Effects of Home-Based Locomotor Treadmill Training on Gross Motor Function in Young Children with Cerebral Palsy

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INTRODUCTION
Parents of young children with cerebral palsy (CP) often state walking achievement as the main goal for their children. This is the first randomized controlled trial to examine a home-based walking program of intensive treadmill intervention in children with CP.

PURPOSE
To examine the effects of an intensive, home-based program of treadmill training on motor skills related to walking in pre-ambulatory children with CP.

METHODS
SUBJECTS
Twelve children with CP with Gross Motor Function Classification System (GMFCS) levels I and II were assigned to the intervention group (n=6) [mean age of 21.76 months (6.50)] and control group (n=6) [mean age of 21.25 (6.07)]. All children were tested pre-intervention, post-intervention, and at a 1-month and a 4-month post-intervention follow-up.

INTERVENTION
All children received their weekly scheduled physical therapy sessions at their homes. In addition, children in the intervention group walked on a portable treadmill in their homes 6 times per week, twice daily for 10-20 minute sessions, for 6 weeks. The intervention was carried out by the children’s parents with weekly supervision by a physical therapist. (Fig. 1)

OUTCOME MEASURES
- Functional Mobility Scale (FMS)
- Timed 10-meter Walk Test (10MWT)
- Peabody Developmental Motor Scales-2 (PDMS-2)
- Gross Motor Function Measure-66 (GMFM-66), Dimensions D/E
- Pediatric Evaluation of Disability Inventory Mobility Scale (PEDI)

STATISTICAL ANALYSIS
The Friedman test and Mann-Whitney-U test was conducted for within-group and between-group differences, respectively.

RESULTS
There was a significant between-group treatment effect for the FMS at the post-test \( (p=0.04) \), indicating that the children in the intervention group walked with less support (Fig. 2). There was a moderate effect size \( (\text{Cohen's } d=0.47) \) for walking speed, with two children (GMFCS I) in the intervention group exceeding typical walking speeds for their age (Fig. 3). The PDMS-2 was significant at post-test \( (p=0.01) \) and 1-month post-intervention follow-up \( (p=0.009) \) (Fig. 4). The PEDI was significant at post-test \( (p=0.01) \), the 1-month post-intervention \( (p=0.009) \) and the 4-month post-intervention follow-up \( (p=0.04) \) (Fig. 5).

CONCLUSIONS
Home-based treadmill training can provide high-intensity, task-specific training with multiple repetitions, when carried out by the parents with supervision of a physical therapist. The results of this study illustrate that a 6-week, intensive, home-based treadmill training protocol can accelerate the attainment of walking skills, increase walking speed and decrease the amount of support needed for walking in children with CP under 3 years of age.