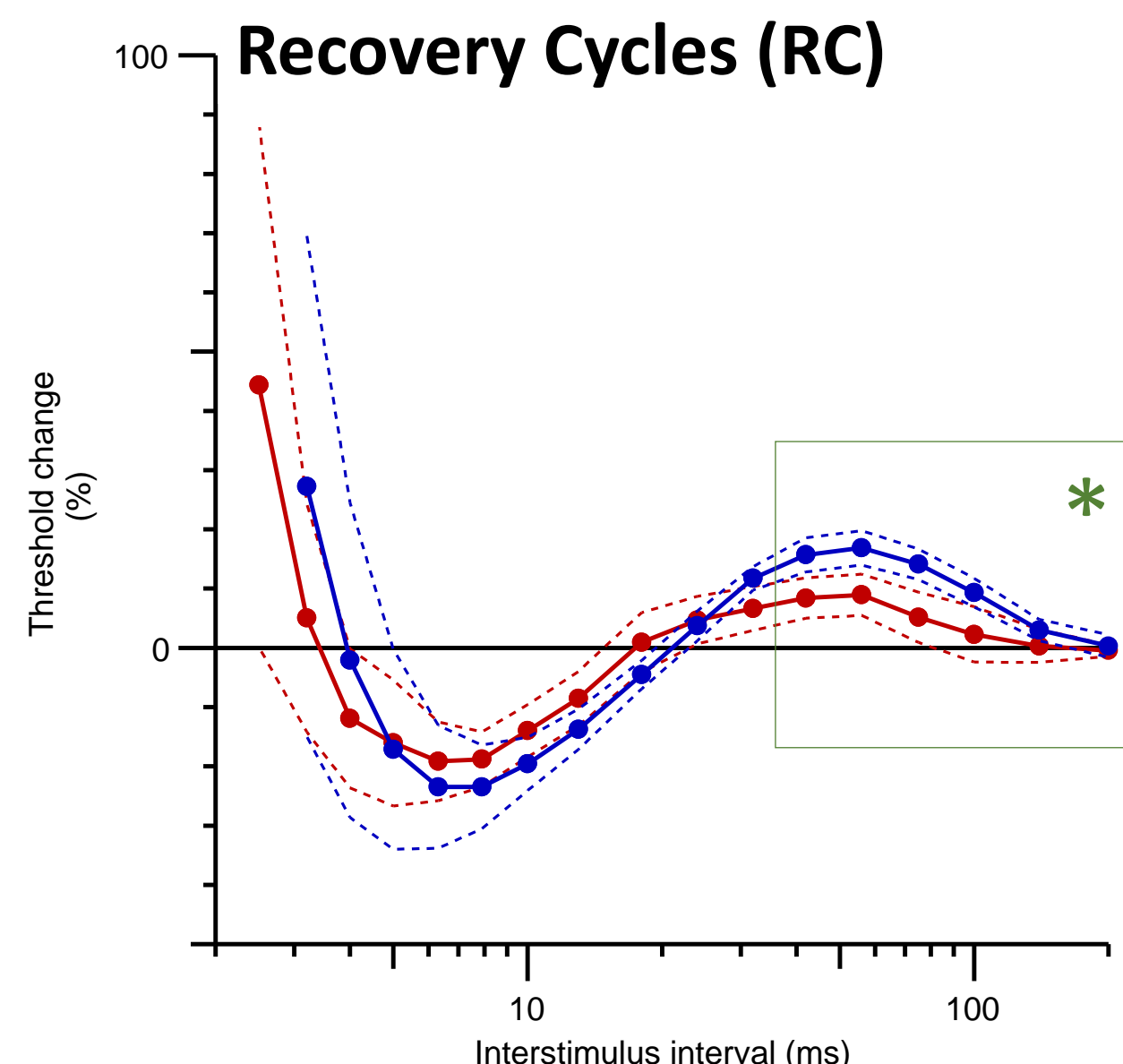
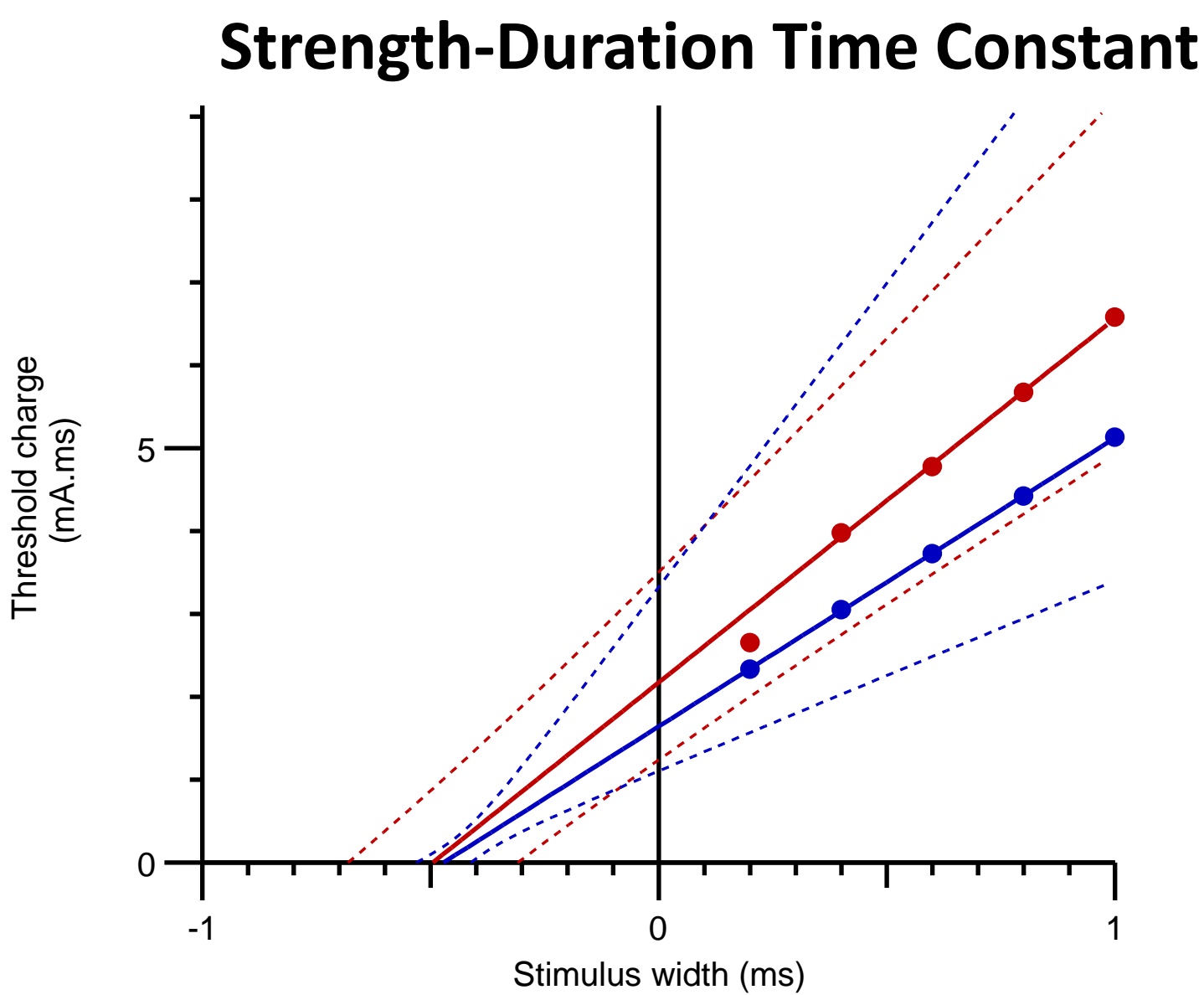
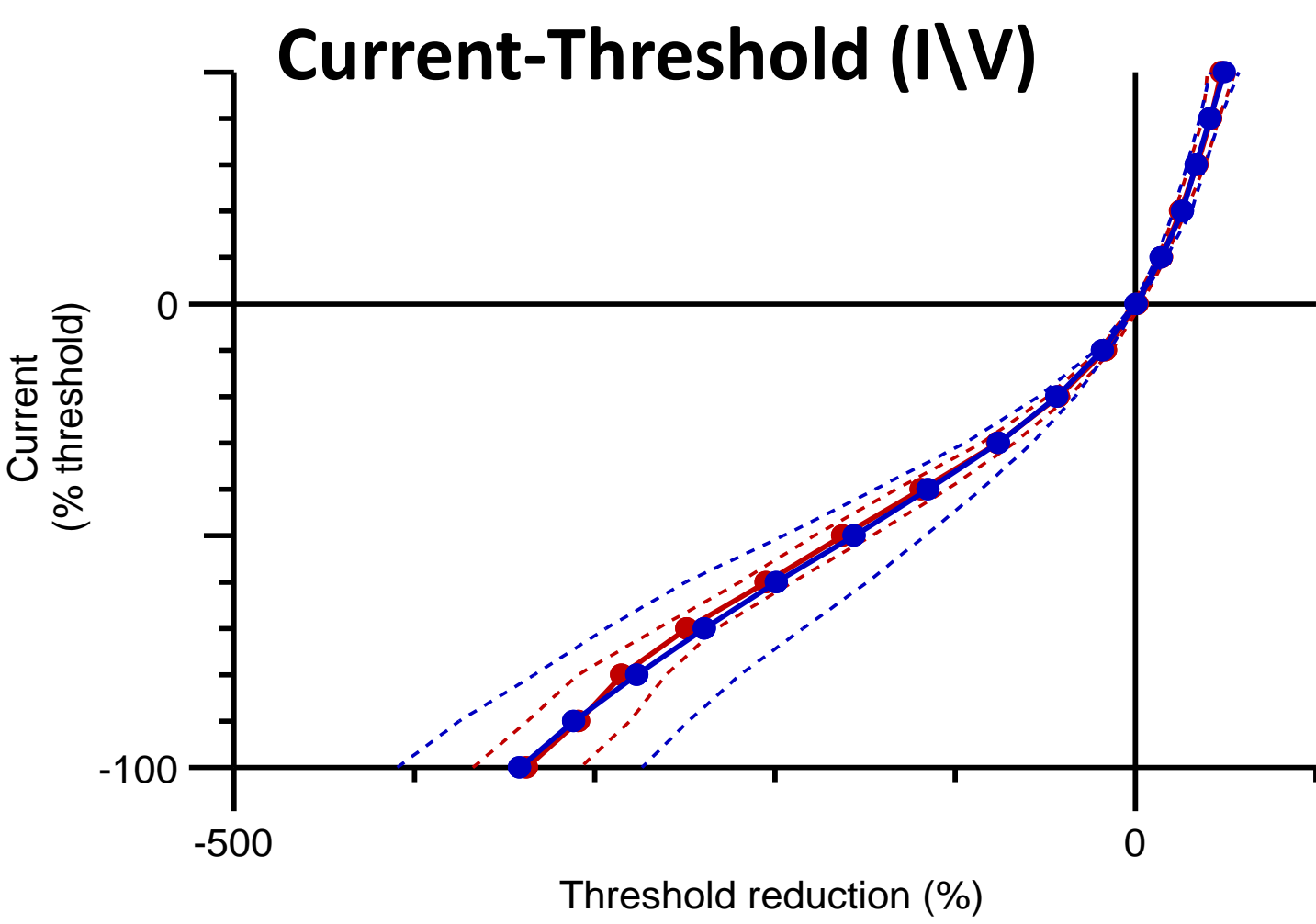
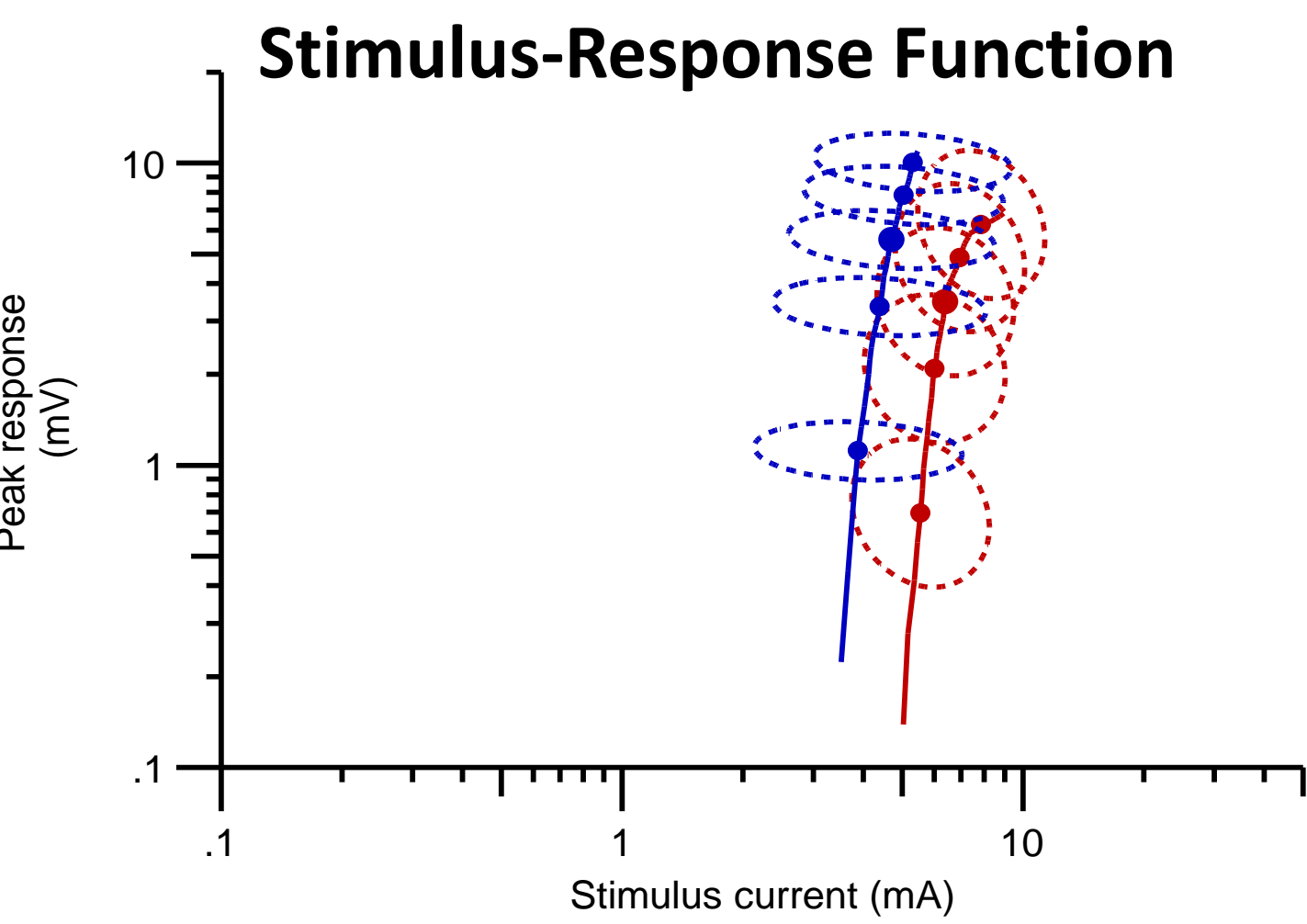
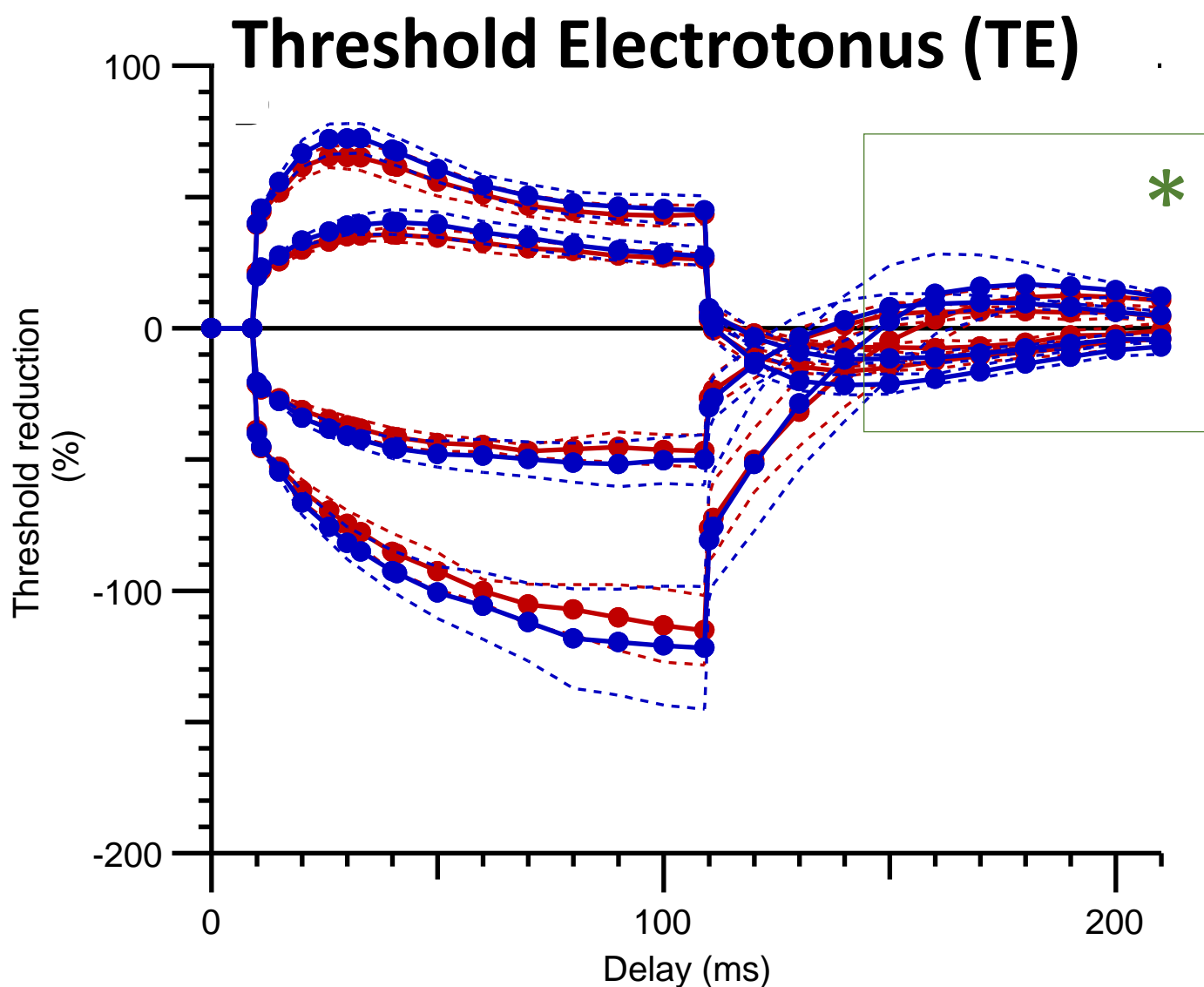
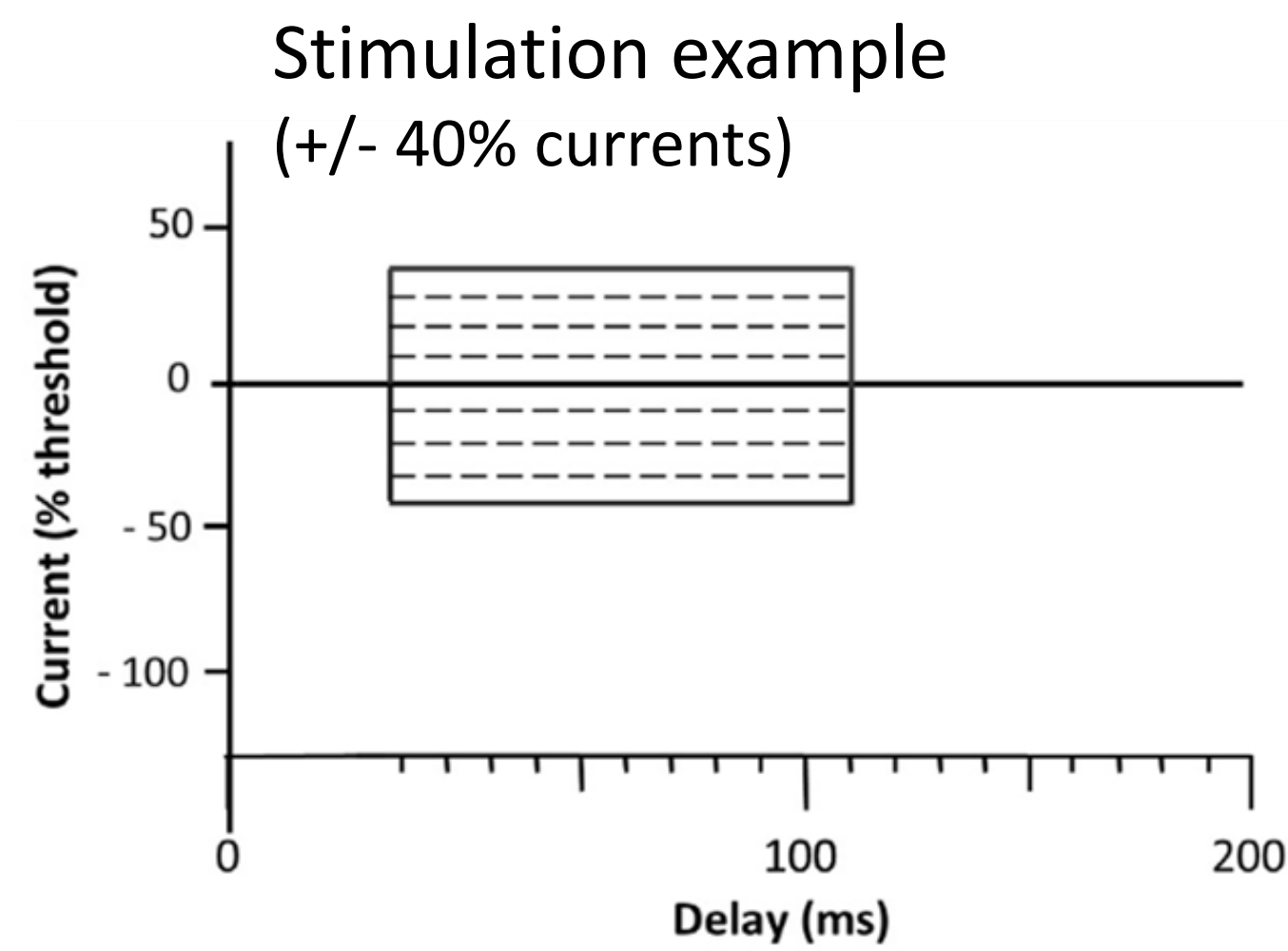
Cross-sectional piloting data demonstrates the feasibility of peripheral nerve testing in people with cervical Spinal Cord Injury and suggests **abnormalities in nerve excitability** and **decrease in number of motor units** compared to healthy controls.

Nerve Excitability Test (NET)

- Stimulating with various test and conditioning stimuli with hyper- and depolarizing currents with threshold-tracking technique to provide indirect measures of channel functioning.
- Potential biomarker for axonal excitability and membrane properties.

Results

Blue= HC (n=5)
Red = SCI (n=6)

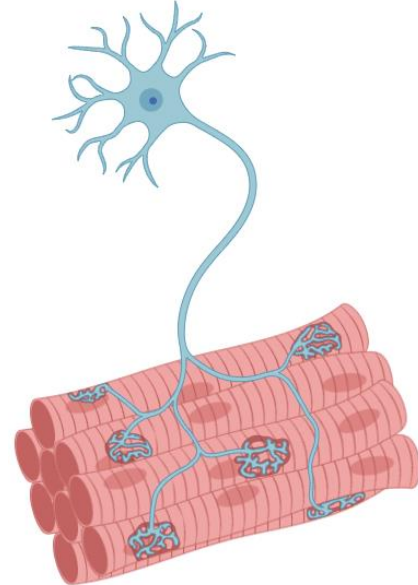


Piloting findings:

Analysis showed that participants with SCI displayed a reduced overshoot in TE and reduced late subexcitability in RC, indicating changes in slow potassium channel functioning.

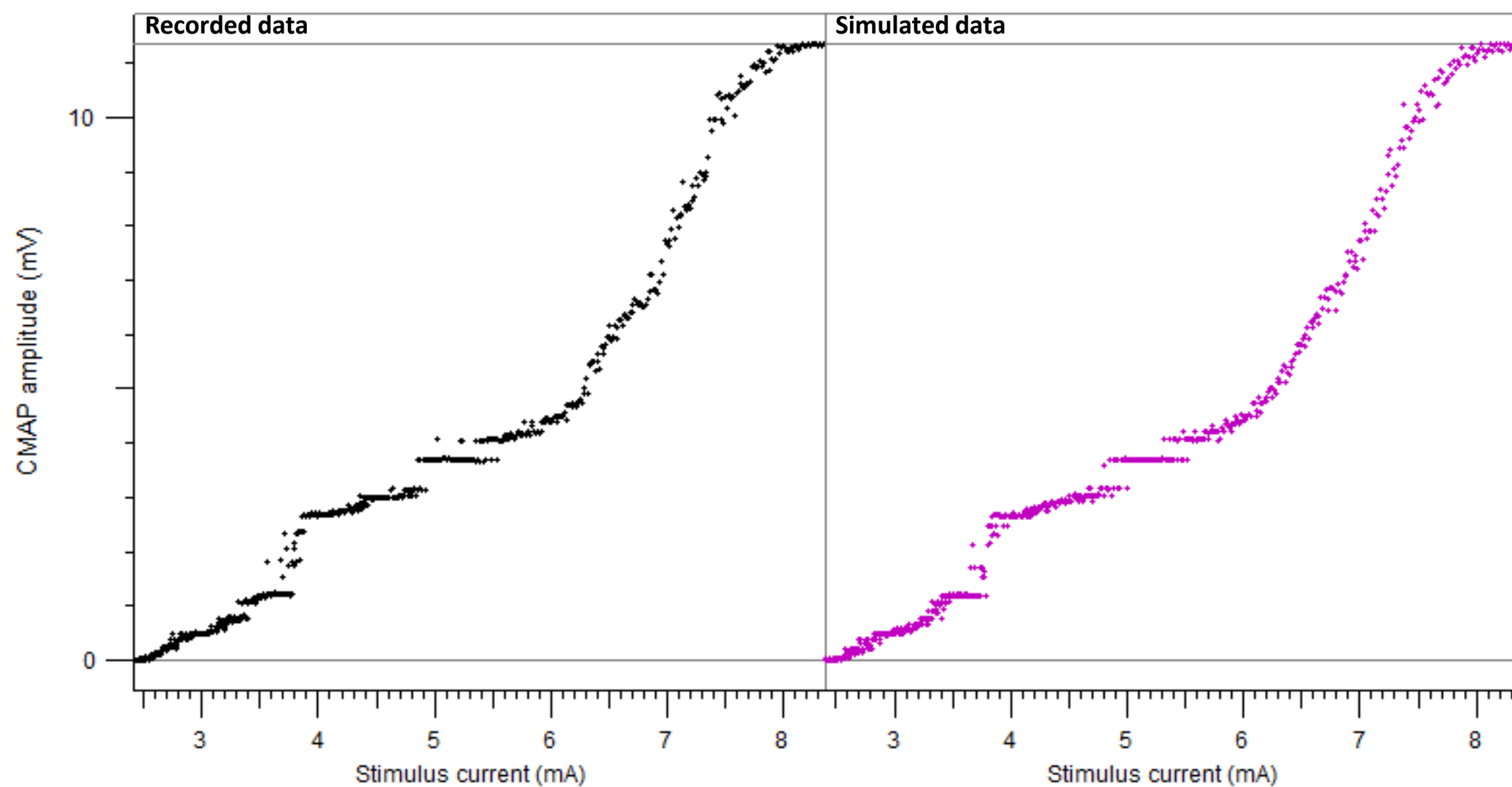
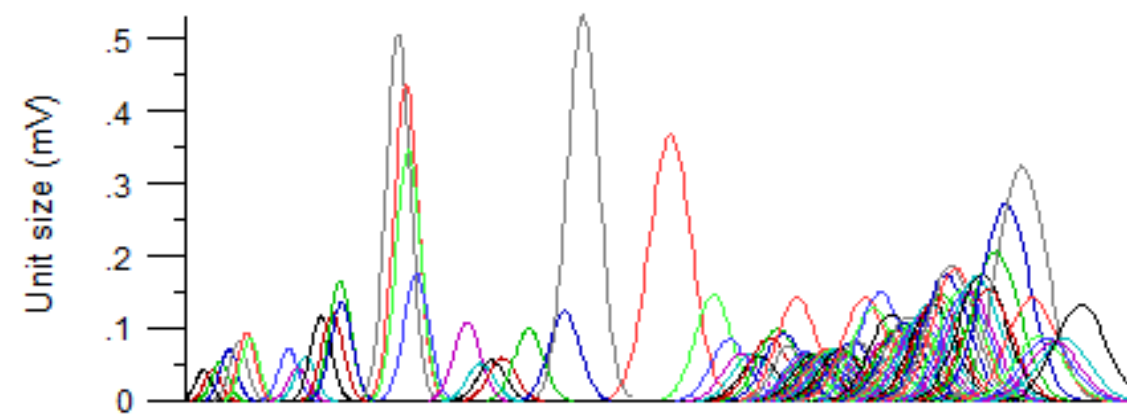
Motor Unit Number Estimation (MUNE) Mscan Fit2

- CMAP recording = stimulus-response curves per stimulation intensity decreasing in steps of 0.2% of supramaximal activation.
- Model terms: N units with three parameters = threshold, amplitude, relative spread of threshold.
- Potential biomarker for denervation and innervation
→ estimates number of motor units and their activation.



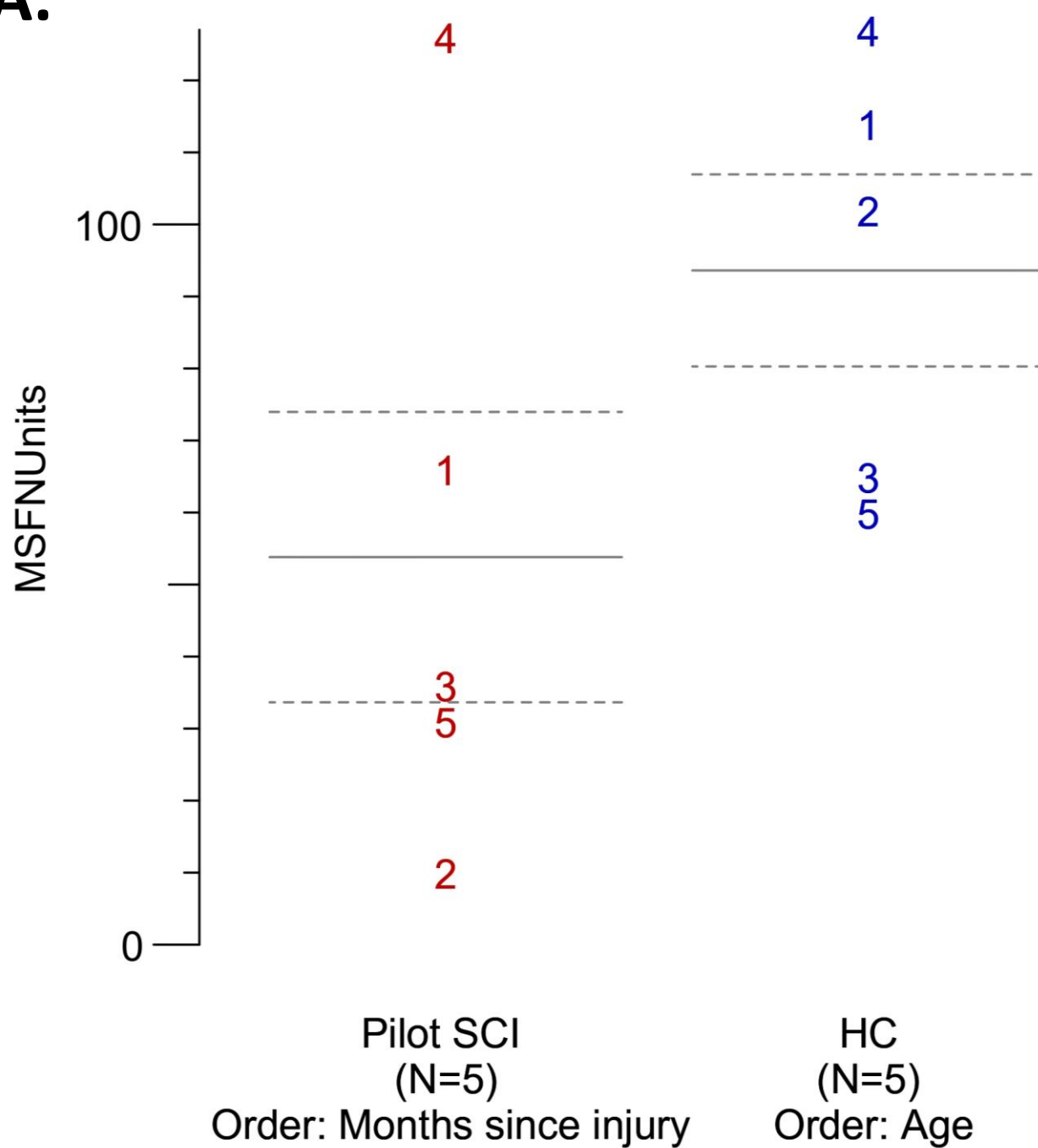
Data modeling

S/R Sites: Wrist-APB
Exponential scan: 623 pts. x 0.2%
Number of units = 91
Fit error = 6.02
SD(foot) = 4.5uV, SD(top) = 12.9uV
Size limit 37.8uV set by CMAP amplitude
Cycle 5.10 Unit 57(25)

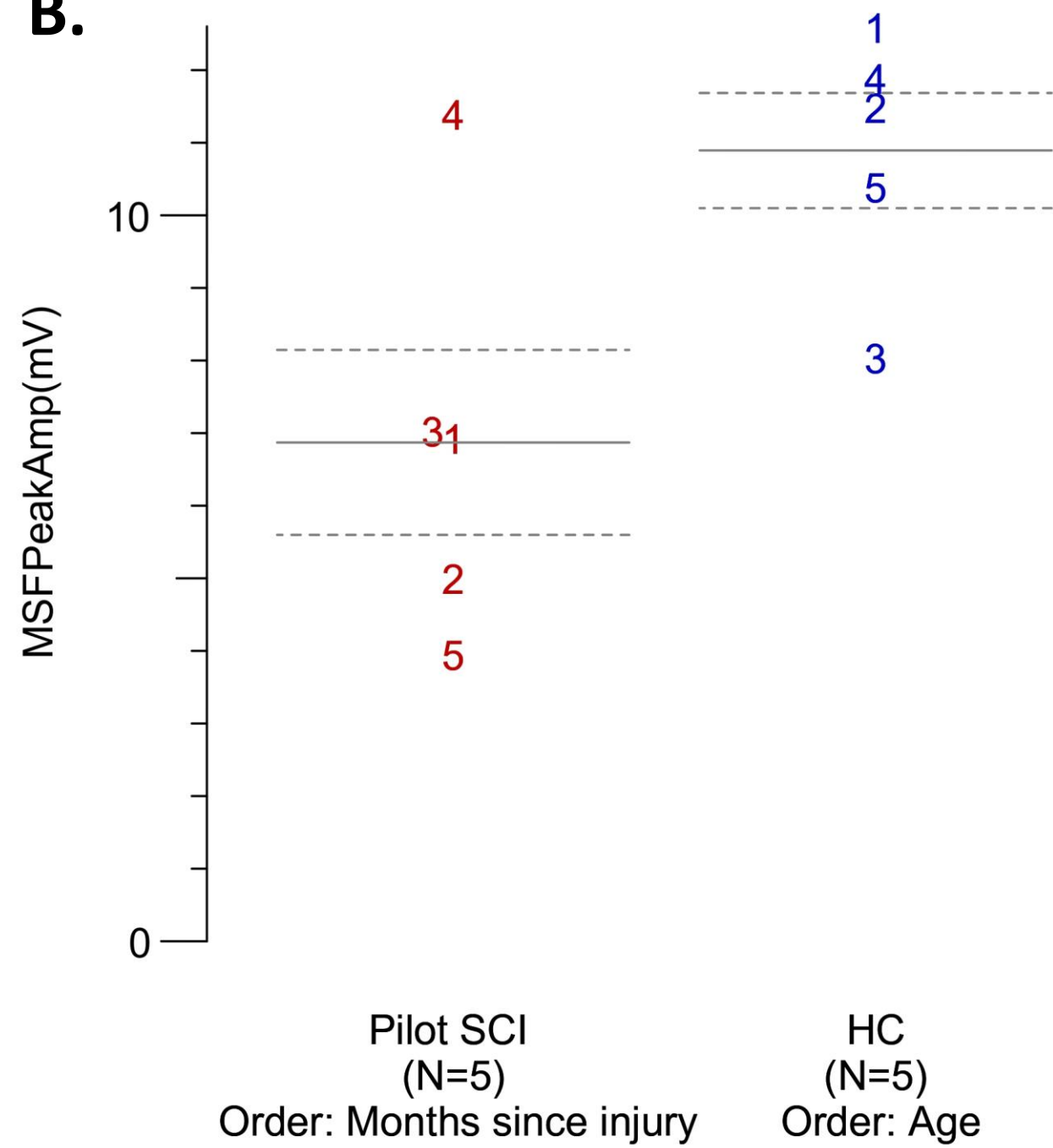


Results

A.



B.



*Data from participant SCI 2 not available for MUNE

Piloting findings:

Participants with SCI displayed a lower mean number of motor units (53.8 ± 20.1 vs. 93.6 ± 13.3) and a lower peak amplitude (mV; 6.87 ± 1.27 vs. 10.89 ± 0.794) with greater variability as compared to HC.

Potential limitations:

High variations in normal range, age-dependent (decrease in number and activation with age) influence results → analysis should be done within-subject and mainly suitable for patient populations (higher sensitivity in detecting abnormalities).

Answer

NET and MUNE are feasible methods to assess peripheral nerve changes following SCI, even in sub-acute SCI (>2 months of injury).
→ Planned experiment will be a longitudinal within-subject design.
→ Standard Operating Protocol from piloting experience and single operator testing should decrease limiting factors.

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