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Interventions and Management

1. NeuroRehabilitation. 2016 Feb 18. [Epub ahead of print]

The effects of virtual reality based bilateral arm training on hemiplegic children's upper limb motor skills.

Do JH, Yoo EY, Jung MY, Park HY.

BACKGROUND: Hemiplegic cerebral palsy is a neurological symptom appearing on the unilateral arm and leg of the body that causes affected upper/lower limb muscle weakening and dysesthesia and accompanies tetany and difficulties in postural control due to abnormal muscle tone, and difficulties in body coordination. **OBJECTIVES:** The purpose of this study was to examine the impact of virtual reality-based bilateral arm training on the motor skills of children with hemiplegic cerebral palsy, in terms of their upper limb motor skills on the affected side, as well as their bilateral coordination ability. **METHODS:** The research subjects were three children who were diagnosed with hemiplegic cerebral palsy. The research followed an ABA design, which was a single-subject experimental design. The procedure consisted of a total of 20 sessions, including four during the baseline period (A1), 12 during the intervention period (B), and four during the baseline regression period (A2). For the independent variable bilateral arm training based on virtual reality, Nintendo Wii game was played for 30 minutes in each of the 12 sessions. For the dependent variables of upper limb motor skills on the affected side and bilateral coordination ability, a Wolf Motor Function Test (WMFT) was carried out for each session and the Pediatric Motor Activity Log (PMAL) was measured before and after the intervention, as well as after the baseline regression period. To test bilateral coordination ability, shooting baskets in basketball with both hands and moving large light boxes were carried out under operational definitions, with the number of shots and time needed to move boxes measured. The results were presented using visual graphs and bar graphs. **RESULTS:** The study's results indicated that after virtual reality-based bilateral arm training, improvement occurred in upper limb motor skills on the affected sides, and in bilateral coordination ability, for all of the research subjects. Measurements of the effects of sustained therapy after completion of the intervention, during the baseline regression period, revealed that upper limb motor skills on the affected side and bilateral coordination ability were better than in the baseline period for all subjects. **CONCLUSION:** This study confirmed that for children with hemiplegic with cerebral palsy, bilateral arm training based on virtual reality can be an effective intervention method for enhancing the upper limb motor skills on the affected side, as well as bilateral coordination ability.

[PMID: 26923353](#)

2. IEEE Trans Neural Syst Rehabil Eng. 2016 Feb 25. [Epub ahead of print]

MIT-Skywalker: A Novel Gait Neurorehabilitation Robot for Stroke and Cerebral Palsy.

Susko T, Swaminathan K, Krebs H.

The MIT-Skywalker is a novel robotic device developed for the rehabilitation or habilitation of gait and balance after a neurological injury. It represents an embodiment of the concept exhibited by passive walkers for rehabilitation training. Its novelty extends beyond the passive walker quintessence to the unparalleled versatility among lower extremity devices. For example, it affords the potential to implement a novel training approach built upon our working model of movement primitives based on submovements, oscillations, and mechanical impedances. This translates into three distinct training modes: discrete, rhythmic, and balance. The system offers freedom of motion that forces self-directed movement for each of the three modes. This paper will present the technical details of the robotic system as well as a feasibility study done with one adult with stroke and two adults with cerebral palsy. Results of the one-month feasibility study demonstrated that the device is safe and suggested the potential advantages of the three modular training modes that can be added or subtracted to tailor therapy to a particular patient's need. Each participant demonstrated improvement in common clinical and kinematic measurements that must be confirmed in larger randomized control clinical trials.

[PMID: 26929056](#)

3. Front Pharmacol. 2016 Feb 19;7:29. doi: 10.3389/fphar.2016.00029. eCollection 2016.

Botulinum Toxin Treatment for Limb Spasticity in Childhood Cerebral Palsy.

Pavone V, Testa G, Restivo DA, Cannavò L, Condorelli G, Portinaro NM, Sessa G.

CP is the most common cause of chronic disability in childhood occurring in 2-2.5/1000 births. It is a severe disorder and a significant number of patients present cognitive delay and difficulty in walking. The use of botulinum toxin (BTX) has become a popular treatment for CP especially for spastic and dystonic muscles while avoiding deformity and pain. Moreover, the combination of physiotherapy, casting, orthotics and injection of BTX may delay or decrease the need for surgical intervention while reserving single-event, multi-level surgery for fixed musculotendinous contractures and bony deformities in older children. This report highlights the utility of BTX in the treatment of cerebral palsy in children. We include techniques for administration, side effects, and possible resistance as well as specific use in the upper and lower limbs muscles.

[PMID: 26924985](#)

4. NeuroRehabilitation. 2016 Feb 18. [Epub ahead of print]

Thorax and pelvis kinematics during walking, a comparison between children with and without cerebral palsy: A systematic review.

Swinnen E, Goten LV, Koster B, Degelaen M.

BACKGROUND: Dysfunctional postural control and pathological thorax and pelvis motions are often observed in children with cerebral palsy (CP) and can be considered as an indicator of diminished dynamic stability. **OBJECTIVE:** The aim of this study was to identify the differences between children with CP and typically developing children in three-dimensional thorax and pelvis kinematics during walking. **METHODS:** Three electronic databases were searched by using different combinations of keywords. The methodological quality of the studies was assessed by two researchers with the Strobe quality checklist. **RESULTS:** Ten studies (methodological quality: 32% to 74%) with in total 259 children with CP and 220 typically developing children (mean age: 7.6 to 13.6 year) were included. Compared to typically developing children, children with bilateral CP showed an increased range of motion of the thorax, pelvis and spine during walking. The results of the children with unilateral CP were less clear. **CONCLUSION:** In general, children with bilateral CP showed larger movement amplitudes of the trunk compared to children without CP. This increase in movement amplitudes could influence the dynamic stability of the body during walking. In children with unilateral CP, the results were less obvious and further research on this topic is required.

[PMID: 26923354](#)

5. *Pediatr Neurol Briefs*. 2015 Mar;29(3):22. doi: 10.15844/pedneurbriefs-29-3-5.

Gait Training and Ankle Dorsiflexors in Cerebral Palsy.

Millichap JG.

Investigators at University of Copenhagen, Denmark, evaluated whether 4 weeks of 30 min daily treadmill training with an incline may facilitate corticospinal transmission and improve control of the ankle joint in 16 children, aged 5-14 years, with cerebral palsy.

[PMID: 26933564](#)

6. *Phys Occup Ther Pediatr*. 2016 Mar 1:1-13. [Epub ahead of print]

Effect of Hippotherapy on Motor Proficiency and Function in Children with Cerebral Palsy Who Walk.

Champagne D, Corriveau H, Dugas C.

AIMS: To evaluate the effects of hippotherapy on physical capacities of children with cerebral palsy. METHODS: Thirteen children (4-12 years old) with cerebral palsy classified in Gross Motor Function Classification System Level I or II were included in this prospective quasi-experimental ABA design study. Participants received 10 weeks of hippotherapy (30 min per week). Gross motor function and proficiency were measured with the Bruininks-Oseretski Motor Proficiency short form [BOT2-SF] and the Gross Motor Function Measure-88 [GMFM-88] (Dimension D and E) twice before the program (T1 and T1'), immediately after (T2), and 10 weeks following the end of the program (T3). RESULTS: Mean scores for dimensions D and E of the GMFM-88 Dimension scores ($p = .005$) and three out of the eight items of the BOT2-SF (fine motor precision ($p = .013$), balance ($p = .025$), and strength ($p = .012$)) improved between baseline and immediately after intervention; mean scores immediately following and 10 weeks following intervention did not differ. CONCLUSIONS: Hippotherapy provided by a trained therapist who applies an intense and graded session for 10 weeks can improve body functions and performance of gross motor and fine motor activities in children with cerebral palsy.

[PMID: 26930110](#)

7. *Sci Rep*. 2016 Mar 3;6:22518. doi: 10.1038/srep22518.

Effects of whole-body vibration training on physical function, bone and muscle mass in adolescents and young adults with cerebral palsy.

Gusso S, Munns CF, Colle P, Derraik JG, Biggs JB, Cutfield WS, Hofman PL.

We performed a clinical trial on the effects of whole-body vibration training (WBVT) on muscle function and bone health of adolescents and young adults with cerebral palsy. Forty participants (11.3-20.8 years) with mild to moderate cerebral palsy (GMFCS II-III) underwent 20-week WBVT on a vibration plate for 9 minutes/day 4 times/week at 20 Hz (without controls). Assessments included 6-minute walk test, whole-body DXA, lower leg pQCT scans, and muscle function (force plate). Twenty weeks of WBVT were associated with increased lean mass in the total body (+770 g; $p = 0.0003$), trunk (+410 g; $p = 0.004$), and lower limbs (+240 g; $p = 0.012$). Bone mineral content increased in total body (+48 g; $p = 0.0001$), lumbar spine (+2.7 g; $p = 0.0003$), and lower limbs (+13 g; $p < 0.0001$). Similarly, bone mineral density increased in total body (+0.008 g/cm²; $p = 0.013$), lumbar spine (+0.014 g/cm²; $p = 0.003$), and lower limbs (+0.023 g/cm²; $p < 0.0001$). Participants reduced the time taken to perform the chair test, and improved the distance walked in the 6-minute walk test by 11% and 35% for those with GMFCS II and III, respectively. WBVT was associated with increases in muscle mass and bone mass and density, and improved mobility of adolescents and young adults with cerebral palsy.

[PMID: 26936535](#)

8. Dev Neurorehabil. 2016 Mar 1:1-13. [Epub ahead of print]**Gaze-based assistive technology in daily activities in children with severe physical impairments-An intervention study.**

Borgestig M, Sandqvist J, Ahlsten G, Falkmer T, Hemmingsson H.

OBJECTIVE: To establish the impact of a gaze-based assistive technology (AT) intervention on activity repertoire, autonomous use, and goal attainment in children with severe physical impairments, and to examine parents' satisfaction with the gaze-based AT and with services related to the gaze-based AT intervention. **METHODS:** Non-experimental multiple case study with before, after, and follow-up design. Ten children with severe physical impairments without speaking ability (aged 1-15 years) participated in gaze-based AT intervention for 9-10 months, during which period the gaze-based AT was implemented in daily activities. **RESULTS:** Repertoire of computer activities increased for seven children. All children had sustained usage of gaze-based AT in daily activities at follow-up, all had attained goals, and parents' satisfaction with the AT and with services was high. **DISCUSSION:** The gaze-based AT intervention was effective in guiding parents and teachers to continue supporting the children to perform activities with the AT after the intervention program.

[PMID: 26930111](#)

Prevention and Cure

9. *Pediatr Neurol Briefs*. 2015 Aug;29(8):62. doi: 10.15844/pedneurbriefs-29-8-5.

De Novo Mutations in Patients with Ataxic CP.

Agarwal S, Emrick L.

As a part of a large study investigating childhood ataxias in the UK and Switzerland, Schnekenberg et al. analyzed the genetic associations with congenital cerebellar ataxia in 10 patients using either a targeted next generation sequencing panel of 118 genes or trio-based exome sequencing.

[PMID: 26933599](#)

10. *Pediatr Neurol Briefs*. 2015 Aug;29(8):60. doi: 10.15844/pedneurbriefs-29-8-3.

MRI and Motor Outcomes in Children with Cerebral Palsy.

Gaebler-Spira D, McCormick K.

Investigators from University of Melbourne, Monash Children's Hospital, Royal Children's Hospital & Murdoch Children's Research Institute sought to identify correlation between magnetic resonance imaging (MRI) characteristics including white matter injury (WMI) in children with cerebral palsy (CP) and severity in motor outcomes later in life, irrespective of CP sub-type.

[PMID: 26933597](#)