

## **Home-Based Treadmill Training in Ambulatory Children with Hemiplegic Cerebral Palsy**

Amy W. Bodkin, MS; James J. Carollo, PhD; Deborah H. Glueck, PhD

*(Departments of Physical Medicine & Rehabilitation and Biometrics, University of Colorado at Denver and Health Sciences Center; Center for Gait and Movement Analysis (CGMA), The Children's Hospital, 1056 E. Nineteenth Ave., Box 476, Denver, CO, 80218, USA)*

**Objectives:** To determine if gait symmetry and endurance improved in a group of children with hemiplegic cerebral palsy following treadmill training compared to a control group and to describe kinematic changes in the treadmill-training subjects.

**Study Design:** Randomized, controlled, single-blinded study.

**Study Participants and Setting:** Subjects were fifteen ambulatory children from six to twelve years old with hemiplegic cerebral palsy classified as GMFCS Levels I and II recruited from a local children's hospital. Eight subjects were in the intervention group, seven in the control group.

**Materials/Methods:** The intervention group completed a home program of twenty minutes of treadmill training three times weekly for eight weeks. The control group maintained their usual activities. Subjects had a computerized gait analysis, six-minute walk test for gait endurance and Gross Motor Function Measure at baseline and follow-up. Subjects and parents completed a questionnaire addressing motor function and satisfaction at follow-up. Gait symmetry was measured by comparing opposite foot contact, step length and step time of affected and unaffected lower extremities and was analyzed with repeated measures ANOVA. Endurance was analyzed with a t-test. Kinematic changes were evaluated clinically.

**Results:** There was no difference in symmetry between the groups at follow-up compared to baseline in opposite foot contact ( $P=0.2503$ ), step length ( $P=0.4618$ ) or step time ( $P=0.1341$ ) and no difference in distance walked during the six-minute walk test at baseline and follow-up ( $P = 0.3869$ ). Subjects in the treadmill-training group had kinematic changes in overground walking at follow-up that were similar to kinematic changes in treadmill walking. Families learned and carried out the treadmill-training program, were satisfied with the intervention and reported improved functional skills post treatment.

**Conclusions/Significance:** Previous research has shown gait changes following treadmill training with a combination of body weight support (BWS), manual guidance and gait speed paradigms. Despite satisfaction with the intervention, our study shows that treadmill walking alone did not lead to changes in gait symmetry or endurance. Further studies are needed to determine which combinations of treadmill training, BWS, manual guidance and training speed produce gait changes in children with cerebral palsy. Kinematic analyses suggest that overground gait pattern changes at follow-up are related to the gait pattern practiced on the treadmill. If so, treadmill training may be a helpful intervention for improving gait kinematics in children with cerebral palsy, although further studies are needed to determine a plausible mechanism for this change.

Word count: 393