Short-Burst Interval Treadmill Training: Feasibility, Walking Capacity & Performance in Cerebral Palsy—A Pilot Study

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Background

- Muscle power production and rapid force development are deficient in children with cerebral palsy (CP) as compared to typically developing (TD) youth.1, 4
- Youth with CP are limited in their ability to ramp up their walking activity to medium and/or high stride rates.2, 4
- TD children engage in very short bursts of intense walking and physical activity interspersed with varying intervals of low and moderate intensity.2, 4
- Locomotor treadmill training protocols for children with CP have been based on adult walking activity patterns and do not approximate the high intensity short burst patterns of TD children.2, 4

Methods

Short Burst Interval Training Protocol:

- 20 total sessions
- 5 days/week over 4 weeks
- 30 minutes total treadmill walking
- 30 seconds self-selected speed – “slow”
- 30 seconds fast walking speed – “fast”
- WeARING current clinically prescribed orthotics
- Screen fail 2 subjects – inadequate orthotic support
- Training speeds based on 75-85% of baseline 10 meter walk tests
- Average of 5 days of StepWatch accelerometer data
- Walking stride activity was defined as4:
  - Low: 1-30 strides/min
  - Moderate: 31-60 strides/min
  - High: > 60 strides/min

Hypothesis

Short burst interval treadmill training (SBITT) will enhance muscle power production and subsequently enhance walking performance and capacity through training patterns which are matching and mirror the walking and physical activity patterns of TD youth.

Study Design & Participants

- Prospective pre/post intervention design
- N=6
- Spastic Diplegia
- GMFCS Levels
  - I = 4
  - II = 2
- Average Age: 7.7 (5.1 to 10.9)
- 3 = female
- Independent walking primary mode of mobility
- Adequate orthotic support for fast walking
- No orthoneurosurgery in last 12 months
- No injection therapy in last 3 months
- No serial casting in 60 days
- No uncontrolled seizure disorder

Outcome Measures:

Walking Capacity – clinical based measures
- 10 meter walk test (m/sec)
- Self-selected walking speed
- Fast walking speed
- 1 Minute Walk Test (1MWT) – meters

Walking Performance: community walking activity

StepWatch accelerometer
- Average Strides/day
- Peak Activity Index –average step rate/minute of the highest 30 minutes/day
- % of walking time
- low, moderate and high stride activity

Results

Training speeds:
- Average self-selected speed: 1.5 mph
- Average fast speed: 2.6 mph

Pilot data suggests:

- SBITT is feasible with easy translation to the clinical setting
- Short burst interval treadmill training has potential positive influence on:
  - Walking speed
  - Community walking activity
- SBITT may require adequate orthotic support – at midstance- due to screen fails related to orthotics
- Current project exploring muscle level mechanisms
  - Architecture
  - Muscle power

Conclusions

References