

UC Irvine

UC Irvine Previously Published Works

Title

Robotic Retraining of Finger Movements After Stroke.

Permalink

<https://escholarship.org/uc/item/3jd4w5dq>

Authors

Ingemanson, Morgan L

Rowe, Justin B

Chan, Vicky

et al.

Publication Date

2016

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed



 FREE ACCESS | ARTICLE

INTERNATIONAL STROKE CONFERENCE POSTER ABSTRACTS

SESSION TITLE: CLINICAL REHABILITATION AND RECOVERY POSTERS II

Abstract TP155: Robotic Retraining of Finger Movements After Stroke

Morgan L Ingemanson, Justin B Rowe, Vicky Chan, Steven C Cramer, and David J Reinkensmeyer Univ of California, Irvine, Irvine, CA

Originally published 1 Feb 2016 | Stroke. 2016;47:ATP155

Abstract

Background: Robots aid motor rehabilitation, but there has been limited attention to recovery of finger movements. This study evaluated robotic assistance during finger movement training. Functional MRI (fMRI) was acquired at baseline to understand predictors of treatment gains.

Methods: Patients with chronic stroke underwent a baseline fMRI scan, alternating rest with affected-side finger movements similar to those made during robotic therapy. Next, subjects received therapy 3 hr/wk for 3 weeks using FINGER (Finger Individuating Grasp Exercise Robot), with which subjects moved their paretic index and middle fingers to play a musical game similar to GuitarHero. FINGER used an assistance-as-needed algorithm to facilitate completion of grasping movements, which increased sensory feedback without altering voluntary motor output. Participants were randomized to receive High Assistance (to insure 85% success) or Low Assistance (55% success).

Results: 30 subjects (mean age 58 yr; baseline Fugl-Meyer 46 out of 66; 37 mo post-stroke) completed the study. Significant gains were found in the primary outcome measure, change in Box & Blocks (B&B) score (23 to 25.5, $p < 0.0001$). There was no difference between High and Low Assistance groups in the primary endpoint ($p = 0.65$), though some secondary outcomes favored High Assistance. The fMRI scans found that greater treatment gains were associated with higher laterality index in primary sensory cortex, indicating greater boost in B&B score over time with higher pretreatment balance of activation towards ipsilesional rather than contralesional sensory cortex; laterality index in primary motor cortex lacked predictive value.

Conclusions: Significant motor gains were found with a robotic device that targets finger movements. Sensory factors appear key: treatment content emphasized augmented sensory

feedback, and the hemispheric balance of fMRI activation within sensory but not motor cortex predicted treatment gains. Together these findings suggest Hebbian rules of sensorimotor cortex plasticity during finger robotic therapy after stroke.

Footnotes

Author Disclosures: **M.L. Ingemanson:** None. **J.B. Rowe:** None. **V. Chan:** None. **S.C. Cramer:** Consultant/Advisory Board; Modest; Roche, MicroTransponder. Ownership Interest; Significant; personIRN. Consultant/Advisory Board; Significant; RAND Corp, Dart Neuroscience. **D.J. Reinkensmeyer:** Ownership Interest; Significant; Flint Rehabilitation Devices.



[^ Back to top](#)



Stroke

AHA Journals

Arteriosclerosis, Thrombosis, and Vascular Biology (ATVB)

Circulation

Circ: Arrhythmia and Electrophysiology

Circ: Genomic and Precision Medicine

Circ: Cardiovascular Imaging

Circ: Cardiovascular Interventions

Circ: Cardiovascular Quality & Outcomes

Circ: Heart Failure

Circulation Research

Hypertension

Stroke

Journal of the American Heart Association (JAHA)



Journal Information

About Stroke

