



EFFECT OF TWO ORTHOTIC APPROACHES ON ACTIVITY LEVEL, BALANCE & SATISFACTION IN CHILDREN WITH CEREBRAL PALSY

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INTRODUCTION

Children with Cerebral Palsy (CP) are at risk of experiencing activity limitations and participation restrictions as a result of their impairment(s), which may affect their overall health, well-being and quality of life (Calley et al., 2012). Hence, an overall goal of intervention, including orthoses, is to enable activities and participation (Morris & Condie, 2009). It has been suggested that orthoses that restrict motion may impose greater activity limitations than those that facilitate normal patterns of joint motion (Morris, 2002). However, very few studies have explored the effect of different orthotic designs on activity levels of children with CP (Harvey et al. 2008). Hence, the purpose of this project was to evaluate whether the degree of ankle motion restriction affects activity level, balance and satisfaction in children with CP. We compared complete ankle motion restriction using a solid ankle-foot orthosis-footwear combination (AFO-FC) to resisted, articulated motion using an adjustable dynamic response AFO with supramalleolar orthosis (ADR-AFO).

METHOD

Subjects: 5 children with CP aged 6-10; GMFCS I-III; 1 hemiplegia, 3 diplegia, and 1 asymmetric diplegia.

Design: Randomized cross-over before and after trial, AABCBC design.

Procedures: Evaluations of steps/day (assessed using the StepWatch (Modus Health LLC, Washington DC) attached to the orthoses), balance (assessed using the Pediatric Balance Scale, PBS), distance walked over 6 minutes (6MWT), patient-reported lower extremity functional status (LEFS), health-related quality of life (HR-QOL) and satisfaction with device (SwD) (assessed using the Orthotic and Prosthetic Users' Survey, OPUS), and participation (assessed using Life-H) occurred twice: with the existing, prescribed orthoses (assessed 4 weeks apart) and then with each study orthosis. Subjects were randomized to AFO-FC or ADR-AFO for 4 weeks each, alternating once for each orthosis (total 16 weeks).

Data Analysis: Descriptive analysis of data in chronological order to allow for assessment of order effects and then by orthosis.

RESULTS

Subjects spent most of their time inactive with low to moderate step activity when active. Only the hemiplegic and asymmetric diplegic subjects had some high step activity rate. Average daily steps were consistently higher in the AFO-FC for Subject 2 and ADR-AFO for Subject 4. Results were mixed for other subjects.

With the exception of Subject 4, all subjects walked less total steps/day in both test orthoses than they did in their originally prescribed orthoses. Total steps/day were consistently higher in the AFO-FC for Subject 3

and ADR-AFO for Subjects 4 and 5. Subjects 1 and 2 had mixed results.

With the exception of Subject 2, baseline PBS scores were consistent and did not exceed the minimal clinically important difference (MCID) (Chen et al. 2013). Balance seemed to be more affected by time in the study than orthosis design with Subjects 2, 3 and 5 demonstrating clinically important change over the course of the study. Clinically important differences between orthoses were observed for various pairs of conditions but without any consistent pattern.

Baseline scores on the 6MWT were consistent for 3 subjects. There was no consistent trend over the course of the rest of the study. Distance was consistently greater for the ADR-AFO in Subject 3 and for the AFO-FC in Subjects 1 and 4. Performance of other subjects was inconsistent across orthotic conditions.

Overall scores for OPUS-LEFS were inconsistent. There was no trend over time and only Subject 2 had a higher score consistently for the AFO-FC. Results for other subjects were inconsistent across orthotic conditions. For HRQOL baseline scores were consistent for 4 subjects. There was no trend over time and only Subject 1 had a consistently higher HRQOL for the ADR-AFO. Results for other subjects were inconsistent across orthotic conditions. For SwD, baseline scores were consistent for 3 subjects. Subject 1 was consistently more satisfied with the ADR-AFO, while the remaining subjects had inconsistent results across orthotic conditions.

Baseline Life H Total Score was reasonably consistent between all testing occasions except for Subject 5. For Subject 4 the ADR-AFO scored slightly, but consistently higher than the AFO-FC. There were no consistent differences between orthoses for the other subjects.

DISCUSSION

Overall results were mixed with regards to whether subjects performed better with the ADR-AFOs or AFO-FCs. Based on patient-reported measures, ADR-AFOs were preferred.

CLINICAL APPLICATIONS

Mixed effect of orthoses not only across subjects but within the same subject based on different measures provides some support for the idea that orthotic benefit might be situation/task specific, supporting the use of time and resources to customize orthotic intervention; the need for patient specific tuning; and the potential utility of bimodal or multi-modal AFOs.

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