THE IMPACT OF TRAINING HAND FUNCTION WITH A NOVEL DEVICE IN A SAMPLE OF CHRONIC STROKE PATIENTS

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Background

Finger and hand function play a crucial role in performing activities of daily living (ADL) and if impaired, can negatively impact social, vocational, and quality of life domains.

Hemiplegia is commonly observed post-stroke, with ~70% of Persons with stroke (PWS) presenting with hand and upper limb impairment.

The objective of this study was to explore the changes in motor function after a 15-hour training program using the MyHand™ System.

Participants

Eleven participants who sustained a single stroke at least 6 months or greater prior to the beginning of the intervention were recruited from Greater Toronto Area, ON Canada.
All participants met the following inclusion criteria:

- 18-100 years old
- Single stroke ≥ 6 months prior to enrollment
- Lack of severe spasticity or contractures
- Chedoke McMaster Stroke Assessment ≥ 3 for shoulder pain and hand function
- Mini-Mental State Exam score arm ≥24
- No botulinum toxin injections in the UL within 3 months of enrollment

Sex	Age (years)	Years Post-Stroke	Aff. UL	Type of Stroke
4F/ 7M	59.82 ± *20.32*	*10..27 ± 9.69*	8 L/3 R	4 Isch/5 Hem/2 Unclear

Table 1: Demographic Information of the sample of 11 participants collected for this study. Age and years post presented as mean ± SD in years. Two participant did not disclose their type of stroke as they were unable to recall. Participant's medical records were not obtained for this study. . Aff, affected; UL, upper limb; Hem, hemorrhagic; Isch, ischemic; ARAT, Action Research Arm Test.

Results

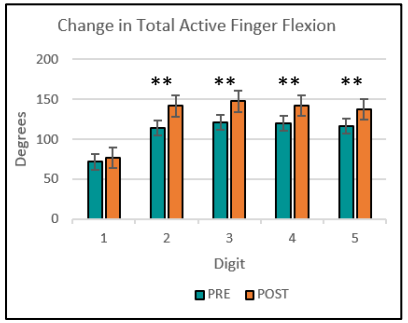


*Figure 1: Changes in Active finger flexion; represented through a composite score of flexion across the metacarpal phalangeal and interphalangeal joints. ** p ≤ 0.01*

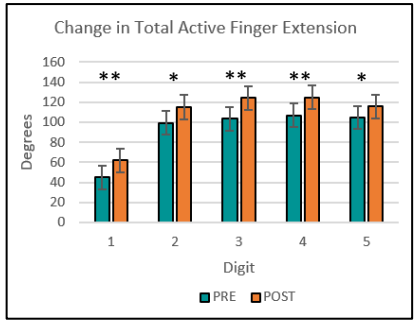
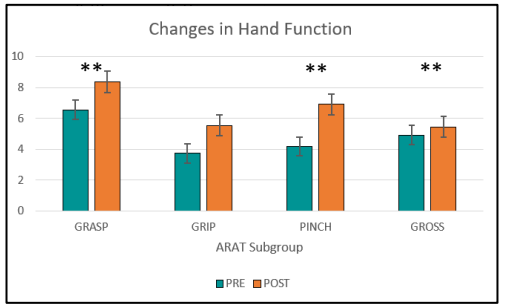


*Figure 2: Changes in Active finger extension; represented through a composite score of extension across the metacarpal phalangeal and interphalangeal joints. *p ≤0.05, ** p≤ 0.01*

Using the Wilcoxon Signed Ranks test, a significant improvement in hand and upper limb activity was observed with the Action Research Arm Test (ARAT [*p = 0.004]*) and in finger and hand strength (Grip *p=0.006,* Tripod Pinch *p=0.015* and Lateral Pinch *p=0.006*). Improvements were made in total active flexion across Digit 2 through 5 (Digit 2 *p=0.006*, Digit 3 *p=0.008*, Digit 4 *p=0.004* and Digit 5 *p=0.01*). Improvements were made across all five digits in total active extension (Digit 1 *p=0.004,* Digit 2 *p= 0.026,* Digit 3 *p=0.008,* Digit 4 *p=0.006,* Digit 5 *p=0.055)*. The mean difference in ARAT met the Minimal Clinically Important Difference.

*Figure 3: Changes in hand function represented through the subcategories of ARAT. ** p≤ 0.01*



Methods

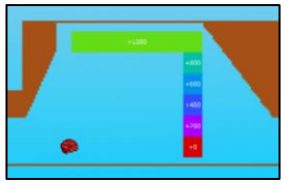


Figure 7: The visual feedback while using the device. One is advised to guide the brain through the course while avoiding the brown blocks via flexion and extension of each finger.

Figure 5: MyHand™ System MK 2.45.

Figure 6: How the hand is placed in the device. Each finger is placed in separate finger cups and adjusted accordingly.

Conclusion

- Statistically significant improvement in the hemiparetic hand and upper limb function was observed after 15 hours of treatment
- Adherence to the protocol was near perfect apart from one participant who was only able to complete 13 out of the 15 sessions
- No adverse events were observed throughout the study
- Future work in this area must focus on understanding the relationship between changes in active range of motion, finger/hand strength and functional changes, and the mechanisms that mediate this recovery.
- Larger sample sizes will help better with generalizing these results across the population. Further, this strategy will also help with understanding practical timelines for neurorehabilitation and dosage parameters.