The Effects of a Hippotherapy Simulator in Children with Cerebral Palsy: A Pilot Study

Authors : Canan Gunay Yazici, Zubeyir Sarı, Devrim Tarakci

Abstract : Background: Hippotherapy considered as global techniques used in rehabilitation of children with cerebral palsy as it improved gait pattern, balance, postural control, balance and gross motor skills development but it encounters some problems (such as the excess of the cost of horses' care, nutrition, housing). Hippotherapy simulator is being developed in recent years to overcome these problems. These devices aim to create the effects of hippotherapy made with a real horse on patients by simulating the movements of a real horse. Objectives: To evaluate the efficacy of hippotherapy simulator on gross motor functions, sitting postural control and dynamic balance of children with cerebral palsy (CP). Methods: Fourteen children with CP, aged 6–15 years, seven with a diagnosis of spastic hemiplegia, five of diplegia, two of triplegia, Gross Motor Function Classification System level I-III. The Horse Riding Simulator (HRS), including four-speed program (warm-up, level 1-2-3), was used for hippotherapy simulator. Firstly, each child received Neurodevelopmental Therapy (NDT; 45min twice weekly eight weeks). Subsequently, the same children completed HRS+NDT (30min and 15min respectively, twice weekly eight weeks). Children were assessed pre-treatment, at the end of 8th and 16th week. Gross motor function, sitting postural control, dynamic sitting and standing balance were evaluated by Gross Motor Function Measure-88 (GMFM-88, Dimension B, D, E and Total Score), Trunk Impairment Scale (TIS), Pedalo® Sensamove Balance Test and Pediatric Balance Scale (PBS) respectively. Unit of Scientific Research Project of Marmara University supported our study. Results: All measured variables were a significant increase compared to baseline values after both intervention (NDT and HRS+NDT), except for dynamic sitting balance evaluated by Pedalo®. Especially HRS+NDT, increase in the measured variables was considerably higher than NDT. After NDT, the Total scores of GMFM-88 (mean baseline 62,2 ± 23,5; mean NDT: 66,6 ± 22,2; $p < 0,05$), TIS (10,4 ± 3,4; 12,1 ± 3; $p < 0,05$), PBS (37,4 ± 14,6; 39,6 ± 12,9; $p < 0,05$), Pedalo® sitting (91,2 ± 6,7; 92,3 ± 5,2; $p > 0,05$) and Pedalo® standing balance points (80,2 ± 10,8; 82,5 ± 11,5; $p < 0,05$) increased by 7,1%, 2%, 3,9%, 5,2% and 6 % respectively. After HRS+NDT treatment, the total scores of GMFM-88 (mean baseline: 62,2 ± 23,5; mean HRS+NDT: 71,6 ± 21,4; $p < 0,05$), TIS (10,4 ± 3,4; 15,6 ± 2,9; $p < 0,05$), PBS (37,4 ± 14,6; 42,5 ± 12; $p < 0,05$), Pedalo® sitting (91,2 ± 6,7; 93,8 ± 3,7; $p > 0,05$) and standing balance points (80,2 ± 10,8; 86,2 ± 5,6; $p < 0,05$) increased by 15,2%, 6%, 7,3%, 6,4%, and 11,9%, respectively, compared to the initial values. Conclusion: Neurodevelopmental therapy provided significant improvements in gross motor functions, sitting postural control, sitting and standing balance of children with CP. When the hippotherapy simulator added to the treatment program, it was observed that these functions were further developed (especially with gross motor functions and dynamic balance). As a result, this pilot study showed that the hippotherapy simulator could be a useful alternative to neurodevelopmental therapy for the improvement of gross motor function, sitting postural control and dynamic balance of children with CP.

Keywords : balance, cerebral palsy, hippotherapy, rehabilitation
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