Repeated Measures Evaluations for Children with Cerebral Palsy Receiving Robotic Gait Training

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ABSTRACT

Background/Objectives: Robotic gait training (RGT) is a new intervention for children with cerebral palsy (CP). While early case series demonstrate improvement in gross motor parameters following RGT, more rigorous evaluation techniques have not been used with this intervention. This study sought to apply a repeated measures design to evaluate RGT in 4 children with CP.

Design: Multiple n of 1 design with 3 measures prior to and 4 measures following the intervention. Participants and Setting: 4 children with CP receiving care at a tertiary pediatric center. Materials/Methods: Participants received a standard course of 18 session of RGT over 6 or 9 weeks. Sessions included walking with a Lokomat device providing graded assistance to leg movement using a treadmill. Participants were assessed at the Gross Motor Function Measure-66 (GMFM), 5 min walk test (6MWT), and 10 meter walk test (10MWT) 3 times before and 4 times following the completion of RGT. Moreover, the Canadian Occupational Performance Measure (COPE), Pediatric Quality Life (CP-QOL) and Children’s Assessment of Participation and Enjoyment (CAPE) were completed before and after RGT. Results: GMFM scores were stable for most participants while the 6MWT and 10MWT showed considerable variation in the intervention. Visual and statistical analysis revealed improvements in GMFM scores that were significant. No changes were demonstrated on the COPE or CPQOL. Conclusions: RGT aids children with CP in achieving self-selected goals, but has uncertain effects on gross motor skills. The 6MWT and 10MWT demonstrated great variability with these young children. While a repeated measures design is useful for novel interventions in small populations, the outcomes measure must be reliable.

METHODS

Participants and Setting: The inclusion criteria were a diagnosis of CP, ages 4-8 years, GMFCS Level II, III or IV and ability to tolerate Lokomat use. Children with CP receiving care at our center who expressed interest in RGT and who agreed to attend additional therapy assessment visits were eligible to enroll. Procedures: Participants received a standard course of 18 session of RGT over 6 or 9 weeks. Sessions included walking with partial body weight support on a treadmill with a Lokomat device providing graded assistance to leg movement. During RGT, the least amount of body weight support was provided to each child while maintaining an erect posture and optimal gait pattern, with a target of approximately 30 minutes of walking. Participants were assessed with the GMFM, 6MWT, and 10MWT 3 times before and 4 times following the completion of RGT. The COPE and CAPE were completed before and after RGT. Two therapists conducted the assessments after demonstrating intertester reliability for the GMFM (ICC=0.98). All participants received their standard therapies before the intervention. They did not participate in regular ongoing outpatient physical therapy during the post intervention period.

RESULTS

Demographic information is presented in Table 1. All participants completed all treatment sessions and evaluations, but Subject 3 could not complete the 6MWT or 10MWT at the final visit due to mechanical difficulties with his damaged walker. Average walking time for each session was 32 minutes. Figure 1 depicts scores on the outcome measures that were assessed multiple times. GMFM scores showed no trends toward improvement except for participant 1 who showed an increase from mean GMFM score of 46.14 to 53.36. Visual analysis of 6MWT and 10MWT do not demonstrate dramatic treatment effects and these scores were not stable in the pre or post treatment periods. The COPE performance scores (PRE=9.078) increased by a mean of 3.9 (t(4, 47), p=0.01) and satisfaction scores increased by a mean of 5.3 (t(4, 47), p=0.04). The stated goals for the COPE included improvement with walking posture, endurance/independence, car transfers, playground activities, and pedaling a tricycle. When the mean pre-RGT scores were compared with the mean post RGT scores for the COPE and CPQOL using paired t tests none of the changes were significant.

DISCUSSION

This study demonstrates a significant effect of RGT on subject family-selected goals. The measures used reflect mobility activity and participation level tasks like walking. Effects of RGT on other measures were not evident or significant, but a true effect could be masked by considerable variability in the outcome measure (6MWT and 10MWT) or limited power due to the very small sample size. These measures may prove very useful in childhood CP.