Is Oxygen Cost Stable Across Three Self-Selected Walking Speeds in Ambulant Youth with Cerebral Palsy at GMFCS Levels I, II and III?

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INTRODUCTION

- Ambulant youth with cerebral palsy (CP) demonstrate increased oxygen cost (O2 cost) and decreased walking speed compared to peers with typical development (TD).  
- O2 cost and walking speed vary by Gross Motor Function Classification System (GMFCS) level with higher costs and slower speeds associated with higher GMFCS levels.  
- Stability of O2 cost over a range of walking speeds has not been verified in youth with CP.  
- Improved O2 cost following orthopedic surgery and physical therapy may not be confirmed if baseline and follow-up O2 cost measurements are at different walking speeds.  

This study examined the relationship between O2 cost and self-selected walking speed in ambulant youth with CP at GMFCS levels I, II and III.

- We hypothesized that the O2 cost across ‘usual’ walking speeds would be less stable among youth with more severe motor impairments.

METHODS

Design
- Cross-Sectional Study

Materials and Methods

- Youth completed a physical activity protocol including three 6 minute walk trials (6MWTs) at ‘usual’ (self-selected) speeds: Comfortable walk (CW)  
  Brisk walk (BW)  
  Fast walk (FW)  
- Each youth wore a Cosmed K4b2 portable indirect calorimeter unit during the 6MWTs.  
- O2 cost was calculated by dividing steady-state weight relative VO2 (ml/kg/m) by walking speed.  
- ANOVAs were generated to  
  1) examine changes in O2 cost as walking speed increased from CW to BW to FW at different GMFCS levels and  
  2) to evaluate between and within GMFCS group differences in O2 cost

RESULTS

Participants
- Ambulant youth with CP (n= 45)  
  - Mean age = 12.4 years (SD = 3.1)  
  - Gender: 49% female; 51% males  
- GMFCS levels  
  - Level I (n = 26, 58%)  
  - Level II (n=9, 20%)  
  - Level III (n=10, 22%)

DISCUSSION

- Findings suggest that O2 cost is a stable measure across a broad range of typical walking speeds for youth with CP who walk without devices.  
- Our data support the assumption that O2 cost is elevated at the extremes of walking speeds; children at GMFCS level III demonstrate significantly higher O2 cost at slow speeds.  
- Slow walking speeds of children at GMFCS III are associated with high energy use. This finding justifies PT goals and treatments to work on higher self-selected walking speeds, (which are more efficient) for youth with CP using devices.

CONCLUSIONS

GMFCS I & II
- O2 cost is stable across walking speeds and may be a good outcome measure to evaluate the effectiveness of surgical and rehabilitation interventions.  
- When using O2 cost as an outcome measure, it is not necessary to control for speed at follow-up evaluations.

GMFCS III
- For youth classified at GMFCS level III for whom walking speeds are significantly slower, O2 cost is not stable  
- When using O2 cost as an outcome measure, it is important to control for speed at follow-up evaluations.

ACKNOWLEDGEMENTS

- Grant: 1 R24 HD065688-01  
- Children and families who participated in the study  
- Study Performance Site Personnel  
  - Franciscan Children’s Hospital  
  - Nemours AI duPont Hospital for Children

REFERENCES