Evaluation of robotic gait training in early stage rehabilitation of children and youth after an acquired brain injury

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Background
- Children with acquired brain injury (ABI) can have significant motor deficits that persist long-term.
- During early/mid-stage rehabilitation, a common goal is to regain independent walking ability. Thus, physiotherapy (PT) frequently focuses on retraining gait-related function.
- Robotic-assisted gait training devices, such as the Lokomat (LOK), target walking retraining and allow earlier exposure to ambulation due to the LOK’s adjustable body support and gait guidance.
- The LOK has been studied mostly in children with cerebral palsy, while research is very limited in ABI with only one previous study from Italy (Beretta et al., 2015) at a later stage in rehabilitation.

Research Questions
1. Is the LOK a feasible and acceptable ‘integrated’ intervention for children with ABI who are in the early ambulation stages of rehabilitation?
2. What magnitudes of change in overall gross motor functional abilities and individualized gait-related goals are associated with Lokomat use in this context?

Methods
- Design: Single-group pre-/post-test feasibility
- Sample: Inpatients admitted to Holland Bloorview’s Rehab program with moderate or severe ABI, age 5-18 years
- Intervention: 2 sessions LOK/week and 3 sessions/week of gym-based PT over 8-weeks
- Key outcome measures:
  a) Clinical: Gross Motor Function Measure (GMFM)
  b) 6 minute walk test (6mWT)
  c) Individualized goal achievement via Canadian Occupational Performance Measure (COPM); parent + child (if possible) report
  d) Goal Attainment Scale (GAS) by PT with child

Results
- Participants:
  - Nine youth (6 males), mean age 15 years
  - Five walked with devices at baseline, and 4 were pre-ambulatory
  - All completed >10 of 16 planned LOK sessions (mean=13.9)

- LOK use:
  - Early LOK discontinuation was linked to rapid gait improvement (new goals) or early discharge
  - LOK set-up was challenging in initial sessions due to ABI-related impairments/fatigue but became easier over time

- Gross Motor and Gait Outcomes
  - GMFM Stand and Walk mean gains (n=15) were 25.3% points (SD=17.2)(P=0.0011) and 29.1% points (SD=26.7)(P=0.0001), respectively
  - 6mWT mean gain of 230.6 metres (SD 116.9) for the 5 youth who did at both assessments

- COPM and GAS
  - COPM (change /10) was 2.17 points (n=8)
  - GAS T-score was 58.0 (n=7) indicating goal achievement above the level targeted

Conclusions
- Our LOK treatment protocol is feasible during early/mid-stage rehabilitation post-ABI
- Dramatic changes in walking independence
- Evidence of large gross motor gains (GMFM) and clinically important change on the COPM and GAS in association with our study’s integrated LOK and PT program
- Gains are far more than in another study (Beretta et al.) – however most of our youth were in earlier rehab phase → peak time for gross motor training and change
- Change score estimates will be valuable a effect size estimates for a future RCT

What are the burning questions now?
- Are there advantages beyond an equal frequency of gym-based PT alone? We do now know that yet?
- Does the LOK speed up achievement of gait gains in the short term?
- Does the LOK promote greater overall gait improvements (reaching new levels of gait quality) that PT alone will ever achieve?

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References