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Motor Evoked Potential Recruitment Curves Indicate Neuroplasticity after Spinal Cord Injury

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Introduction

- ▶ Noninvasive neurostimulatory technology, such as transcranial magnetic stimulation (TMS), can be used to appraise the condition of neuromuscular circuits in spinal cord injury (SCI) patients.
- ▶ Recruitment curves plot TMS stimulus intensity against motor evoked potentials (MEPs) and reflect the excitability of corticomotor pathways.
- ▶ We aimed to investigate excitability in the biceps brachii (BB) of SCI and nonimpaired subjects with paralyzed triceps to observe neuroplasticity associated with the injury.

Methods

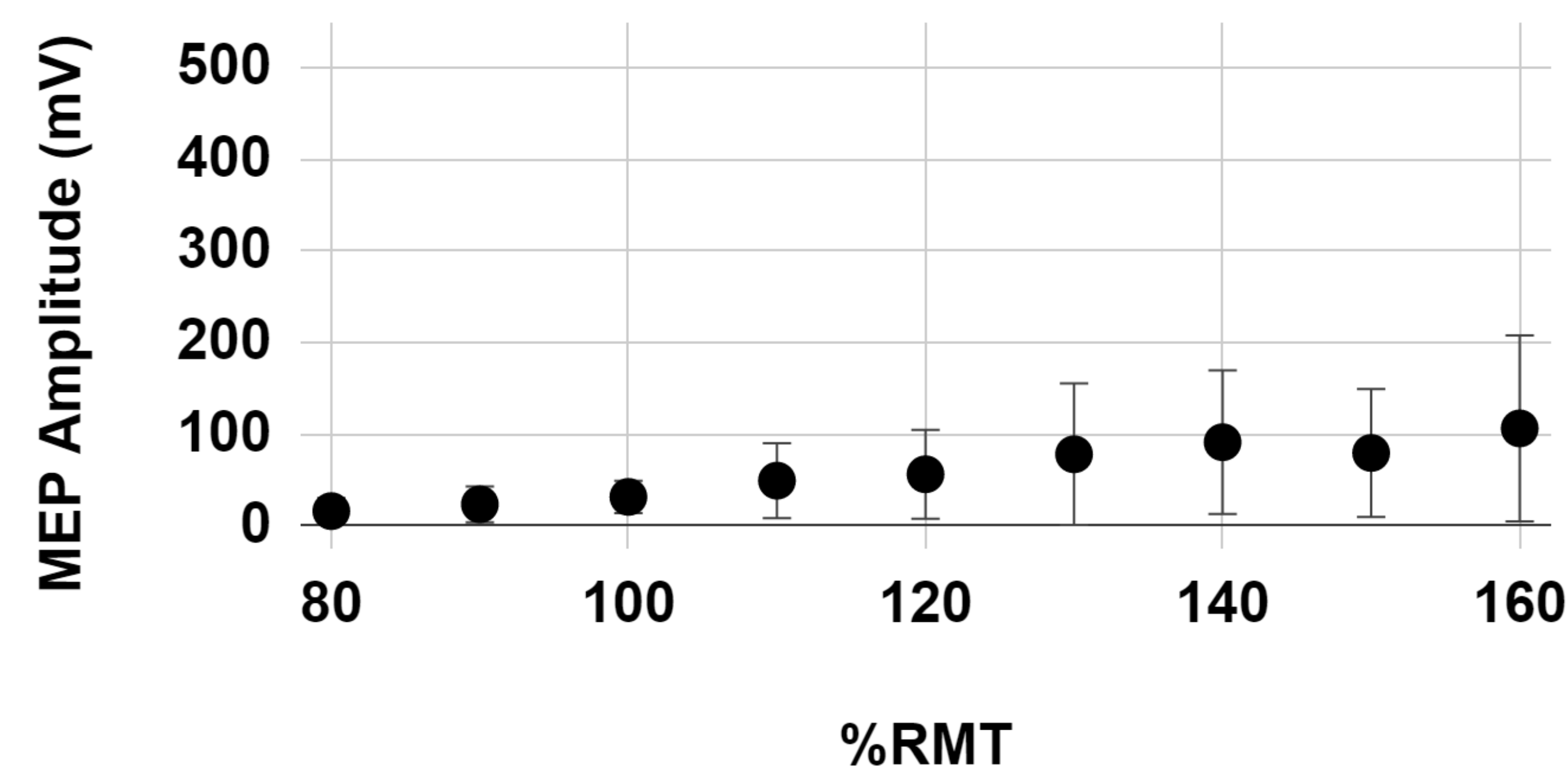
- ▶ 10 nonimpaired and 6 SCI subjects consented to participate in the study, and completed three sessions.
- ▶ Electromyographic (EMG) activity of the BB muscle is recorded during TMS stimulation sessions.
- ▶ Resting motor threshold (RMT) is found as the lowest TMS intensity required to elicit a non-random EMG response trials when stimulating over the hotspot.
- ▶ 52 TMS stimuli were randomly administered between 80% and 160% RMT, with 10 s intervals to the BB hotspot of the motor cortex.
- ▶ Custom MATLAB code was developed for data processing



Figure 1. TMS and subject set up during experimental sessions

Results

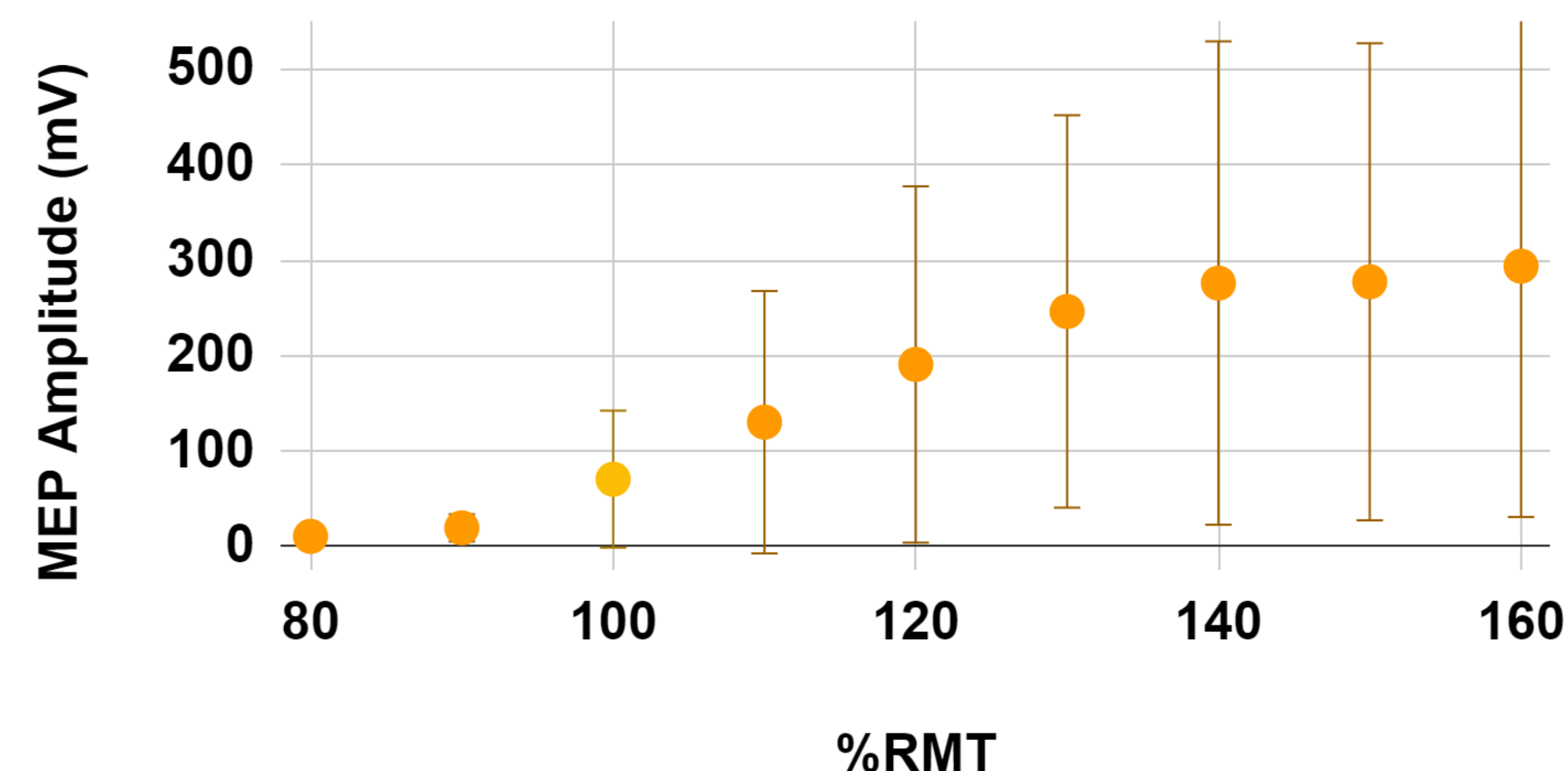
Nonimpaired Recruitment Curve A.



- ▶ The recruitment curve slopes for individuals with SCI, on average, were greater relative to the slopes of nonimpaired individuals between 100% and 140% RMT.

- ▶ Slope was, on average, 5.13 across individuals with SCI, versus 1.49 in the nonimpaired population.

Impaired Recruitment Curve B.



- ▶ MEPs were highly variable in impaired population as two subjects had very low responses.

Figures 2. Individuals with SCI demonstrate greater recruitment curves slopes relative to nonimpaired individuals. Bars indicate standard deviations.

Discussion/Conclusion

- Greater slope in individuals with SCI suggests enhanced excitability of the biceps, which is consistent with previous studies showing greater cortical representation of non-paralyzed hand muscles relative to paralyzed muscles [1]. Steeper slopes in individuals with SCI indicate greater recruitment of later I-waves [2].
- Whether increased recruitment of later I-waves is associated with greater cortical map area is unclear and will require further investigation.
- Future data analysis will include the calculation and comparison of MEP latencies.

References

[1] Stretz LJ et al., *Brain Topogr.* 1995; 7(3):245–50. [2] Nardone R et al., *Spinal Cord.* 2015;53:534-538.

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