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Interventions and Management

1. Disabil Rehabil. 2012 May 26. [Epub ahead of print]

Systematic review and meta-analysis of the effect of equine assisted activities and therapies on gross motor outcome in children with cerebral palsy.

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Purpose: To evaluate the literature on the efficacy of equine assisted activities and therapies (EAAT) on gross motor outcomes representing the ICF component of body functions and activity in children with cerebral palsy (CP). **Methods:** We conducted a systematic review and meta-analysis of randomized controlled trials and observational studies of hippotherapy (HPOT) and therapeutic horseback riding (TR) for children with spastic CP. Gross motor outcomes, assessed via muscle activity and muscle tone, gait, posture and Gross Motor Function Measures (GMFM) were evaluated. **Results:** Five TR studies and nine HPOT studies were included. Our meta-analysis indicated that short-term HPOT (total riding time 8-10 min) significantly reduced asymmetrical activity of the hip adductor muscles. HPOT could improve postural control in children with spastic CP, GMFCS level < 5. However, the evidence did not show a statistically significant effect on GMFM after long-term HPOT or TR (total riding time, 8-22 h) in children with spastic CP. **Conclusions:** This systematic review found insufficient evidence to support the claim that long-term TR or HPOT provide a significant benefit to children with spastic CP. We found no statistically significant evidence of either therapeutic effect or maintenance effects on the gross motor activity status in CP children.

[PMID: 22630812](https://pubmed.ncbi.nlm.nih.gov/22630812/) [PubMed - as supplied by publisher]

2. Ann Rehabil Med. 2012 Apr;36(2):233-9. Epub 2012 Apr 30.

Inter-rater Reliability of the K-GMFM-88 and the GMPM for Children with Cerebral Palsy.

Ko J, Kim M.

Department of Rehabilitation Medicine, CHA Bundang Medical Center, CHA University, Seongnam 463-712, Korea.

OBJECTIVE: To examine inter-rater reliability of the Korean version Gross Motor Function Measure (K-GMFM-88)

and the Gross Motor Performance Measure (GMPM) based on the video clips. **METHOD:** We considered a sample of 39 children (28 boys and 11 girls; the mean age=3.50±1.23 years) with cerebral palsy (CP). Two pediatric physical therapists assessed the children based on video recordings. **RESULTS:** For the K-GMFM-88, the intraclass correlation coefficient (ICC(3, 1)) ranged from .978 to .995, and Spearman's correlation coefficient ranged from .916 to .997. For the GMPM, ICC(3, 1) ranged from .863 to .929, and Spearman's correlation coefficient ranged from .812 to .885. With the gross motor function classification system classified according to the functional level (GMFCS I-II vs. III-V), the ICCs were .982 and .994 for the K-GMFM-88 total score and .815 and .913 for the GMPM total score. There were good or high correlations between the subscales of the two measures ($r=.762-.884$). **CONCLUSION:** The K-GMFM-88 and GMPM are reliable tools for assessing the motor function of children with CP. These two methods are highly correlated, which adds more reliability on them. Thus, it is advisable to use K-GMFM-88 and GMPM for children with CP to assess gross motor function.

[PMID: 22639748](#) [PubMed - in process] PMID: PMC3358680

3. *Physiother Can.* 2011 Summer;63(3):345-54. Epub 2011 Aug 10.

Applying motor-control theory to physical therapy practice: a case report.

Kenyon LK, Blackinton MT.

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Purpose: This case report describes the application of an integrated, systems-based theory of motor control to physical therapy practice. **Client Description:** The patient was a 5-year-old boy with spastic hemiplegic cerebral palsy who was entering kindergarten. Parent concerns related to the child's safety in playground activities such as playing on the slide. **Interventions:** Motor-control theory, including factors related to the task, the environment, and the individual, was used to guide and direct physical therapy management related to the patient goal of safely and effectively climbing the ladder to the playground slide. **Patient Outcomes:** When the child entered kindergarten, he was able to safely ascend the ladder to the playground slide, using a modified movement pattern, when distractions were minimized. However, attentional issues continued to affect task execution when other children were present. **Implications:** This case report demonstrates a means by which current knowledge and theory can be integrated into clinical practice. **Future Directions:** Applying motor-control theory to this case led to the development of clinical questions for future research.

[PMID: 22654241](#) [PubMed - in process]

4. *J Korean Neurosurg Soc.* 2012 Mar;51(3):177-81. Epub 2012 Mar 31.

Intraoperative vertebral artery angiography to guide c1-2 transarticular screw fixation in a patient with athetoid cerebral palsy.

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We present a case of an athetoid cerebral palsy with quadriparesis caused by kyphotic deformity of the cervical spine, severe spinal stenosis at the cervicomedullary junction, and atlantoaxial instability. The patient improved after the first surgery, which included a C1 total laminectomy and C-arm guided right side unilateral C1-2 transarticular screw fixation. C1-2 fixation was not performed on the other side because of an aberrant and dominant vertebral artery (VA). Eight months after the first operation, the patient required revision surgery for persistent neck pain and screw malposition. We used intraoperative VA angiography with simultaneous fluoroscopy for precise image guidance during bilateral C1-2 transarticular screw fixation. Intraoperative VA angiography allowed the accurate insertion of screws, and can therefore be used to avoid VA injury during C1-2 transarticular screw fixation in comorbid patients with atlantoaxial deformities.

[PMID: 22639719](#) [PubMed - in process] PMID: PMC3358609

5. Soins. 2012 Apr;(764):21-4.**The prevention of pain during botulinum toxin injections in children [Article in French]**

Gosset B, Dufour E, Jonas MV, Hiriart B, Morelle S, Keirel I, Longue V, Lamy V.

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According to the recommendations of the French health products safety agency (AFSSAPS) in 2009, botulinum toxin injections are recommended to reduce spasticity in children with cerebral palsy. Apprehension of the session can increase the pain. Therefore, programmes have been put in place which help to win over the child and gain their trust. Since 2008 a nurse consultation which informs the child through play has been set up in the centre for physical medicine and rehabilitation of the Association for the social and professional integration of disabled people.

[PMID: 22641937](#) [PubMed - in process]

6. Dev Neurorehabil. 2012 May 30. [Epub ahead of print]**Deficits in two versions of a sustained attention test in adolescents with cerebral palsy.**

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Objective: To evaluate sustained attention in adolescents with cerebral palsy (CP). CP affects motor control as well as certain cognitive processes such as attention, but its influence on the latter remains largely unexplored.

Methods: Manual (Experiment 1) and oculomotor (Experiment 2) versions of the Continuous Performance Test were performed by adolescents with spastic CP and healthy age-matched controls (n = 10 per group in each experiment). **Results:** In both experiments, patients with CP showed more omissions and their reaction time was more variable than controls. In Experiment 2, patients also showed more commissions. This problem was not observed in Experiment 1, possibly because of the presence of a hand movement deficit in CP. **Conclusion:** Taken together, the results show that sustained attention and inhibition capabilities are affected in CP. The present study also proposes that eye movements could constitute an interesting alternative for measuring sustained attention when hand movement is affected.

[PMID: 22646134](#) [PubMed - as supplied by publisher]

7. J Speech Lang Hear Res. 2012 May 31. [Epub ahead of print]**Indirect Estimates of Jaw Muscle Tension in Children with Suspected Hypertonia, Suspected Hypotonia, and Matched Controls.**

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PURPOSE: To compare indirect estimates of jaw muscle tension in children with suspected muscle tone abnormalities and age- and sex-matched controls. **METHOD:** Jaw movement and muscle activation were measured in children (3 years, 11 months - 10 years) with suspected muscle tone abnormalities (Down syndrome or spastic cerebral palsy; n = 10) and controls (n = 11). Two measures were used infer jaw tension: a kinematic index of mass-normalized stiffness and electromechanical delay (EMD). The kinematic index used video-based kinematics to obtain the slope of the peak velocity-displacement relationship. The EMD was derived from the interval between the onset of suprahyoid muscle activity and the onset of jaw depression. **RESULTS:** Neither measure differentiated the groups. The kinematic index revealed differences between stressed and unstressed syllables in three-syllable productions by the cerebral palsy and control groups, but not in two-syllable productions by the Down syndrome and control groups. **CONCLUSIONS:** This preliminary investigation included the novel application of two measures to infer the jaw muscle tension of children with suspected tone abnormalities. Though the results do not support the hypothesis that suspected muscle tone abnormalities affect jaw movement sufficiently to influence speech

production, considerations for interpreting the findings include methodological limitations and possible compensatory muscle co-activation.

[PMID: 22653916](#) [PubMed - as supplied by publisher]

8. Paediatr Drugs. 2012 May 31. doi: 10.2165/11208120-000000000-00000. [Epub ahead of print]

Glycopyrrolate Oral Solution: For Chronic, Severe Drooling in Pediatric Patients with Neurologic Conditions.

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Chronic drooling (sialorrhea) is a common dysfunction in children with neurologic disorders such as cerebral palsy. Glycopyrrolate oral solution, an anticholinergic agent, is the first drug treatment approved in the US for drooling in children with neurologic conditions. This article reviews the clinical efficacy and tolerability of glycopyrrolate oral solution in pediatric patients with neurologic conditions and provides an overview of the pharmacological properties of the drug. In a phase III, randomized, double-blind, multicenter trial, children (aged 3-16 years; n = 36) with problem drooling associated with neurologic conditions and receiving glycopyrrolate oral solution had a significantly ($p < 0.01$) greater modified Teacher's Drooling Scale (mTDS) response rate at 8 weeks (primary endpoint) than those receiving placebo (73.7% vs 17.6%). At 24 weeks in an additional, noncomparative, phase III study, 52.3% of glycopyrrolate oral solution recipients (aged 3-18 years; n = 137) had an mTDS response (primary endpoint); the response rate was consistently above 50% at all 4-weekly timepoints, aside from the first assessment at week 4 (40.3%). In general, glycopyrrolate oral solution was well tolerated in clinical trials. The majority of adverse events were within expectations as characteristic anticholinergic outcomes.

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9. World J Orthop. 2012 May 18;3(5):58-61.

Scurvy: An unusual presentation of cerebral palsy.

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Scurvy is caused by prolonged severe dietary deficiency of ascorbic acid, in which the breakdown of intercellular cement substances leads to capillary hemorrhages and defective growth of fibroblasts, osteoblasts and odontoblasts, resulting in impaired synthesis of collagen, osteoid and dentine. It is characterized by hemorrhagic gingivitis, subperiosteal hemorrhages, perifollicular hemorrhages, and frequently petechial hemorrhages (especially on the feet). People with abnormal dietary habits, mental illness or physical disability are prone to develop this disease. Epiphyseal separation is known to occur in scurvy but is rarely seen now. Epiphyseal separation from the metaphysis is always through the zone of calcified cartilage, known as "scorbutic lattice", which in the radiographs is represented as "the white line of Frenkel". We report a case of multiple epiphyseal separations in a cerebral palsy child because of vitamin C deficiency. The child was treated with splintage of extremity and nutritional supplementation. All physeal separation healed completely without any deformity.

[PMID: 22655223](#) [PubMed - in process]

Prevention and Cure

10. *Dev Med Child Neurol.* 2012 May 31. doi: 10.1111/j.1469-8749.2012.04332.x. [Epub ahead of print]

New insights into the pathology of white matter tracts in cerebral palsy from diffusion magnetic resonance imaging: a systematic review.

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Aim: Structural connectivity analysis using diffusion magnetic resonance imaging (dMRI) and tractography has become the method of choice for studying white matter pathology and reorganization in children with congenital hemiplegia. To evaluate its role in the research domain, we systematically reviewed the literature about children with cerebral palsy (CP) to document common findings and identify strengths and possible limitations of this neuroimaging technology. **Method:** A literature search was performed for peer-reviewed studies pertaining to dMRI and CP. **Results:** Twenty-two studies met the inclusion criteria. The corticospinal tract was studied in greatest detail (18/22). The most common finding was decreased fractional anisotropy and/or increased mean diffusivity, indicating significant loss in the integrity of these corticomotor pathways. Fewer studies assessed ascending sensorimotor pathways including the posterior and superior thalamic radiations, which also showed decreased fractional anisotropy. Anisotropy indices (fractional anisotropy, mean diffusivity) obtained for both corticomotor and sensorimotor tracts were repeatedly shown to correlate with clinical measures. Other tracts studied included commissural and association fibres, which showed conflicting results. **Interpretation:** There is sound evidence that dMRI-based connectivity techniques are useful for improving our understanding of the structure-function relationships of corticomotor and sensorimotor neural networks in CP.

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11. *J Matern Fetal Neonatal Med.* 2012 May 28. [Epub ahead of print]

Preterm birth and developmental problems in the preschool age Part I: Minor motor problems.

Ferrari F, Gallo C, Pugliese M, Guidotti I, Gavioli S, Coccolini E, Zagni P, Casa ED, Rossi C, Lugli L, Todeschini A, Ori L, Bertocelli N.

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Nearly half of very preterm (VP) and extremely preterm (EP) infants suffers from minor disabilities. The paper overviews the literature dealing with motor problems other than cerebral palsy (CP) during infancy and preschool age. The term "minor motor problems" indicates a wide spectrum of motor disorders other than CP; "minor" does not mean "minimal", as a relevant proportion of the preterm infants will develop academic and behavioural problems at school age. Early onset disorders consist of abnormal general movements (GMs), transient dystonia and postural instability; these conditions usually fade during the first months. They were underestimated in the past; recently, qualitative assessment of GMs using Prechtl's method has become a major item of the neurological examination. Late onset disorders include developmental coordination disorder (DCD) and/or minor neurological dysfunction (MND): both terms cover partly overlapping problems. Simple MND (MND-1) and complex MND (MND-2) can be identified and MND-2 gives a higher risk for learning and behavioural disorders. A relationship between the quality of GMs and MND in childhood has been recently described. The Touwen infant neurological examination (TINE) can reliably detect neurological signs of MND even in infancy. However, the prognostic value of these disorders requires further investigations.

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12. Pediatr Cardiol. 2012 May 30. [Epub ahead of print]**Outcome of Extremely Preterm Infants (<1,000 g) With Congenital Heart Defects From the National Institute of Child Health and Human Development Neonatal Research Network.**

Pappas A, Shankaran S, Hansen NI, Bell EF, Stoll BJ, Laptook AR, Walsh MC, Das A, Bara R, Hale EC, Newman NS, Boghossian NS, Murray JC, Cotten CM, Adams-Chapman I, Hamrick S, Higgins RD.

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Little is known about the outcomes of extremely low birth weight (ELBW) preterm infants with congenital heart defects (CHDs). The aim of this study was to assess the mortality, morbidity, and early childhood outcomes of ELBW infants with isolated CHD compared with infants with no congenital defects. Participants were 401-1,000 g infants cared for at National Institute of Child Health and Human Development Neonatal Research Network centers between January 1, 1998, and December 31, 2005. Neonatal morbidities and 18-22 months' corrected age outcomes were assessed. Neurodevelopmental impairment (NDI) was defined as moderate to severe cerebral palsy, Bayley II mental or psychomotor developmental index <70, bilateral blindness, or hearing impairment requiring aids. Poisson regression models were used to estimate relative risks for outcomes while adjusting for gestational age, small-for-gestational-age status, and other variables. Of 14,457 ELBW infants, 110 (0.8 %) had isolated CHD, and 13,887 (96 %) had no major birth defect. The most common CHD were septal defects, tetralogy of Fallot, pulmonary valve stenosis, and coarctation of the aorta. Infants with CHD experienced increased mortality (48 % compared with 35 % for infants with no birth defect) and poorer growth. Surprisingly, the adjusted risks of other short-term neonatal morbidities associated with prematurity were not significantly different. Fifty-seven (52 %) infants with CHD survived to 18-22 months' corrected age, and 49 (86 %) infants completed follow-up. A higher proportion of surviving infants with CHD were impaired compared with those without birth defects (57 vs. 38 %, $p = 0.004$). Risk of death or NDI was greater for ELBW infants with CHD, although 20 % of infants survived without NDI.

[PMID: 22644414](#) [PubMed - as supplied by publisher]

13. Pediatr Neurol. 2012 Jun;46(6):339-44.**Rehabilitation for Children After Acquired Brain Injury: Current and Emerging Approaches.**

Gordon AL, di Maggio A.

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Evidence is emerging of diverse, chronic, cumulative disabilities experienced by children in the months and years after acquired brain injury. The long-held assumption that younger children recover better from brain injury than older children or adults has been challenged by recent studies. Populations with acquired brain injury include children with traumatic brain injury and stroke, and a proportion of children with cerebral palsy. Although characteristics of brain injury in children vary, subgroups of this population offer the potential to inform our understanding of developing brain structure-function relationships in response to intervention. Limited evidence and few controlled rehabilitation trials exist regarding children with neurologic conditions. A number of rehabilitation approaches produced benefits in adult stroke, and cerebral palsy populations may be applied to children with other acquired brain injuries. Rehabilitation approaches that have been applied to children with acquired brain injuries, or hold promise for future applications, are reviewed.

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