A Pilot Study of a Hand Robotic Device for Post-Stroke Rehabilitation

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Introduction and Purpose

• Hemiparesis is a substantial contributor of post-stroke disability.

• Repeated exercise has been found useful in restoring function post-stroke.

• Robotic devices are able to deliver well-defined repetitive exercises consistently.

• The Amadeo Hand Robot System is a novel device for improving hand function.

• Results for 12 subjects reported in a feasibility study training hemiparetic stroke survivors.

Figure 1: Amadeo Hand Robot System

Figure 2: Gaming modes using isometric finger contractions for control.

Methods

• Participants were evaluated at baseline, midpoint and conclusion of a 6-week training program.

• Training sessions were held 3 times/week.

• Sessions included active assisted finger movement, and isometric finger contractions in both flexion and extension to control games.

• Primary outcome measures was the Upper Extremity component of the Fugl-Myer (UEFM)

• Secondary outcome measures included, the Motor Activity Log (MAL), the Manual Ability Measure-36 (MAM-36), the 9-Hole Peg Test, the Jebsen Test of Hand Function, and the Stroke Impact Scale.

Results

Significant improvements were seen in:

• UEFM mean score of 37.9(baseline) to 43.0 (end) (p=0.0004).

• MAL Amount of Use mean score 37.8 (baseline) to 55.7 (end) (p=0.001); MAL Quality of Use mean score 40.2 (baseline) to 54.2 (end) (p=0.004).

• Improved speed in Jebsen Test of Hand Function with a mean of 701.5 seconds (baseline) to a mean of 649.0 seconds (end) (p=0.007).

• No significant improvements were noted in the MAM-36, 9-Hole Peg Test and Stroke Impact Scale.

Figure 3: Mean MAL Raw Scores in Amount and How Well scales at baseline, midpoint and completion of training.
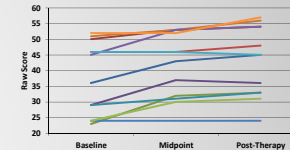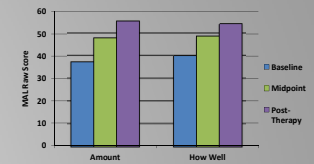

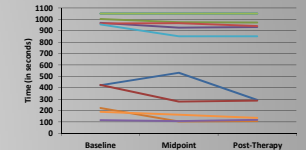Figure 4: UEFM individual scores at baseline, midpoint and completion of training.

Figure 5: Jebsen Test of Hand Function individual total time at baseline, midpoint and completion of training.

Conclusion

Results suggest:

• Improved speed in performing functional tasks.

• Increased use of affected hand and improved quality of use in affected hand.

• Overall improvements in hand function.

Clinical Relevance

Hand robotic training with the Amadeo Hand Robot System is feasible and well tolerated in individuals with chronic stable deficits post-stroke.