**BACKGROUND**

- Motor Learning strategies commonly integrated into occupational therapy include practice, repetition, and functional context.
- Emerging research in pediatric and motor learning suggests need for grading error to maximize motor learning.
- Additional evidence to support need for variability of practice to improve generalization of skills to other contexts.
- The intensity of practice and number of repetitions needed for development and improvement of motor skills is difficult to achieve in a typical therapy session.

**PURPOSE**

To determine if motor training with the ReoGO for 60 minutes, 5x per week in addition to standard of care occupational therapy would lead to greater improvement in upper extremity motor function.

**METHODS**

- **Outcome Measures:** Wee-Fim, Fugl-Meyer Upper Extremity, UE AROM measurements with goniometry, UE manual muscle testing, grasp dynamometry, Box and Blocks test.
- **Admission:** The patient is led by the robot, but must attend and follow along with movement if possible (passive mode).
- **Discharge:** The patient completely controls the movement (active mode).

**RESULTS**

- **Arm**:
  - Admission: 14/66 to 54/66 to 61.5
  - Discharge: 25/66 to 65/66

- **Minimal detectable change =** 5.2 points on FMA Upper Extremity (Wagner et al. 2008)

**DISCUSSION**

- Motor learning key principles: practice, error, variability
- Pragmatic: Increased number of repetitions.
- Recovery: On average 210 functional arm movements in 23 minutes.
- Traditional care averages 85 functional arm movements in 36 minutes (Journal of Neurological Physical Therapy, 2007)
- Error: Options for errorless and error learning.

**REFERENCES**

- Variability: Varieties of exercises, customizable exercises, customizable sessions, various accessories. Games offer additional variety of motor movements and plans.
- Consistent with results out of Boston (2008): 12 children, age 4-12 with hemiparesis from CP or TBI. Outpatient robotic therapy for 60 minutes, 2x per week for total of 8 weeks.

**CLINICAL RELEVANCE**

- Implementing 1 hr of ReoGO therapy, 5 days a week in addition to 60 minutes of standard of care occupational therapy was feasible for staff and patients in an inpatient rehab setting.
- OTR necessary for setting-up program, progressing program. Daily execution of program did not require OTR. Opportunities for group.
- Adding ReoGO robotic therapy might lead to improvements in UE recovery in adolescents with hemiplegia after neurologic incident. Recovery may include improved functional use of paretic UE and overall independence with ADLs and IADLs due to high repetitions, high variability of motor movements and flexible error allowed by the technology.

**PATIENTS**

- **Patient 1:** Female, 12 y.o.
- **Patient 2:** Female, 17 y.o.
- **Patient 3:** Male, 14 y.o.

**Spinal cord injury with resultant incomplete spinal cord injury**

- Neurofibroma with lesion in 2 in auditory canal and 1 in lumbar region
- Left MCA stroke, HX of Moya Moya

**Dominant, RUE affected**

- Non-dominant, LUS affected
- Dominant, RUE affected

**Inpatient Rehab LOS = 31 days**

- Inpatient Rehab LOS = Inpatient Rehab LOS = 39 days

**Standard of Care OT**

- 50 minute therapy (160 minute, 30 minute session)
- Functional task training (ADLs, IADLs, reaching, grasping, handwriting and keyboarding/computer-use)
- Weight-bearing
- Therapeutic exercises
- Electrostimulation (NMES)
- Splicing
- Therapeutic Taping

**Wee-Fim**

- **Admission:** 5 6 7 7 4 7
- **Discharge:** 2 6 4 6 3 5

**Fugl-Meyer**

- **Admission to discharge improvement in FMA Upper Extremity**
  - Patient 1: 14/66 to 54/66
  - Patient 2: 46/66 to 59/66
  - Patient 3: 13/66 to 65/66

- Not reported graphically however additional gains were noted across all outcome measures. Notable improvements include:
  - Patient 1 and 2 discharged with full UE AROM against gravity at all ranges, all joints and 5/5 strength as measured by MMET.
  - Patient 2 gross grasp dynamometry increased from RUE average of 27.9 lbs to 61.5 lbs.

**Variability**: Variety of exercises, customizable exercises, customizable sessions, various accessories. Games offer additional variety of motor movements and plans.

- **Consistent with results out of Boston (2008): 12 children, age 4-12 with hemiparesis from CP or TBI. Outpatient robotic therapy for 60 minutes, 2x per week for total of 8 weeks.**

- **Statistically significant improvements in upper limb coordination and quality of movement on QUEST and FMA.**

- **Smaller impact on spasticity and strength.**

- **Parental questionnaires revealed large gains in quantity and quality of paretic arm use during daily activities.**

- **Limitations with case series: Small sample, each patient with different etiology of hemiparesis, variable length of stay and this variable intervention length, different primary therapist with each patient.**

- **Limitations with ReoGO: Challenge with pediatric population (seat, positioning).**

**Upper Extremity Robotic Intervention for Acute Pediatric UE Impairment**

Jordan Porter, M.S. OTR/L

Center for Rehabilitation, Occupational Therapy Department