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More information

At-home Stroke NeuroRehabilitation with the NeuroEXO Brain-Machine Interface System

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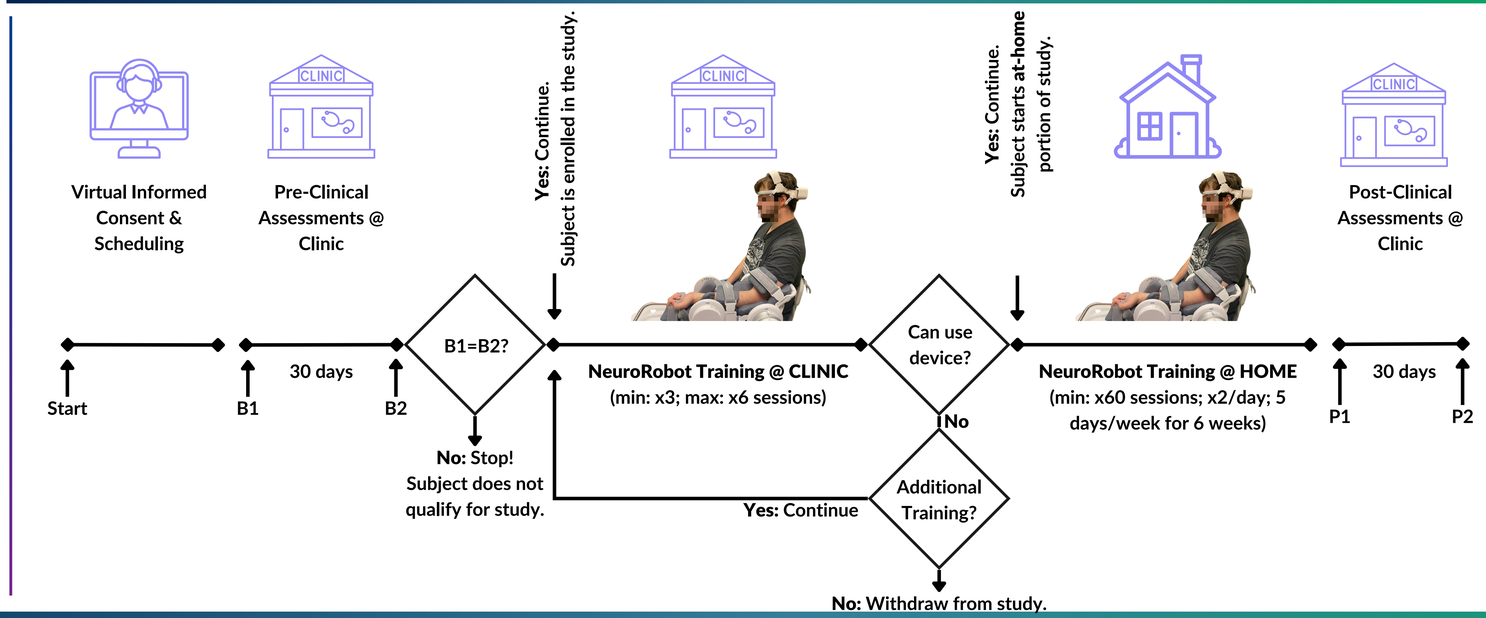
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Introduction

Emerging potential solutions to augment conventional rehabilitation include **brain-computer interface (BCI)**. However, a holistic approach includes **reward**, **engagement**, and **motivation** to improve the **cortical plasticity** phenomenon. This feasibility study presents the validation of the **NeuroEXO**[1], an upper-limb stroke robotic home-based rehabilitation BCI system. The study focuses on assessing **usability**, **Movement Related Cortical Potentials (MRCP) changes**, **electrode impedance**, and **user compliance**.



Methodology (IRB STUDY00003430)



Conclusion

Usability, **performance**, **user compliance**, and **feedback** of the NeuroEXO were assessed in a longitudinal study. The system was used by 5 stroke survivor participants. Results suggest that integral areas that require special attention for device development for stroke survivors include **connectors, power systems**, and s**tructural reinforcement.** Despite **Fugl-Meyer** scores not reaching the thresholds for statistical significance participants experienced self-reported improvements in **mobility**.

References

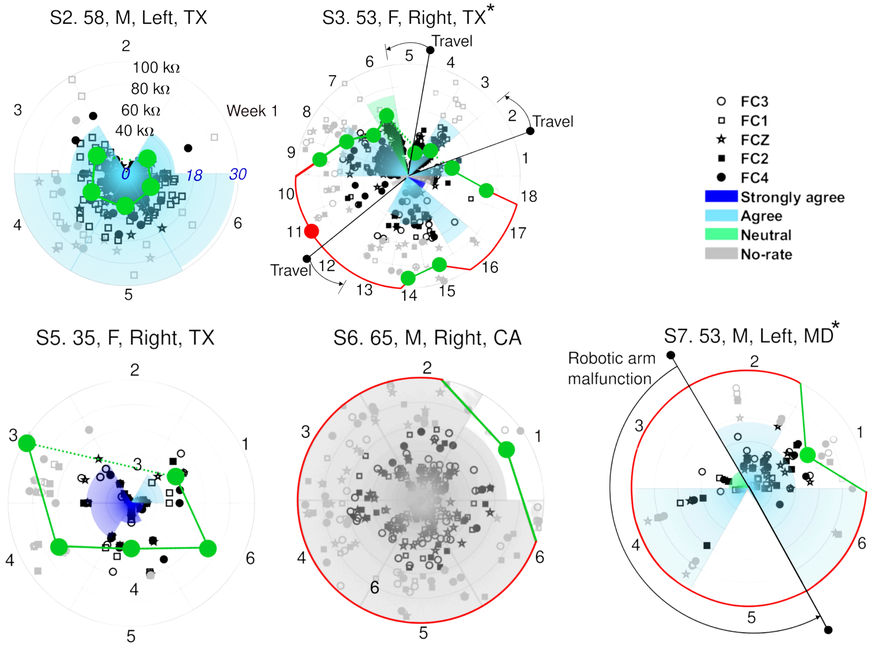
[1] A. Craik et al., "Design and validation of a low-cost mobile EEG-based brain–computer interface," Sensors, vol. 23, no. 13, p. 5930, Jun. 2023. doi:10.3390/s23135930

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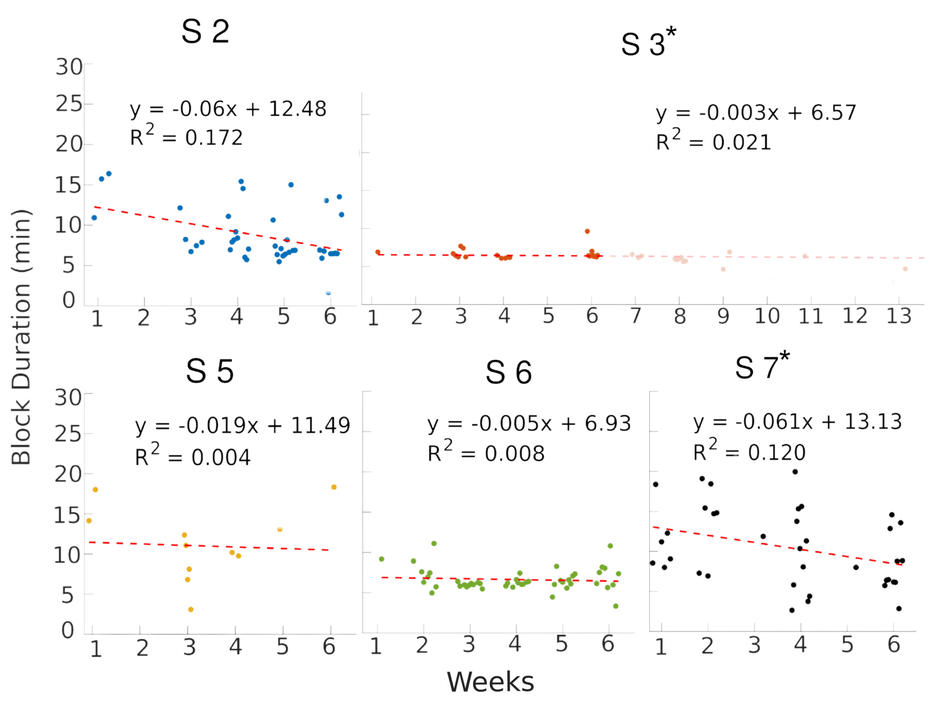
Results

User Compliance, BMI Performance, Signal Quality



*Participant did not have family or friends assistance.

Trial Block Duration



Device Malfunctions

Issues	S2	S3	S5	S6	S7
Robotic arm not pairing	✓	✓			✓
Micro-USB charging port		✓			
Battery endurance	✓				
Server Deadlock	✓				
Structural		✓		✓	✓

Malfunctions reported by the participants with the BCI system included robotic arm not pairing, micro-USB charging port, battery endurance, server deadlocks, and structural integrity. Modifications were made to the system such as the addition of a battery bank, addition of a USB-C charging port, and headset design changes to provide solutions for the issues.