

INTERNET-BASED HOME TRAINING FOR ADULTS WITH CEREBRAL PALSY – THE ULTrA PROJECT

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Movement Therapy

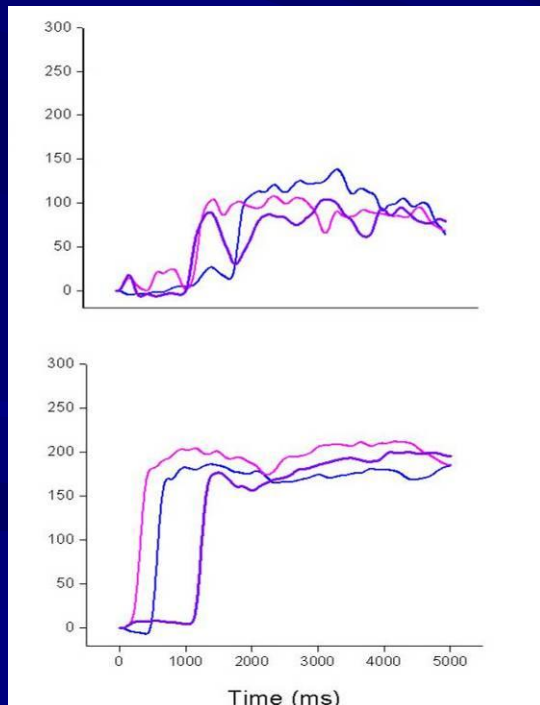
- Role of task-based motor training to improve upper limb function
- Based on concept of plasticity within the central nervous system (“use it or lose it”)
 - increase in synaptic connections, neurotransmitters, growth factors

- Typically involves intensive practice (up to 10 hrs/day for several weeks)
 - e.g. constraint-induced therapy in stroke
- Limitations:
 - Time commitment
 - Resources – clinical setting, rehabilitation specialist required
 - Motivation/Adherence

Motor Training in Children with Hemiplegic CP

- 6 wk home training program (40 min 2x daily, 5x wk)
- Improved upper limb coordination, grasp force control

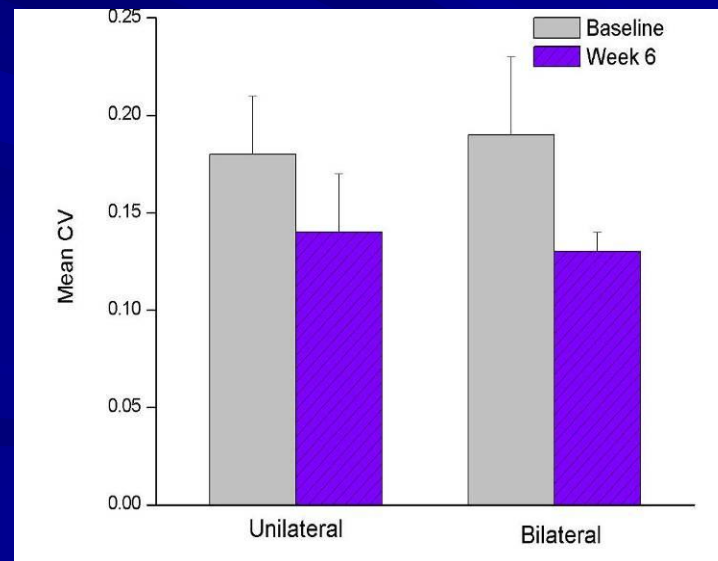
Grasp Force



pre

post

Grasp Force Variability



Purpose of the ULTrA Study

- To determine if an internet-based home training program will improve sensorimotor function in adults with hemiplegic cerebral palsy.

Study Participants

- N=12 (3 males, 9 females)
- age range: 21-58 yrs
- mild to moderate UL spasticity

- home setting
 - greater Ann Arbor area, Flint, Lansing, Ohio, Windsor, Canada

- 10/12 – no assistive devices

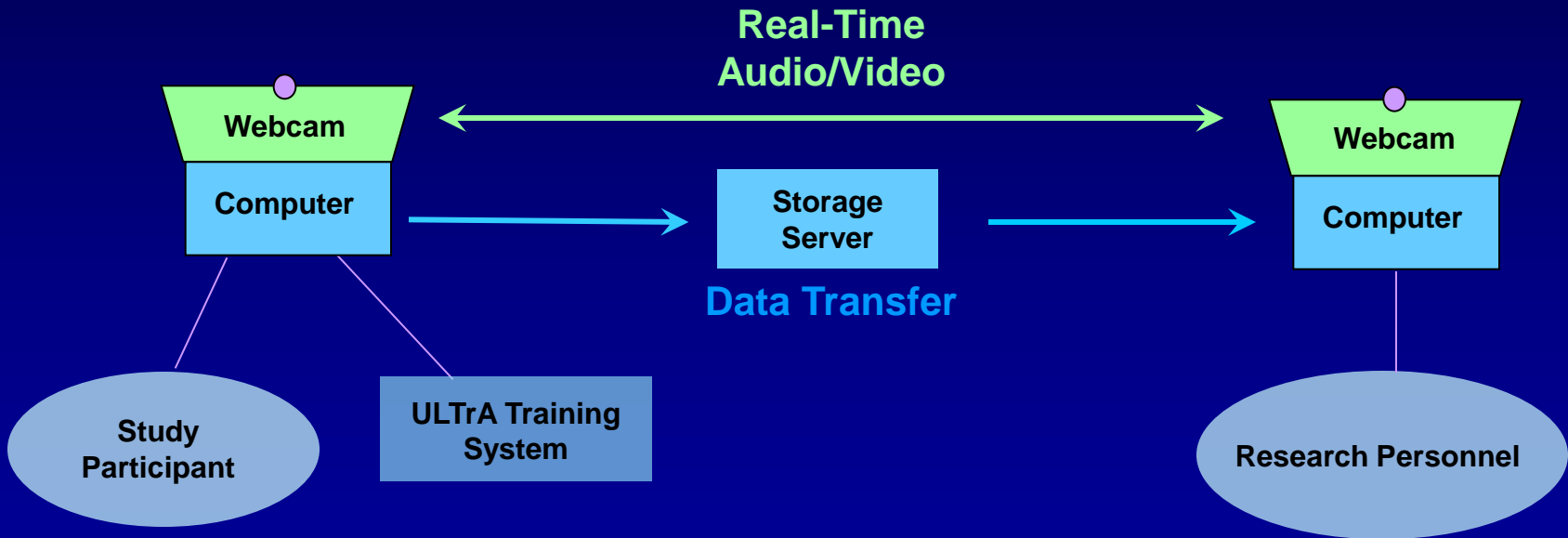
ULTrA Program

- 8 wks – 40 min/day, 5 days/wk
- monitored by interactive webcam – 2-3 times/wk
- arm and hand performance data uploaded from home to lab via the internet after each training session
- software-guided instructions for warm-up/training modules
- pre/post laboratory-based movement assessment

Participant's Residence

Internet

Motor Control Laboratory



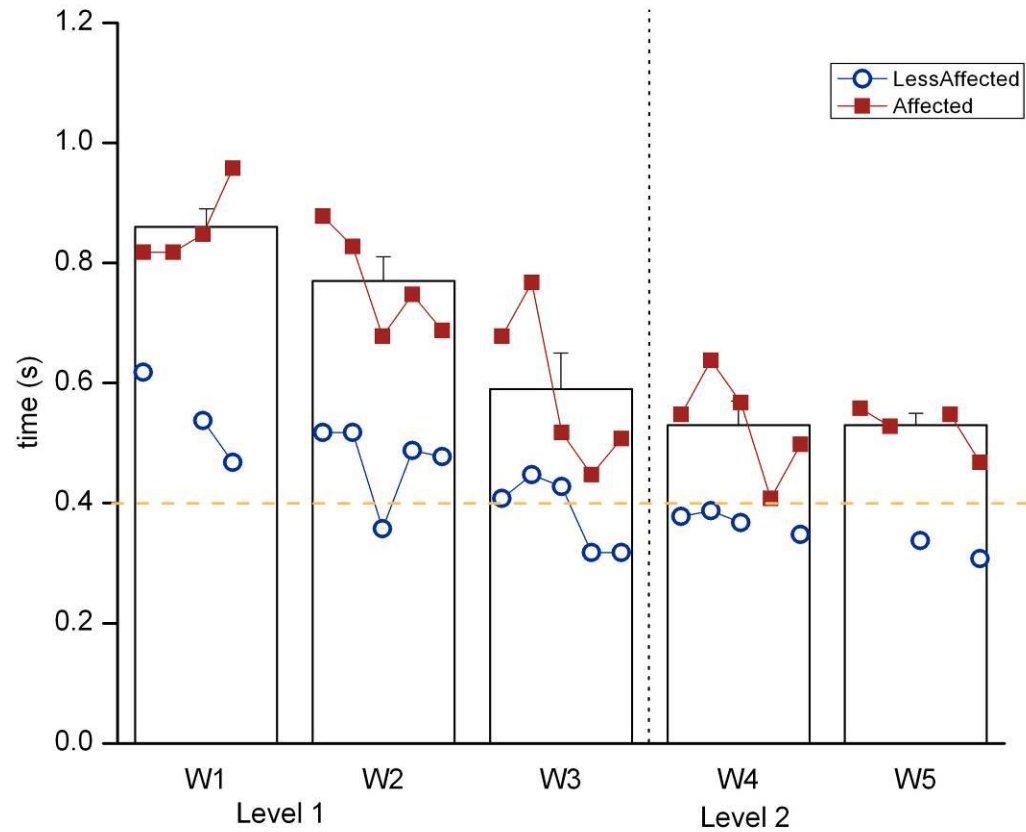
ULTrA Training Components

- Visually-guided upper limb reaching (unilateral, bilateral)
 - Workspace – low - high targets; central – lateral targets)
- Manipulation tasks (grasp-transfer-release, stereognosis, card turning, object transfer)
- Tactile discrimination tasks (N. Byl, UCSF)

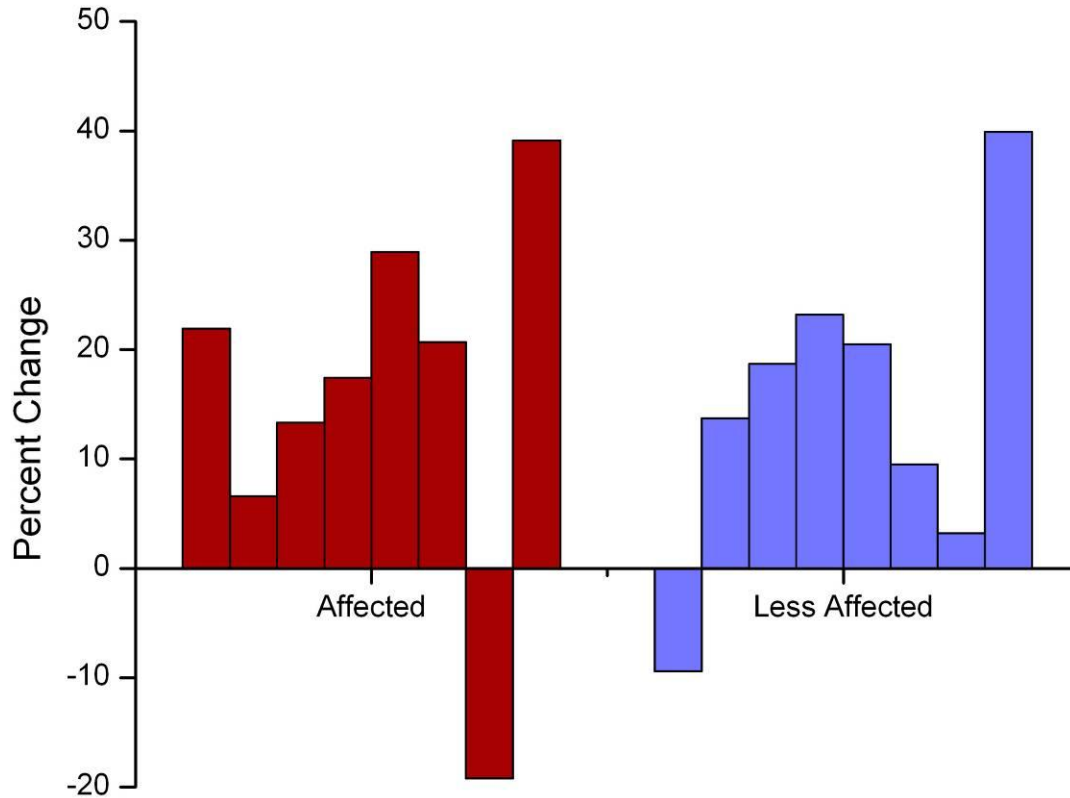
Training Board Tasks



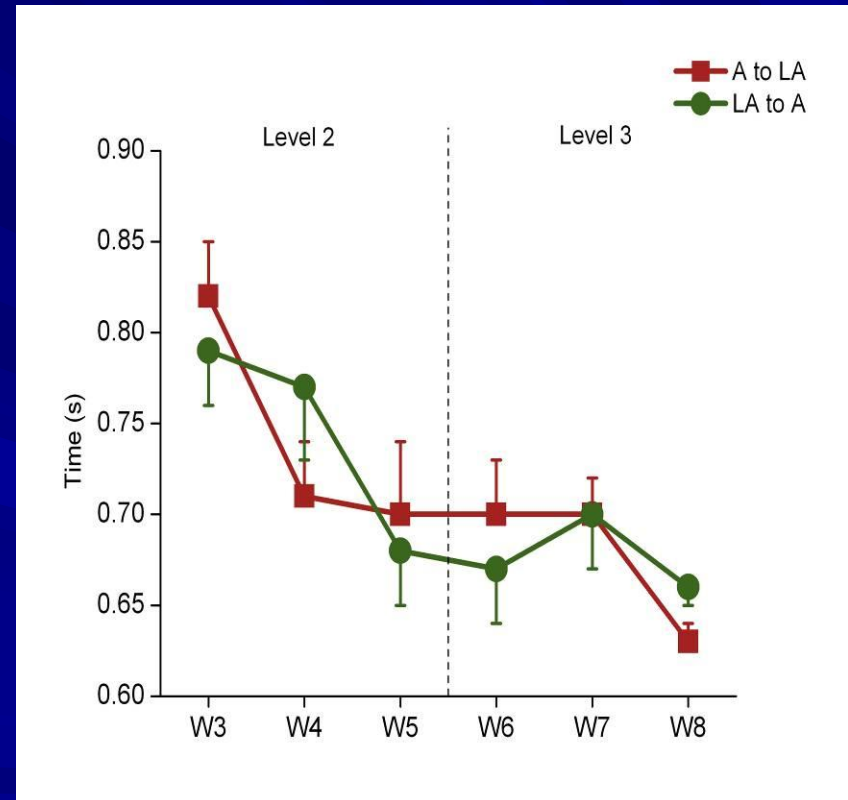
Unilateral Movement Duration



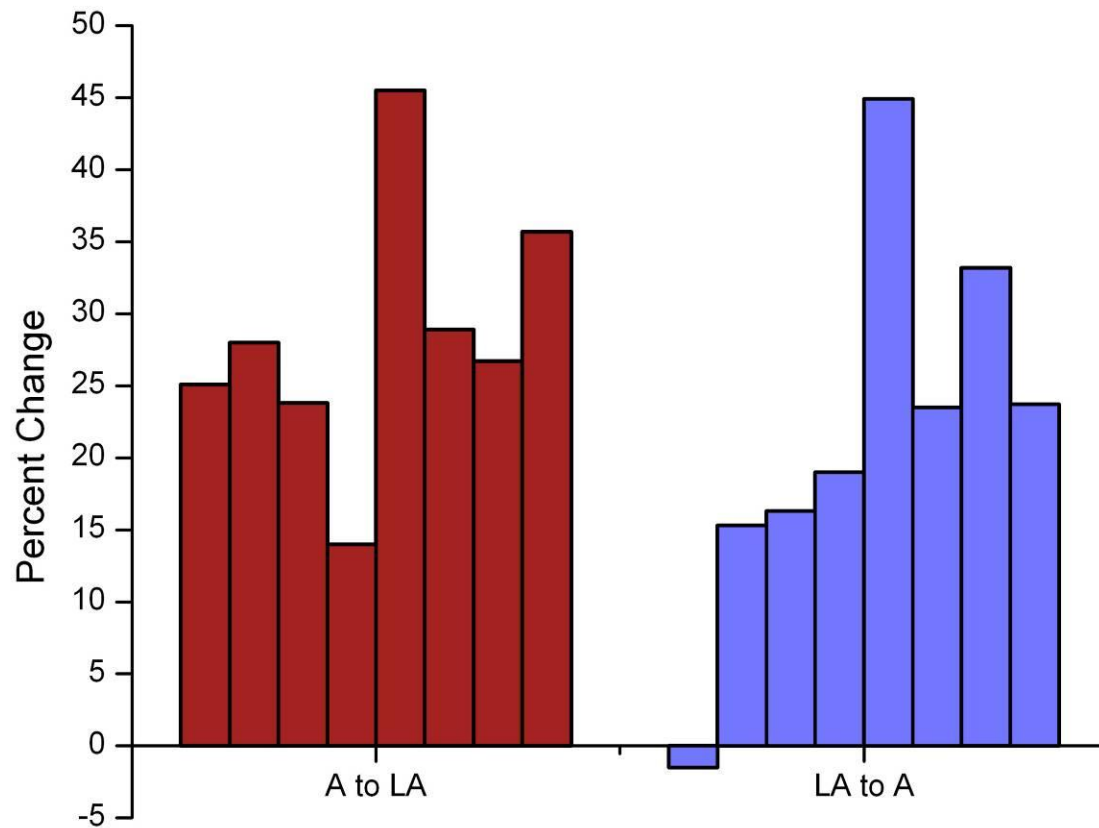
Improvement in Reaching Performance



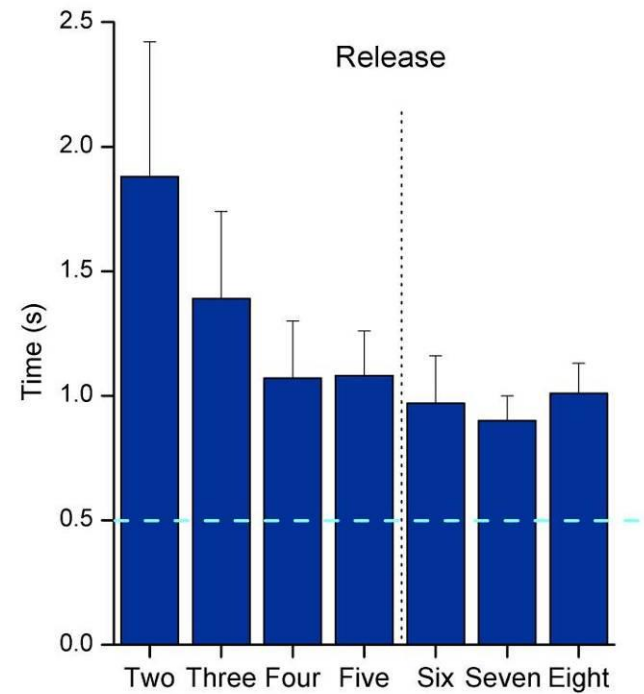
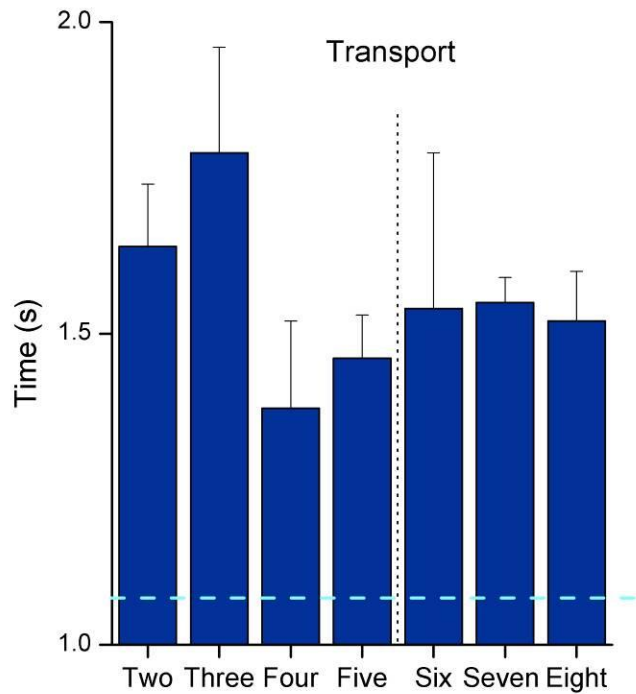
Bilateral Sequential Movements – Interlimb Movement Time



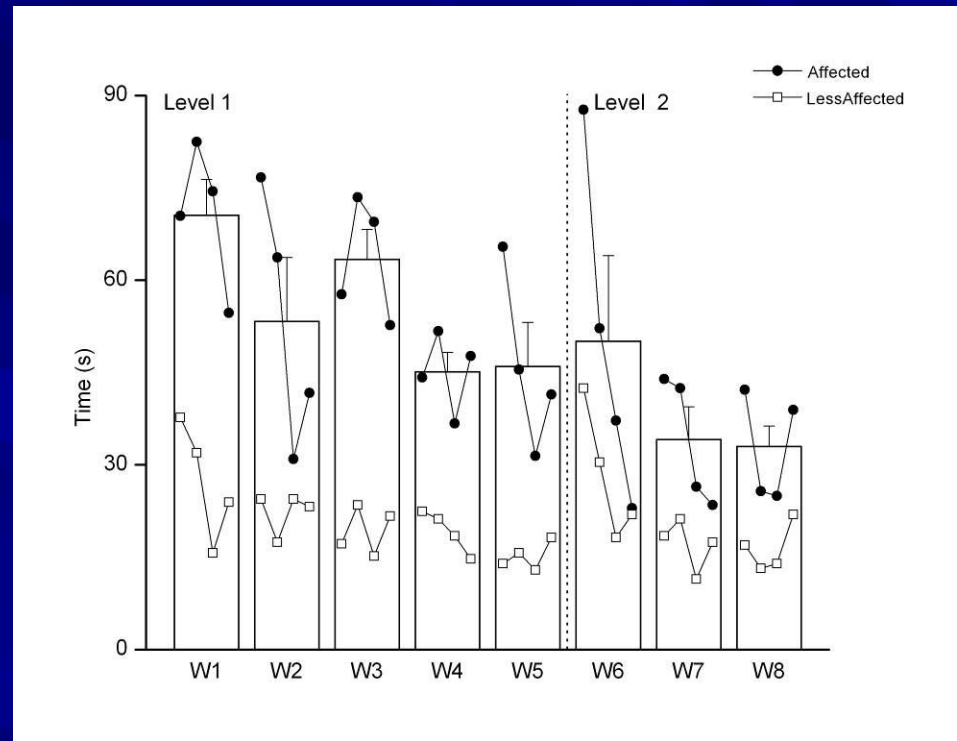
Improvement in Interlimb Coordination



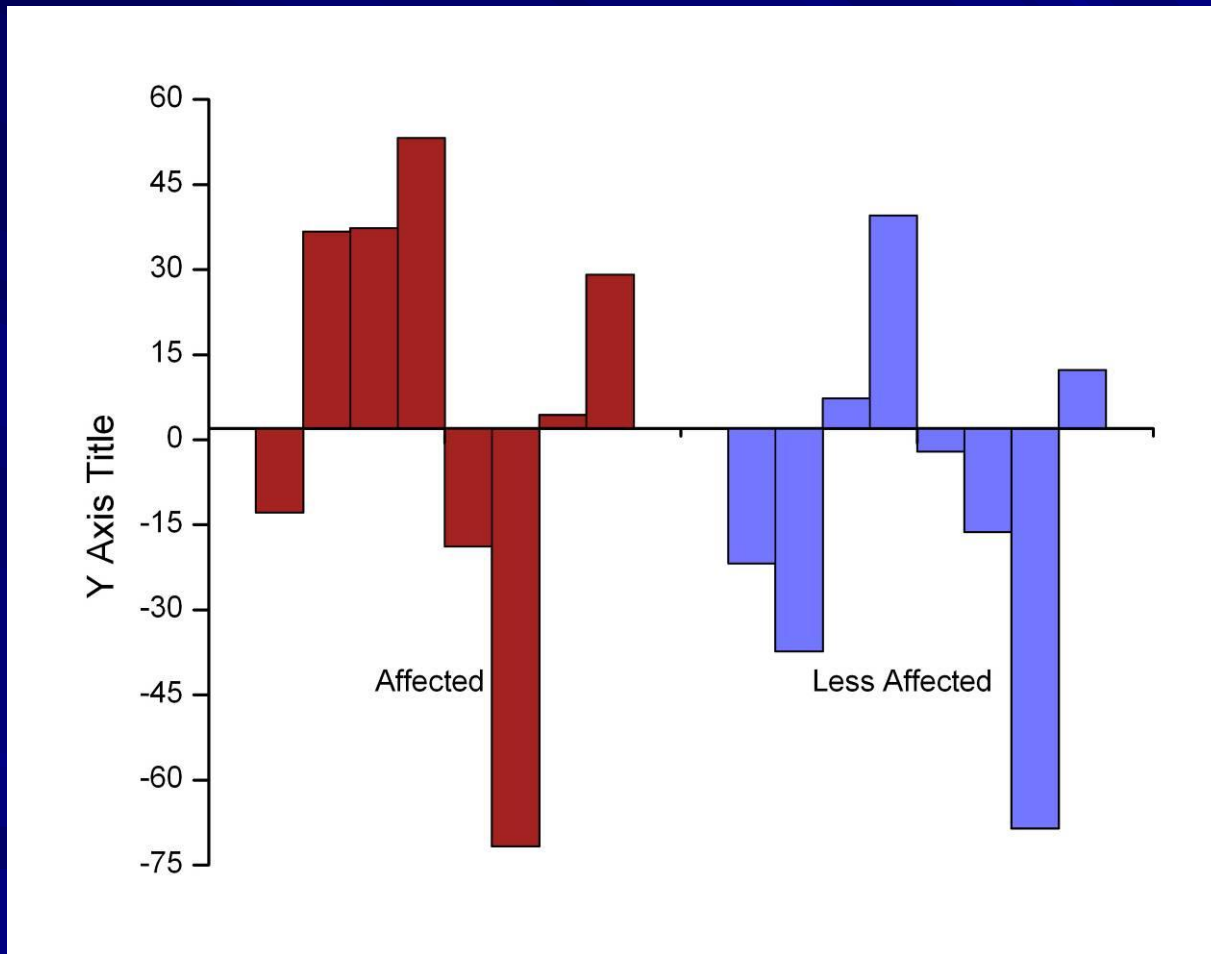
Reach-Grasp-Release Duration



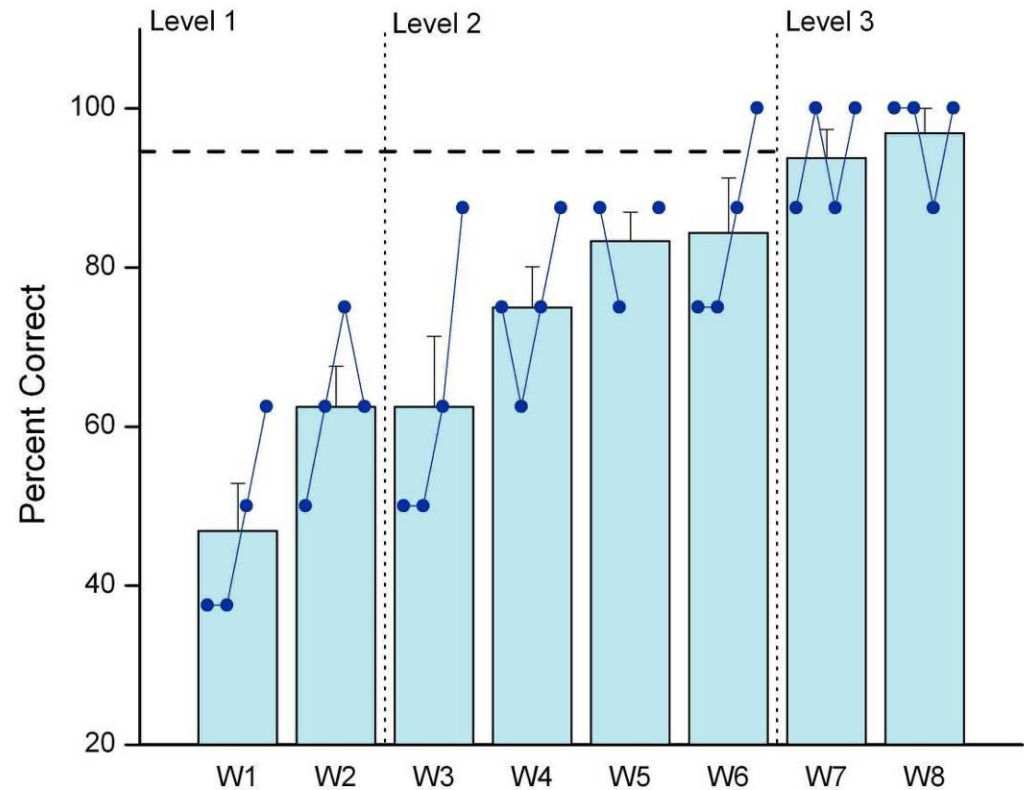
Hand Manipulation - Stereognosis



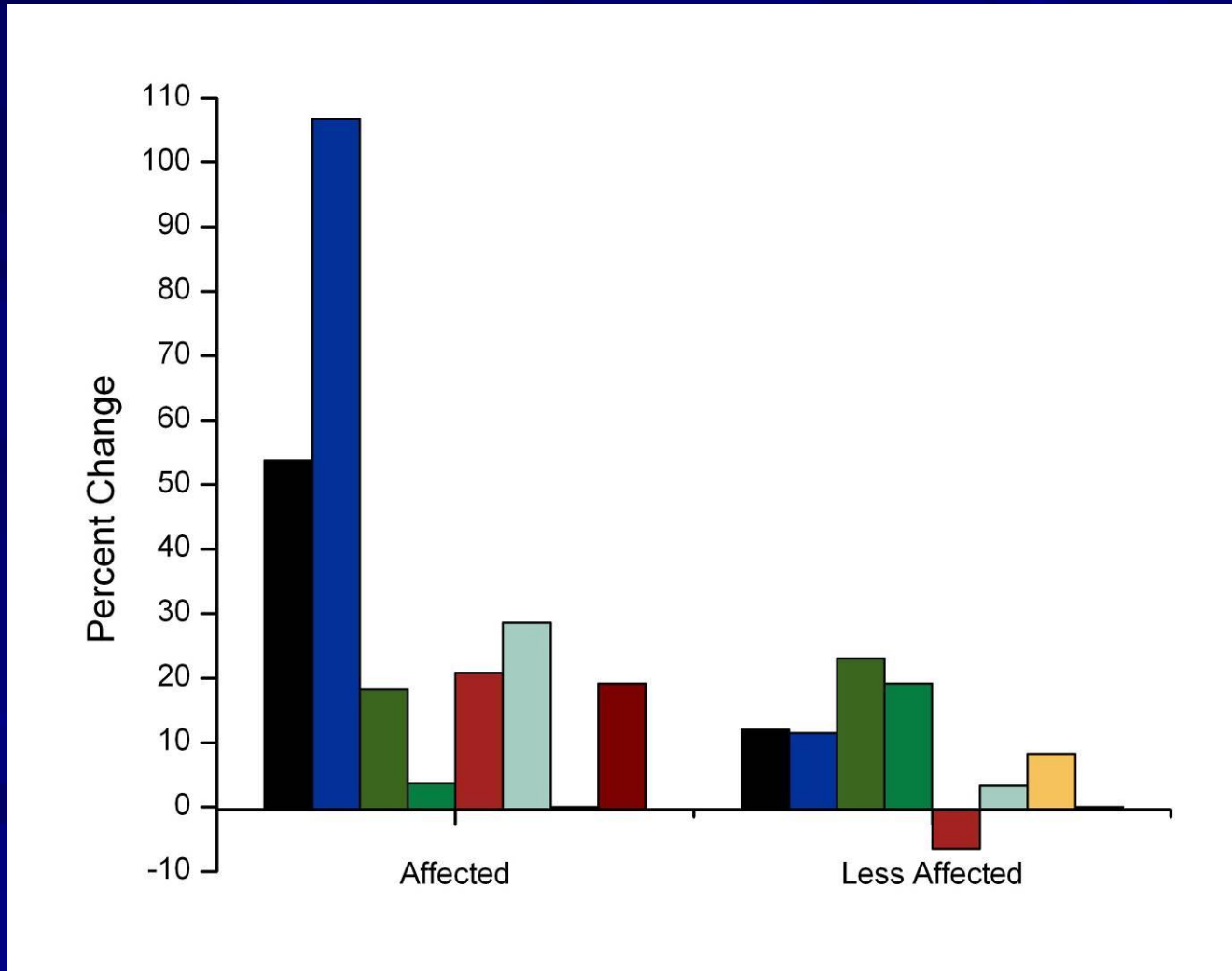
Variable Change in Stereognosis



Tactile Discrimination



Improvement in Tactile Discrimination



Summary

- Task-specific upper limb training can lead to marked improvement in upper limb function in adults with CP.
- Existing internet technology is an effective, low-cost means of delivering movement-based therapy which can be remotely monitored by rehabilitation professionals.
- The ULTrA program provides quantitative data related to performance throughout the training period without the need to travel to a clinical/research setting.

Future Directions

- Expand program nationally and internationally
 - Determine carryover, optimal training duration
 - Quantify spontaneous motor function
- Expand training system to include instrumented haptic devices, modify for use in pediatric populations

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