An Actical accelerometer (Figures 1 & 2) was worn for one week.

Outcome measures included:

- Subject was a four-year-old female with a diagnosis of cerebral palsy and spastic diplegia.
- The purpose of this case study was to explore the impact of a high-intensity robot-assisted locomotor training (RALT) program emphasizing cognitive engagement on ambulatory motor capacity in a child with CP.

Case Description

- The subject was a four-year-old female with a diagnosis of right hemiparesis and CP and a Gross Motor Functional Classification (GMFCS) level 2.
- Testing was performed to establish the subject’s baseline activity and participation levels.
- Outcome measures included:
  - Activity level: 10 meter walk test (10MWT), 6 minute walk test (6mWT), and Gross Motor Function Measurement (GMFM) D and E
  - Participation level: Average steps/min, average Total Energy Expenditure, Children’s Physical Activity Questionnaire (C-PAQ)

- An Actical accelerometer (Figures 1 & 2) was worn for one week prior to, after, and 3 months following the intervention period.

PROTOCOL

Intervention

- Subject completed 18 sessions, 2x-week, 45-60 min/session of the RALT program using the Hocoma Lokomat. (Figure 3)
- RALT training utilized augmented feedback to stimulate a virtual walking environment and improve cognitive engagement. (Figure 4)
- Initial settings each day included: Speed at 1.0 km/hr, Body weight support (BWS) at 50% of subject’s weight, and Guidance Force (GF) at 100%.
- Physical Therapists used clinical judgment to adjust the following treatment parameters:
  - Speed: based upon an observed normal cadence.
  - Mean Speed = 1.2 km/hr (Range 1.1 to 1.4 km/hr)
  - BWS: the least amount of support in which the child could still maintain dynamic knee flexion during stance.
  - GF: the least amount of assistance needed to successfully participate in augmented feedback activities.
  - Reduced to 60% by the end of the 9-week protocol.

RESULTS

Activity Level Outcomes

- GMFM had a 5 point increase from pre-test to post-test
- 10mWT increased by 0.27m/s following training (Figure 5)
- 6mWT increased by 46m following training (Figure 6)
- C-PAQ increased by 101 minutes of physical activity per day at posttest

Participation Level Outcomes

- Accelerometer data revealed an increase in:
  - Average steps/minute by 207% (Figure 7)
  - Average Total Energy Expenditure by 475% (Figure 8)
- Change in activity level correlated with the change in participation that increased over time.

DISCUSSION

Clinical Impact

- When participating in augmented feedback activities, subject demonstrated a 90% increase in target acquisition with a concurrent 40% decrease in Lokomat GF resulting in greater movement independence with training.
- RALT demonstrated an improvement in comfortable walking speed and endurance following training.
- Speed and endurance declined at 3-month follow up suggesting that daily activities did not replicate the intensity experienced with RALT.
- 3-month follow up, although declined from post test outcomes, were still improved over baseline measurements.

Participation Level Outcomes

- Following RALT, over a 7-day period the subject demonstrated a 3 times greater increase in walking cadence (steps/min), coupled with a 2.3 times greater increase in energy expenditure that continued to improve at the 3-month follow up.
- Improvements in ambulatory motor capacity translated to greater amounts of time spent participating in light, moderate, and vigorous activities.
- The change in activity level correlated with the change in parent perceived activity participation measured by the C-PAQ.

Conclusions

- RALT training improved the subject’s ambulatory motor capacity allowing for higher levels of consistent physical participation that increased over time.
- The overall impact needs further exploration with a larger sample size to confirm these findings, and to see if elevation of consistent locomotor activity in early age could have a significant positive impact on bone and muscle growth, cardiovascular function, and/or psychological well-being.

References

5. sliced-lok.png
6. RALT demonstrated an improvement in comfortable walking speed and endurance following training.
7. Mean Speed = 1.2 km/hr (Range 1.1 to 1.4 km/hr)
8. BWS: the least amount of support in which the child could still maintain dynamic knee flexion during stance.
9. GMFM had a 5 point increase from pre-test to post-test
10. Accelerometer data revealed an increase in:
    - Average steps/minute by 207% (Figure 7)
    - Average Total Energy Expenditure by 475% (Figure 8)
11. Change in activity level correlated with the change in participation that increased over time.