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Interventions and Management

1. Am J Phys Med Rehabil. 2012 Jan;91(1):53-64.

Botulinum toxin a treatment in children with cerebral palsy: its effects on walking and energy expenditure.

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OBJECTIVE: This study aimed to evaluate the effects of botulinum toxin A (BTX-A) treatment on energy expenditure and ambulation in children with cerebral palsy (CP) and to determine if energy expenditure measurement could be considered a useful tool for evaluating the effectiveness of BTX-A treatment for CP. **DESIGN:** The study included 16 pediatric CP patients with equinus deformity who were capable of walking without assistance (group with CP). The children with CP were administered BTX-A injections into the gastrocnemius muscle. All the children underwent three-dimensional gait analysis and energy expenditure measurement before injection and 8 wks after injection, the results of which were compared with those of children without CP (control group). **RESULTS:** After BTX-A treatment, oxygen consumption in the group with CP was significantly lower than at pretreatment and was similar to that in the control group ($P > 0.05$). In the group with CP, post-BTX-A treatment ankle joint dorsiflexion angle at initial contact, mid-stance, and mid-swing improved significantly ($P < 0.05$). **CONCLUSION:** BTX-A injected into the gastrocnemius muscle in children with CP not only reduced spasticity and improved ankle range of motion and walking pattern but also reduced energy consumption, resulting in functional improvement. Energy expenditure measurement can be considered an objective quantitative tool for clinical evaluation of the functional outcome of therapeutic interventions such as BTX-A.

[PMID: 22157436](https://pubmed.ncbi.nlm.nih.gov/22157436/) [PubMed - in process]

2. Clin Orthop Relat Res. 2011 Dec 14. [Epub ahead of print]

Rectus Femoris Transfer Improves Stiff Knee Gait in Children With Spastic Cerebral Palsy.

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BACKGROUND: Stiff knee gait is common among children with ambulatory cerebral palsy (CP). When surgery is indicated, rectus femoris transfer as a primary treatment enhances knee range of motion, reduces time to peak knee flexion, increases peak knee flexion, and reduces toe drag. **QUESTIONS/PURPOSES:** We determined whether (1) distal rectus femoris transfer improved knee range of motion, time to peak knee flexion, peak knee flexion, and toe drag in children with CP diagnosed with stiff knee gait; and (2) patients in some subgroups (eg, those with relatively high knee range of motion compared with those with low knee range of motion before rectus femoris transfer) had greater improvement in these parameters. **METHODS:** We retrospectively reviewed gait data from 56 patients (99 limbs) preoperatively, short-term, and long-term. Subgroup analyses were performed to determine whether patients with high knee range of motion relative to those with low or moderate knee range of motion improved differentially after rectus femoris transfer. The minimum followup was 7 years (mean \pm SD, 10 \pm 2 years; range, 7-13 years). **RESULTS:** The mean peak knee flexion increased from baseline to short-term and to long-term followup. Patients with low peak knee flexion had the greatest improvement of peak knee flexion after rectus femoris transfer relative to the moderate and high peak knee flexion subgroups. Similarly, the greatest improvement after rectus femoris transfer for knee range of motion occurred in the low knee range of motion subgroup relative to moderate and high subgroups. Rectus femoris transfer improved mean time to peak knee flexion at short-term and long-term followup compared with baseline. Likewise, there was a decrease in toe drag at short- and long-term after rectus femoris transfer. **CONCLUSION:** Distal rectus femoris transfer selectively improved peak knee flexion, toe drag, and reduced time to peak knee flexion in ambulatory children with CP with stiff knee gait.

LEVEL OF EVIDENCE: Level IV, therapeutic study.

[PMID: 22167658](#) [PubMed - as supplied by publisher]

3. Dev Med Child Neurol. 2011 Dec 7. doi: 10.1111/j.1469-8749.2011.04164.x. [Epub ahead of print]

The importance of addressing heteroscedasticity in the reliability analysis of ratio-scaled variables: an example based on walking energy-cost measurements.

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Aim: When analysing the reliability of ratio-scaled variables, such as walking energy cost, variability of the error term often increases with increasing mean values. This phenomenon is called heteroscedasticity, and it makes the analysis of reliability more complicated. This study presents an examination of heteroscedasticity for walking energy cost before analysing the reliability. **Method:** Walking energy cost was collected from 33 children with cerebral palsy (CP), with varying Gross Motor Function Classification System (GMFCS) levels (19 males; 14 females; mean age: 7y 6mo [SD 2y 6mo]; GMFCS levels I [n=16], II [n=7], and III [n=10]). It was assessed by measuring oxygen uptake during 10 minutes of resting and 5 minutes of walking at comfortable speed. Measurements were performed twice, within 4 to 6 weeks. Primary outcomes included gross energy cost, gross non-dimensional energy cost, net energy cost, net non-dimensional energy cost, speed, and non-dimensional speed. Heteroscedasticity was analysed with Bland-Altman plots and Kendall's tau. **Results:** Visual inspection of the Bland-Altman plots showed heteroscedasticity for gross energy cost, gross non-energy cost, and net energy cost. This was confirmed by Kendall's tau coefficients. Accordingly, data were logarithmically transformed, and reliability was assessed with ratio statistics. For speed, heteroscedasticity was not observed. **Interpretation:** Variability of gross energy cost, gross non-energy cost, and net energy cost, assessed across different GMFCS levels in children with CP, was proportional to the mean, indicating the presence of heteroscedasticity. This finding emphasizes the importance of always performing a heteroscedasticity examination in reliability studies on energy cost and reporting the reliability statistics accordingly.

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[PMID: 22150364](#) [PubMed - as supplied by publisher]

4. Clin Orthop Relat Res. 2011 Dec 20. [Epub ahead of print]**Coronal Plane Knee Moments Improve After Correcting External Tibial Torsion in Patients With Cerebral Palsy.**

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BACKGROUND: External tibial torsion causes an abnormal axis of joint motion relative to the line of progression with resultant abnormal coronal plane knee moments and affects lever arm function of the foot in power generation at the ankle. However, it is unclear whether surgical correction of the tibial torsion corrects the moments and power. **QUESTIONS/PURPOSES:** We evaluated whether surgical correction of external tibial torsion in patients with cerebral palsy would correct the abnormal coronal plane knee moments and improve ankle power generation. **METHODS:** We studied 22 patients (26 limbs) with cerebral palsy (Gross Motor Function Classification System Level I or II) who underwent distal internal rotation osteotomies for correction of external tibial torsion as part of a multilevel surgical intervention. There were 10 males and 12 females with a mean age at surgery of 14 years (range, 6.8-20.9 years). All patients had pre- and postoperative standardized clinical evaluation and computerized three-dimensional gait analysis. Minimum followup was 9 months (average, 13 months; range, 9-19 months). **RESULTS:** On physical examination, the mean (\pm SD) transmalleolar axis improved from $43^\circ \pm 10^\circ$ preoperatively to $20^\circ \pm 7^\circ$ postoperatively. Mean knee rotation improved kinematically from $40^\circ \pm 9^\circ$ preoperatively to $21^\circ \pm 9^\circ$ postoperatively. Twenty-two of 26 limbs (88%) improved in one or both peaks of the abnormal coronal plane knee moments. Ankle power generation did not change from preoperative (1.6 ± 0.7 W/kg) to postoperative (1.6 W/kg). **CONCLUSIONS:** Correction of external tibial torsion in ambulatory patients with cerebral palsy improves the kinematic and kinetic deviations identified by gait analysis.

LEVELS OF EVIDENCE: Level IV, therapeutic series.

[PMID: 22183475](#) [PubMed - as supplied by publisher]

5. J Bone Joint Surg Am. 2011 Dec 7;93(23):e1381-7.**Ankle dorsiflexor function after plantar flexor surgery in children with cerebral palsy.**

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BACKGROUND: Surgical lengthening is used to address both overactivity and shortening of the spastic agonist muscle in children with cerebral palsy. It has been presumed that the function of the antagonist muscle will improve when the spastic agonist muscle has been surgically lengthened. The purposes of the current study were to use quantitative gait analysis to determine the prevalence of the ankle dorsiflexor muscles (antagonist) dysfunction during the swing phase of the gait cycle and to analyze how this function is affected following surgical lengthening of the ankle plantar flexor muscles (agonist). **METHODS:** The study design was a retrospective, cohort series of fifty-three children with cerebral palsy who underwent gait analysis before and after surgical lengthening of the gastrocnemius-soleus muscle group. Data from the physical examination, gait study kinematics, and dynamic electromyography in swing phase were analyzed. **RESULTS:** The mean age at the time of the initial gait analysis was eight years and eleven months. Significant improvements were noted in ankle dorsiflexion passive range of motion ($p < 0.001$), ankle dorsiflexor selective control ($p = 0.002$), ankle dorsiflexor strength ($p = 0.001$), and peak and mean ankle dorsiflexion in swing phase ($p < 0.001$ for each) following ankle plantar flexor lengthening surgery. Active ankle dorsiflexor function in swing phase was present in 79% of the extremities prior to ankle plantar flexor surgery. Swing phase dorsiflexor function was present in 96% of the extremities following surgery, with ten extremities improving from absent to present. **CONCLUSIONS:** The kinematic data support the clinical impression that ankle dorsiflexion during swing phase is improved following ankle plantar flexor lengthening surgery in children with cerebral palsy. In the majority of patients, this was a consequence of the correction of a fixed equinus contracture of the ankle plantar flexors that was constraining preexisting ankle dorsiflexor function. Weakness of all of the muscles is common, and surgical lengthening should only be considered for the correction of recalcitrant

muscle contractures. Improved function of the antagonist muscle should be anticipated and optimized by appropriately focused strength training and other modalities during rehabilitation.

LEVEL OF EVIDENCE: Therapeutic Level IV.

[PMID: 22159860](#) [PubMed - in process]

6. J Bone Joint Surg Br. 2011 Dec;93(12):1670-5.

Severe crouch gait in spastic diplegia can be prevented: a population-based study.

Vuillermin C, Rodda J, Rutz E, Shore BJ, Smith K, Graham HK.

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We studied the prevalence of severe crouch gait over a 15-year period in a defined population of children with spastic diplegia and Gross Motor Function Classification System levels II and III, to determine if there had been a decrease following changes to the management of equinus gait. These changes were replacing observational with three-dimensional gait analysis, replacing single level with multilevel surgery, and replacing gastrocnemius lengthening with gastrocnemius recession. Of 464 children and adolescents with spastic diplegia who underwent three-dimensional gait analysis, 27 had severe crouch gait. Seventeen of these had been managed by isolated lengthening of the gastrocnemius. Following changes in the management of equinus gait, the prevalence of severe crouch gait decreased from 25% and stabilised at a significantly lower rate, fluctuating between 0% and 4% annually ($p < 0.001$). We conclude that severe crouch gait in this population was precipitated by isolated lengthening of the gastrocnemius. These findings may be relevant to other surgical populations, as severe crouch gait may be a useful way to monitor the quality of the surgical management of abnormal gait in children with cerebral palsy and spastic diplegia.

[PMID: 22161932](#) [PubMed - in process]

7. Neuromodulation. 2011 Dec 12. doi: 10.1111/j.1525-1403.2011.00412.x. [Epub ahead of print]

Gait Improvement in Patients with Cerebral Palsy by Visual and Auditory Feedback.

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Objectives: To study the effects of gait training with visual and auditory feedback cues on the walking abilities of patients with gait disorders due to cerebral palsy. **Materials and Methods:** Visual and auditory feedback cues were generated by a wearable device, driven by inertial sensors. Ten randomly selected patients with gait disorders due to cerebral palsy and seven age-matched healthy individuals trained with visual feedback cues, while ten patients and eight age-matched healthy individuals trained with auditory feedback cues. Baseline performance (walking speed and stride length along a 10-m straight track) was measured before device use. Following 20-min training with the device and a 20-min break, performance without the device was measured again and compared with the baseline performance. **Results:** For the patients who trained with visual feedback, the average improvement was $21.70\% \pm 36.06\%$ in the walking speed and $8.72\% \pm 9.47\%$ in the stride length. For the patients who trained with auditory feedback, the average improvement was $25.43\% \pm 28.65\%$ in the walking speed and $13.58\% \pm 13.10\%$ in the stride length. For the healthy individuals who trained with visual feedback, the average improvement was $-2.41\% \pm 9.54\%$ in the walking speed and $-2.84\% \pm 10.11\%$ in the stride length. For the healthy individuals who trained with auditory feedback, the average improvement was $0.01\% \pm 7.73\%$ in the walking speed and $-2.03\% \pm 6.15\%$ in the stride length. **Conclusions:** Training with visual and auditory feedback cues can improve gait parameters in patients with gait disorders due to cerebral palsy. This was contrasted by no improvement in age-matched healthy individuals.

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8. BMC Musculoskelet Disord. 2011 Dec 16;12(1):284. [Epub ahead of print]

Prevalence of hip dislocation among children with cerebral palsy in regions with and without a surveillance programme: a cross sectional study in Sweden and Norway.

Elkamil AI, Andersen GL, Hagglund G, Lamvik T, Skranes J, Vik T.

BACKGROUND: Hip dislocation is a serious complication among children with cerebral palsy (CP). The aim of this study was to compare the prevalence of hip dislocation among children with CP in an area providing regular care with an area providing hip surveillance services. **METHODS:** This is a cross-sectional study in seven Norwegian counties providing regular care and one Swedish healthcare region where a hip surveillance programme was introduced in 1994. Data were provided by the Norwegian Cerebral Palsy Register and the CP Register in Southern Sweden. Children born 1996-2003 with moderate to severe CP, defined as Gross Motor Classification System (GMFCS) levels III - V, were included. In all, 119 Norwegian and 136 Swedish children fulfilled the criteria. In Norway, data on hip operations and radiographs of the hips were collected from medical records, while these data are collected routinely in the Swedish register. The hip migration percentage was measured on the recent radiographs. Hip dislocation was defined as a migration percent of 100%. **RESULTS:**

The proportion of children at GMFCS levels III - V was 34% in the Norwegian and 38% in the Swedish population. In the Norwegian population, hip dislocation was diagnosed in 18 children (15.1%; CI: 9.8-22.6) compared with only one child (0.7%; 95% CI: 0.01-4.0) in Southern Sweden ($p < 0.001$). Hip surgery was performed in 53 (44.5%) of the Norwegian children and in 43 (32%) of the Swedish children ($p = 0.03$). The total number of hip operations was 65 in Norway and 63 in Sweden. Norwegian children were first operated at a mean age of 7.6 years (SD: 2.9) compared with 5.7 years (SD: 2.3) in Sweden ($p = 0.001$). **CONCLUSIONS:** The surveillance programme reduced the number of hip dislocations and the proportion of children undergoing hip surgery was lower. However, with the surveillance programme the first operation was performed at a younger age. Our results strongly support the effectiveness of a specifically designed follow-up programme for the prevention of hip dislocation in children with CP.

[PMID: 22177473](#) [PubMed - as supplied by publisher]

9. Vopr Kurortol Fizioter Lech Fiz Kult. 2011 Sep-Oct;(5):3-6.

The application of microcurrent reflexotherapy for the rehabilitative treatment of patients presenting with the diplegic form of juvenile cerebral palsy [Article in Russian]

[No authors listed]

Sixty children suffering the diplegic form of juvenile cerebral palsy were admitted to a specialized therapeutic center for medical examination and treatment. In 30 patients, background therapy (remedial gymnastics, manual massage) was supplemented by microcurrent reflexotherapy targeted at biologically active points (BAPs) located paravertebrally in the paretic limb muscles and in the zones of craniotherapy. The remaining children ($n = 30$) were given medicines affecting neurotrophic processes in the central nervous system in addition to background therapy. It was shown that introduction of microcurrent reflexotherapy in the program of combined rehabilitation of the children presenting with the diplegic form of juvenile cerebral palsy results in the 2-2.3 times improvement of their initially impaired motor activity.

[PMID: 22165136](#) [PubMed - in process]

10. Disabil Rehabil. 2011 Dec 9. [Epub ahead of print]

Effects of functional electrical stimulation on trunk control in children with diplegic cerebral palsy.

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Purpose: This study aimed to investigate the efficiency of FES application on the abdomen-posterior back muscles in children with CP that were enrolled into physical therapy and rehabilitation (PTR) program. **Method:** The study included 55 spastic diplegic children that were hospitalized for rehabilitation. Those with deformities that could disrupt the balance in sitting and cause problems in evaluations were excluded. The patients were randomly divided into two equal groups according to their time of presentation. Thirty-two children completed the study. The control group received PTR program only for 4 weeks. The children in the FES group received PTR in addition to electrical stimulation. Electrical stimulation was applied 5 days a week for 4 weeks to abdomen-posterior back muscles in 30-minute-long sessions. To evaluate the balance in sitting, sitting score of gross motor function measurement (GMFM) and to evaluate the trunk asymmetry in sitting, radiographic measurements were used. Thus, kyphosis, Cobb and sacral angles were measured. **Results:** The comparisons of the measurements of the two groups before and after the treatment showed that the GMFM sitting score and the sacral angle were statistically significantly increased, and the kyphotic and Cobb angles were statistically significantly decreased. After the treatment, both groups demonstrated an increase in the GMFM score, but the increase in the FES group was statistically significantly higher than that in the control group. With respect to radiological measurements, the changes observed in both the kyphotic and Cobb angles after the treatment were statistically significantly higher in the FES group than in the control group. The rates of the changes in the sacral angle did not differ among the groups. **Conclusion:** We believe to provide balance in sitting for children with CP, FES applied on abdomen-back muscles along with conventional therapy to maintain trunk control is more effective than conventional therapy alone. [Box: see text].

[PMID: 22149464](#) [PubMed - as supplied by publisher]

11. Int Orthop. 2011 Dec 11. [Epub ahead of print]

Infections after spinal correction and fusion for spinal deformities in childhood and adolescence.

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BACKGROUND: Infection after spinal fusion for scoliosis is a commonly reported complication. Although techniques in paediatric spinal fusion have improved with regard to infection prophylaxis, postoperative infection rates range from 0.4% to 8.7%. **INFECTION RATES AND CAUSATIVE FACTORS:** The rate of infection in surgery for adolescent idiopathic scoliosis (AIS) has ranged from 0.9% to 3%. The rate of infection in spinal surgery for deformity related to myelomeningocele has been reported to be from 8% to 24%. The rate of infection in spinal surgery for deformity related to cerebral palsy has been reported to be from 6.1% to 8.7%. Infection after spinal fusion for scoliosis related to a muscular dystrophy is generally less frequent. Despite a large number of cases and studies, the literature did not provide documentation of several factors that may be related to the occurrence of wound infection. The rate of wound infection after spine surgery is dependent on many factors, including the complexity of the procedure, health status of the patient, and potentially the experience and technique of the operating surgeon. **TREATMENT ALGORITHM:** The general algorithm for treatment depends on a variety of factors, including the delay from the index procedure, the infecting organism, the location and extent of the infection, the gross appearance of the fusion mass, and the surgical strategy used to correct the initial deformity. For infections that develop within the first 90 days after the index procedure all attempts to retain the instrumentation should be made. In late infections, the fusion mass must be carefully inspected before instrumentation removal is considered. Although fusion may appear to be solid both radiographically and intra-operatively, there still may be the possibility of loss of correction at last follow-up. **CONCLUSION:** Deep wound infection after instrumented fusion of the spine remains a difficult and challenging clinical problem and entails substantial morbidity, cost, and recovery time for the patient. An aggressive approach to deep wound infection emphasising early irrigation and debridement allowed preservation of instrumentation and successful fusion in most cases. At the conclusion of treatment, patients can expect a medium-term clinical outcome similar to patients in whom infectious complication did not occur.

[PMID: 22159571](#) [PubMed - as supplied by publisher]

12. J Neurosurg Spine. 2011 Dec 16. [Epub ahead of print]**Complications of cervical pedicle screw fixation for nontraumatic lesions: a multicenter study of 84 patients.**

Nakashima H, Yukawa Y, Imagama S, Kanemura T, Kamiya M, Yanase M, Ito K, Machino M, Yoshida G, Ishikawa Y, Matsuyama Y, Ishiguro N, Kato F.

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Object: The cervical pedicle screw (PS) provides strong stabilization but poses a potential risk to the neurovascular system, which may be catastrophic. In particular, vertebrae with degenerative changes complicate the process of screw insertion, and PS misplacement and subsequent complications are more frequent. The purpose of this study was to evaluate the peri- and postoperative complications of PS fixation for nontraumatic lesions and to determine the risk factors of each complication. **Methods:** Eighty-four patients who underwent cervical PS fixation for nontraumatic lesions were independently reviewed to identify associated complications. The mean age of the patients was 60.1 years, and the mean follow-up period was 4.1 years (range 6-168 months). Pedicle screw malpositioning was classified on postoperative CT scans as Grade I (< 50% of the screw outside the pedicle) or Grade II (= 50% of the screw outside the pedicle). Risk factors of each complication were evaluated using a multivariate analysis. **Results:** Three hundred ninety cervical PSs and 24 lateral mass screws were inserted. The incidence of PS misplacement was 19.5% (76 screws); in terms of malpositioning, 60 screws (15.4%) were classified as Grade I and 16 (4.1%) as Grade II. In total, 33 complications were observed. These included postoperative neurological complications in 11 patients in whom there was no evidence of screw misplacement (C-5 palsy in 10 and C-7 palsy in 1), implant failure in 11 patients (screw loosening in 5, broken screws in 4, and loss of reduction in 2), complications directly attributable to screw insertion in 5 patients (nerve root injury by PS in 3 and vertebral artery injury in 2), and other complications in 6 patients (pseudarthrosis in 2, infection in 1, transient dyspnea in 1, transient dysphagia in 1, and adjacent-segment degeneration in 1). The multivariate analysis showed that a primary diagnosis of cerebral palsy was a risk factor for postoperative implant failure (HR 10.91, $p = 0.03$) and that the presence of preoperative cervical spinal instability was a risk factor for both Grade I and Grade II screw misplacement (RR 2.12, $p = 0.03$), while there were no statistically significant risk factors for postoperative neurological complications in the absence of evidence of screw misplacement or complications directly attributable to screw insertion. **Conclusions:** In the present study, misplacement of cervical PSs and associated complications occurred more often than in previous studies. The rates of screw-related neurovascular complications and neurological deterioration unrelated to PSs were high. Insertion of a PS for nontraumatic lesions is surgically more challenging than that for trauma; consequently, experienced surgeons should use PS fixation for nontraumatic cervical lesions only after thorough preoperative evaluation of each patient's cervical anatomy and after considering the risk factors specified in the present study.

[PMID: 22176430](#) [PubMed - as supplied by publisher]

13. Int J Pediatr. 2011;2011:712165. Epub 2011 Nov 24.**Aquatic exercise programs for children and adolescents with cerebral palsy: what do we know and where do we go?**

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Aquatic exercise programs may be a beneficial form of therapy for children and adolescents with cerebral palsy (CP), particularly for those with significant movement limitations where land-based physical activity is difficult. The most recently published systematic review (2005) on aquatic interventions in children with CP found supportive but insufficient evidence on its effectiveness. The aim of this paper is to review recently published literature since 2005 with a focus on aquatic exercise for children with CP. In total, six new studies were published with a main focus on aerobic aquatic interventions in higher functioning children and adolescents with CP. Swimming is one of the most frequently reported physical activities in children and adolescents with CP. Therefore, information on its safety and benefits is highly needed, for those with more severe CP in particular. Research design issues are discussed to help guide future research and practice.

[PMID: 22164180](#) [PubMed - in process] [PMCID: PMC3228376](#)

14. Cochrane Database Syst Rev. 2011 Dec 7;12:CD009242.

Treadmill interventions with partial body weight support in children under six years of age at risk of neuromotor delay.

Valentin-Gudiol M, Mattern-Baxter K, Girabent-Farrés M, Bagur-Calafat C, Hadders-Algra M, Angulo-Barroso RM.

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BACKGROUND: Delayed motor development may occur in children with Down syndrome, cerebral palsy or children born preterm, which in turn may limit the child's opportunities to explore the environment. Neurophysiologic and early intervention literature suggests that task-specific training facilitates motor development. Treadmill intervention is a good example of locomotor task-specific training. **OBJECTIVES:** To assess the effectiveness of treadmill intervention on locomotor motor development in pre-ambulatory infants and children under six years of age who are at risk for neuromotor delay. **SEARCH METHODS:** In March 2011 we searched CENTRAL (The Cochrane Library 2011, Issue 1), MEDLINE (1948 to March Week 2, 2011), EMBASE (1980 to Week 11, 2011), PsycINFO (1887 to current), CINAHL (1937 to current), Science Citation Index (1970 to 19 March 2011), PEDro (until 7 March 2011), CPCI-S (1990 to 19 March 2011) and LILACS (until March 2011). We also searched CTRP, ClinicalTrials.gov, mRCT and CenterWatch. **SELECTION CRITERIA:** We included randomised controlled trials, quasi-randomised controlled trials and controlled clinical trials that evaluated the effect of treadmill intervention in children up to six years of age with delays in gait development or the attainment of independent walking or who were at risk of neuromotor delay. **DATA COLLECTION AND ANALYSIS:** Four authors independently extracted the data using standardised forms. Outcome parameters were structured according to the "Body functions" and "Activity and Participation" components of the International Classification of Functioning, Disability and Health, Children & Youth version (ICFCY), which was developed by the World Health Organization. **MAIN RESULTS:** We included five studies, which reported on treadmill intervention in 139 children. Of the 139 children, 73 were allocated to treadmill intervention groups, with the other children serving as controls. The studies varied in the type of population studied (children with Down syndrome, cerebral palsy or who were at risk for neuromotor delay); the type of comparison (for example, treadmill versus no intervention, high intensity treadmill versus low intensity); the time of evaluation (during the intervention or at various intervals after intervention), and the parameters assessed. Due to the diversity of the studies, we were only able to use data from three studies in meta-analyses and these were limited to two outcomes: age of onset of independent walking and gross motor function. Evidence suggested that treadmill intervention could lead to earlier onset of independent walking when compared to no treadmill intervention (two studies; effect estimate -1.47; 95% confidence interval (CI): -2.97, 0.03), though these trials studied two different populations and children with Down syndrome seemed to benefit while it was not clear if this was the case for children at high risk of neuromotor disabilities. Another two studies, both in children with Down syndrome, compared different types of treadmill intervention: one compared treadmill intervention with and without orthotics, while the other compared high versus low intensity treadmill intervention. Both were inconclusive regarding the impact of these different protocols on the age at which children started to walk. There is insufficient evidence to determine whether treadmill intervention improves gross motor function (two studies; effect estimate 0.88; 95% CI: -4.54, 6.30). In the one study evaluating treadmill with and without orthotics, results suggested that adding orthotics might hinder gross motor progress (effect estimate -8.40; 95% CI: -14.55, -2.25). One study of children with Down syndrome measured the age of onset of assisted walking and reported those receiving the treadmill intervention were able to walk with assistance earlier than those who did not receive the intervention (effect estimate -74.00; 95% CI: -135.40, -12.60). Another study comparing high and low intensity treadmill was unable to conclude whether one was more effective than the other in helping children achieve supported walking at an earlier age (effect estimate -1.86; 95% CI: -4.09, 0.37). One study of children at high risk of neuromotor disabilities evaluated step quality and found a statistically significant benefit from treadmill intervention compared to no treadmill intervention (effect estimate at 16 months of age: -15.61; 95% CI: -23.96, -7.27), but was not able to conclude whether there was a beneficial effect from treadmill training on step frequency at the same age (effect estimate at 16 months of age: 4.36; 95% CI: -2.63, 11.35). Step frequency was also evaluated in children with Down syndrome in another study and those who received high intensity rather than low intensity treadmill training showed an increased number of alternating steps (effect estimate 11.00; 95% CI: 6.03, 15.97). Our other primary outcome, falls and injuries due to falls, was not measured in any of the included studies. **AUTHORS' CONCLUSIONS:** The current review provided only limited evidence of the efficacy of treadmill intervention in

children up to six years of age. Few studies have assessed treadmill interventions in young children using an appropriate control group (which would be usual treatment or no treatment). The available evidence indicates that treadmill intervention may accelerate the development of independent walking in children with Down syndrome. Further research is needed to confirm this and should also address whether intensive treadmill intervention can accelerate walking onset in young children with cerebral palsy and high risk infants, and whether treadmill intervention has a general effect on gross motor development in the various subgroups of young children at risk for developmental delay.

[PMID: 22161449](#) [PubMed - in process]

15. J Bone Joint Surg Am. 2011 Dec 7;93(23):e1401-5.

Treatment of glenohumeral arthrosis and inferior shoulder subluxation in an adult with cerebral palsy: a case report.

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[PMID: 22159862](#) [PubMed - in process]

16. Neuropediatrics. 2011 Dec 7. [Epub ahead of print]

Functional Taping Applied to Upper Limb of Children with Hemiplegic Cerebral Palsy: A Pilot Study.

Mazzone S, Serafini A, Iosa M, Aliberti MN, Gobbetti T, Paolucci S, Morelli D.

Fondazione Santa Lucia.

Functional taping with elastic bandages and adhesive tapes could limit the action of upper limb spastic muscles and sustain that of weaker muscles in children with hemiplegic cerebral palsy (CP). 16 young children with CP (3±2 years old) were enrolled in this pilot study including 5 months of taping in conjunction with conventional physical therapy, followed by 7 months of physical therapy alone (taping wash-out), and other 5 months of taping plus therapy. Large improvements in the Melbourne assessment score were found in the first period in which taping was used (+15.4%, $p < 0.001$) and also in the second one despite 8 drop-outs (+8.4%, $p = 0.012$), but not during the taping wash-out (-7.6%; $p = 0.093$). These results suggest that children with CP could benefit from the continuous correction provided by taping in order to limit the development of improper upper limb motor schemas and to favour that of proper ones.

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[PMID: 22161724](#) [PubMed - as supplied by publisher]

17. Acta Chir Belg. 2011 Sep-Oct;111(5):351-3.

Simple technique of selecting the correct feeding gastrostomy button.

Durai R, Ng PC.

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Feeding gastrostomy is often performed in children with neurological conditions e.g. cerebral palsy or cystic fibrosis. A feeding button is often used to replace the gastrostomy tube for convenience. The button often leaks and the correct size and length is difficult to choose. The authors describe an easy and perfect way of choosing the correct size and length button by using Foley catheters.

[PMID: 22191144](#) [PubMed - in process]

18. Case Report Med. 2011;2011:145084. Epub 2011 Nov 16.

An unusual case of spontaneous bladder perforation with associated autodialysis of the ensuing urinary ascites.

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Spontaneous rupture of the urinary bladder is a rare occurrence, and when encountered it is a diagnostic challenge. We present an unusual case of urinary bladder rupture in a patient with severe cerebral palsy who initially presented with localized abdominal pain and during admission developed generalized peritonitis caused by bladder rupture. In this case, the patient had none of risk factors associated with urinary bladder.

[PMID: 22162695](#) [PubMed - in process] PMID: PMC3226425

19. Dent Traumatol. 2011 Dec 8. doi: 10.1111/j.1600-9657.2011.01095.x. [Epub ahead of print]

Assessment of dental trauma among cerebral palsy individuals in Udaipur city.

Jalihal S, Nagarajappa R, Sharda A, Asawa K, Tak M.

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Objective: (i) To assess the prevalence of traumatic dental injuries (TDI) in individuals with cerebral palsy and its possible relationship with type of palsy at Udaipur city, Rajasthan, India. (ii) To assess the prevalence of temporomandibular joint symptoms in cerebral palsy individuals. Materials and methods: The total sample comprised of 281 cerebral palsy individuals in the age group of 10-35 years. Clinical examination for dental trauma was performed on the basis of Andreasen & Andreasen classification (1994). Chi-square test, multiple logistic and stepwise linear regression analyses were carried out to find out the relationship between cerebral palsy individuals with different independent variables. Results: Findings of the study indicated that there was highest prevalence of TDI in cerebral palsy patients with hemiplegia (40.6%) (P = 0.00). Stepwise and multiple logistic regression analyses showed that the best predictors for dental traumatic injuries was overjet and type of cerebral palsy. Conclusion: It was concluded that hemiplegic cerebral palsy patients were most prone to TDI.

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20. J Indian Med Assoc. 2011 May;109(5):318, 323.

Ocular manifestations in children with cerebral palsy.

Sasmal NK, Maiti P, Mandal R, Das D, Sarkar S, Sarkar P, Biswas MC, Dey AK, Chatterjee S.

Department of Ophthalmology, NRS Medical College, Kolkata 700014.

To evaluate the prevalence of ocular abnormalities among children with cerebral palsy, 140 patients with age between 6 months and 16 years were selected and the overall incidence of ocular abnormalities in this study was 42.1%. Two major ocular abnormalities identified in these cases were strabismus in 36.4%. Myopia was detected in 12.9% children while hypermetropia in 8.6% and astigmatism in 3.6% cases. Non-glaucomatous optic atrophy was present in 10.7% cases and nystagmus in 9.3% cases. Raised intra-ocular pressure was detected in 2.1% cases. Cortical visual impairment was seen in 20.7% children. Ocular abnormalities are frequent manifestations in cerebral palsy patients. Therefore, evaluation of all cerebral palsy cases emphasises the need for a full ophthalmological

examination in order to detect ocular problems and to institute necessary therapy of the abnormalities for better livelihood of these physically challenged patients.

[PMID: 22187765](#) [PubMed - in process]

21. Clin Nucl Med. 2012 Jan;37(1):e4-6.

Epileptogenic Pachygyria Demonstrating on FDG PET.

Huang BK, Chu YK.

From the Department of Nuclear Medicine, Taipei Veterans General Hospital, Taipei, Taiwan, Republic of China; and National Yang-Ming University College of Medicine, Taipei, Taiwan, Republic of China.

A 5-year-old boy presented with intractable epilepsy since he was 3 months of age. He was born at 33-week gestation with preterm intracerebral hemorrhage. Infantile spasm, cerebral palsy, and delayed development were noted after birth. The seizure progressed in the past years. Medication and diet regimens were not helpful. Magnetic resonance imaging showed right occipital pachygyria and hypoxic porencephaly in left hemisphere. EEG delineated continuous spike-wave at right parieto-occipital area which sometimes augmented and caused seizure. On FDG PET, slightly increased metabolism in right occipital cortex was associated with continuous neuronal electronic discharging from the dysfunctional pachygyria.

[PMID: 22157055](#) [PubMed - in process]

22. Dev Med Child Neurol. 2011 Nov;53(11):974-5. doi: 10.1111/j.1469-8749.2011.04097.x.

A new reminder that pain hurts.

Breau L.

School of Nursing, Dalhousie University, Halifax, NS, Canada.

Comment on

Dev Med Child Neurol. 2011 Nov;53(11):1013-8.

[PMID: 22014317](#) [PubMed - indexed for MEDLINE]

23. Pediatr Emerg Care. 2011 Dec;27(12):1216.

Measuring pain in children with cognitive impairment and cerebral palsy: a multiregional survey in the use of specific pain scales.

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[PMID: 22158291](#) [PubMed - in process]

24. Disabil Rehabil. 2011 Dec 10. [Epub ahead of print]**Identifying assessment measures and interventions reported for Thai children with cerebral palsy using the ICF-CY framework.**

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School of Health and Rehabilitation Science (Physiotherapy), The University of Queensland, St Lucia, Qld, Australia, 4072.

Background: Cerebral palsy (CP) is the most common disability in childhood. The International Classification of Functioning, Disability and Health (ICF) provides a standard framework for classifying performance in people with disability, including children with CP. Linking measures actually reported with the ICF classification promotes best practice, especially pertinent in developing countries such as Thailand. This study aimed to explore the charted demographic data, assessment and intervention measures reported for children with CP in Central region of Thailand using the ICF for children and youths (ICF-CY) framework to clarify the scope of actual management practice in this population. Methods: Charts of children admitted to four public hospitals and two schools in 2007-2009 were age stratified, and approximately 48% audited (n=?269). Results: Contextual information was clearly reported, and measures could be classified across all components of the ICF, being mainly classified in Body Structures and Functions and to a lesser degree, in Activities and Participation. Our ability to compare across cultures was affected by poor recording practices limiting the amount and quality of data available. Conclusions: Classifying measures of children with CP in Thailand in terms of the ICF-CY framework demonstrates their holistic management as well as where gaps need to be addressed, and thus contributes to best practice. [Box: see text].

[PMID: 22148940](#) [PubMed - as supplied by publisher]

25. Pediatr Psychol. 2011 Dec 15. [Epub ahead of print]**Academic, Physical, and Social Functioning of Children and Adolescents With Chronic Physical Illness: A Meta-analysis.**

Pinquart M, Teubert D.

Department of Psychology, Philipps University.

OBJECTIVE: We compared the levels of academic, physical, and social functioning of children and adolescents with chronic physical diseases with those of healthy peers or test norms. METHODS: A random effects meta-analysis was computed to integrate the results of 954 studies. RESULTS: Impairments of physical functioning ($g = ?0.82$ standard deviation units) were stronger than impairments of academic ($g = ?0.53$) and social functioning ($g = ?0.43$). Children with cerebral palsy and spina bifida showed the largest levels of functional impairments. The levels of functional impairments also varied by year of publication, source of information, ethnicity, country, and sociodemographic equivalence of the compared groups. CONCLUSIONS: More efforts are needed to develop and implement measures for the prevention of impaired functioning of children and adolescents with chronic physical illness and for the reduction of already existing impairments of their functioning.

[PMID: 22173882](#) [PubMed - as supplied by publisher]

26. J Neural Eng. 2011 Aug;8(4):046022. Epub 2011 Jun 28.**Offline comparison of spatial filters for two-dimensional movement control with noninvasive field potentials.**

Foldes ST, Taylor DM.

Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH 44106, USA. taylor8@ccf.org

Paralyzed individuals can control the movement of an assistive device using changes in electroencephalographic

(EEG) power resulting from attempted movements. Simultaneous, proportional control of two-dimensional (2D) device movements can be achieved with the concurrent modulation of brain activity that is associated with the attempted movement and rest of two independent body parts. Movement control may be improved by spatial filtering methods that recombine raw EEGs to form new signals with more focused information about the underlying brain activity. This study compared spatial filters offline for improving simultaneous proportional 2D movement commands from EEGs. Filtering options evaluated were common average referencing, Laplacian, independent component analysis, principle component analysis, and two novel ways of applying common spatial pattern (CSP) analysis. CSP analysis is a supervised algorithm that optimally recombines EEGs collected under two known conditions. Both CSP options resulted in more accurate movement prediction than the other filtering options. CSP was particularly advantageous when separating EEGs associated with neighboring or overlapping areas on the motor homunculus. Finally, CSP performed well using smaller subsets of filtered signals, thus making CSP practical and efficient for simultaneous 2D control. A 2D online cursor control example using CSP filtering is included to show CSP's utility.

[PMID: 21712569](#) [PubMed - indexed for MEDLINE]

27. Brain. 2011 Dec 20. [Epub ahead of print]

Modifying the Medical Research Council grading system through Rasch analyses.

Vanhoutte EK, Faber CG, van Nes SI, Jacobs BC, van Doorn PA, van Koningsveld R, Cornblath DR, van der Kooij AJ, Cats EA, van den Berg LH, Notermans NC, van der Pol WL, Hermans MC, van der Beek NA, Gorson KC, Eurelings M, Engelsman J, Boot H, Meijer RJ, Lauria G, Tennant A, Merkies IS; on behalf of the PeriNomS Study Group.

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The Medical Research Council grading system has served through decades for the evaluation of muscle strength and has been recognized as a cardinal feature of daily neurological, rehabilitation and general medicine examination of patients, despite being respectfully criticized due to the unequal width of its response options. No study has systematically examined, through modern psychometric approach, whether physicians are able to properly use the Medical Research Council grades. The objectives of this study were: (i) to investigate physicians' ability to discriminate among the Medical Research Council categories in patients with different neuromuscular disorders and with various degrees of weakness through thresholds examination using Rasch analysis as a modern psychometric method; (ii) to examine possible factors influencing physicians' ability to apply the Medical Research Council categories through differential item function analyses; and (iii) to examine whether the widely used Medical Research Council 12 muscles sum score in patients with Guillain-Barré syndrome and chronic inflammatory demyelinating polyradiculoneuropathy would meet Rasch model's expectations. A total of 1065 patients were included from nine cohorts with the following diseases: Guillain-Barré syndrome (n=?480); myotonic dystrophy type-1 (n=?169); chronic inflammatory demyelinating polyradiculoneuropathy (n=?139); limb-girdle muscular dystrophy (n=?105); multifocal motor neuropathy (n=?102); Pompe's disease (n=?62) and monoclonal gammopathy of undetermined related polyneuropathy (n=?8). Medical Research Council data of 72 muscles were collected. Rasch analyses were performed on Medical Research Council data for each cohort separately and after pooling data at the muscle level to increase category frequencies, and on the Medical Research Council sum score in patients with Guillain-Barré syndrome and chronic inflammatory demyelinating polyradiculoneuropathy. Disordered thresholds were demonstrated in 74-79% of the muscles examined, indicating physicians' inability to discriminate between most Medical Research Council categories. Factors such as physicians' experience or illness type did not influence these findings. Thresholds were restored after rescoring the Medical Research Council grades from six to four options (0, paralysis; 1, severe weakness; 2, slight weakness; 3, normal strength). The Medical Research Council sum score acceptably fulfilled Rasch model expectations after rescoring the response options and creating subsets to resolve local dependency and item bias on diagnosis. In conclusion, a modified, Rasch-built four response category Medical Research Council grading system is proposed, resolving clinicians' inability to differentiate among its original response categories and improving clinical applicability. A modified Medical Research Council sum score at the interval level is presented and is recommended for future studies in Guillain-Barré syndrome and chronic inflammatory demyelinating polyradiculoneuropathy.

[PMID: 22189568](#) [PubMed - as supplied by publisher]

28. Curr Opin Pediatr. 2011 Dec 20. [Epub ahead of print]**Vitamin D deficiency: a paediatric orthopaedic perspective.**

Clarke NM, Page JE.

University Hospital Southampton, NHS Foundation Trust Southampton University Hospitals, Southampton General Hospital, Southampton, Hampshire, UK.

PURPOSE OF REVIEW: At the turn of the last century, rickets (vitamin D deficiency) was one of the most common musculoskeletal diseases of the paediatric population presenting to physicians. Today, the most common referral pathway for these patients ends in a paediatric orthopaedic outpatient clinic. Vitamin D deficiency is a clinical entity that can affect all children and should be looked for in all children with musculoskeletal symptoms. **RECENT FINDINGS:** The child at risk of rickets is now white, breastfed, protected from the sun and obese. Vitamin D deficiency can present as atypical muscular pain, pathological fractures or slipped upper femoral epiphysis. Obesity is linked with lower vitamin D levels; however, in the paediatric population, this does not necessarily equal clinical disorder. Vitamin D supplements can be used to reduce the risk of pathological fractures in the cerebral palsy child. It should also form part of the differential diagnosis in the work-up of nonaccidental injuries. Children with a low vitamin D present with a higher incidence of fractures from normal activities. Vitamin D levels need to be assessed before any form of orthopaedic surgery, as it can affect growth, both in the diaphysis of the bone and in the growth plate. **SUMMARY:** Vitamin D levels are a key element in the successful practice of paediatric orthopaedics. It is not just the possible cause of disorder presenting to the clinician but also extremely important in ensuring the successful postoperative recovery of the patient.

[PMID: 22189396](#) [PubMed - as supplied by publisher]

29. J Child Neurol. 2011 Dec 21. [Epub ahead of print]**Effect of General Anesthesia in Patients With Cerebral Palsy at the Turn of the New Millennium: A Population-Based Study Evaluating Perioperative Outcome and Brief Overview of Anesthetic Implications of This Coexisting Disease.**

Wass CT, Warner ME, Worrell GA, Castagno JA, Howe M, Kerber KA, Palzkill JM, Schroeder DR, Cascino GD.

Mayo Clinic, Rochester, MN, USA.

The severity of preoperative cerebral palsy appears to correlate directly with postoperative complications. The primary aim of this study was to characterize the frequency of perioperative morbidity and mortality in cerebral palsy patients undergoing anesthesia. This was accomplished by undertaking a systematic review of the Mayo Database. The risk for perioperative adverse events was 63.1% (95% confidence interval 59.8%-66.5%). However, it deserves clarification that hypothermia and clinically significant yet non-life-threatening hypotension represented the majority (80%) of these complications. When these 2 events are excluded, the rate of adverse perioperative events was 13.1% (95% confidence interval 10.8%-15.5%). Risk factors associated with increased risk included American Society of Anesthesiologists physical status score exceeding 2, history of seizures, upper airway hypotonia, general surgery procedures, and adults. Our findings are useful to counsel patients with cerebral palsy, their caregivers, and their guardians regarding the risk of general anesthesia.

[PMID: 22190505](#) [PubMed - as supplied by publisher]

30. Swiss Med Wkly. 2011 Dec 14;141:w13311. doi: 10.4414/smw.2011.13311.**Artificial muscle: the human chimera is the future.**

Tozzi P.

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Severe heart failure and cerebral stroke are broadly associated with the impairment of muscular function that

conventional treatments struggle to restore. New technologies enable the construction of "smart" materials that could be of great help in treating diseases where the main problem is muscle weakness. These materials "behave" similarly to biological systems, because the material directly converts energy, for example electrical energy into movement. The extension and contraction occur silently like in natural muscles. The real challenge is to transfer this amazing technology into devices that restore or replace the mechanical function of failing muscle. Cardiac assist devices based on artificial muscle technology could envelope a weak heart and temporarily improve its systolic function, or, if placed on top of the atrium, restore the atrial kick in chronic atrial fibrillation. Artificial sphincters could be used to treat urinary incontinence after prostatectomy or faecal incontinence associated with stomas. Artificial muscles can restore the ability of patients with facial paralysis due to stroke or nerve injury to blink. Smart materials could be used to construct an artificial oesophagus including peristaltic movement and lower oesophageal sphincter function to replace the diseased oesophagus thereby avoiding the need for laparotomy to mobilise stomach or intestine. In conclusion, in the near future, smart devices will integrate with the human body to fill functional gaps due to organ failure, and so create a human chimera.

[PMID: 22180171](#) [PubMed - in process]

Prevention and Cure

31. Ann Neurol. 2011 Nov;70(5):698-712. doi: 10.1002/ana.22518.

Stem cell therapy for neonatal brain injury: Perspectives and Challenges.

Titomanlio L, Kavelaars A, Dalous J, Mani S, El Ghouzzi V, Heijnen C, Baud O, Gressens P.

Inserm, UMR-676, Robert Debré Hospital, Paris, France; Paris Diderot University, Diderot Medical School, Paris, France; PremUP, Paris, France; Assistance Publique-Hôpitaux de Paris, Pediatric Emergency Department, Robert Debré Hospital, Paris, France.

Cerebral palsy is a major health problem caused by brain damage during pregnancy, delivery, or the immediate postnatal period. Perinatal stroke, intraventricular hemorrhage, and asphyxia are the most common causes of neonatal brain damage. Periventricular white matter damage (periventricular leukomalacia) is the predominant form in premature infants and the most common antecedent of cerebral palsy. Stem cell treatment has proven effective in restoring injured organs and tissues in animal models. The potential of stem cells for self-renewal and differentiation translates into substantial neuroprotection and neuroregeneration in the animal brain, with minimal risks of rejection and side effects. Stem cell treatments described to date have used neural stem cells, embryonic stem cells, mesenchymal stem cells, umbilical cord stem cells, and induced pluripotent stem cells. Most of these treatments are still experimental. In this review, we focus on the efficacy of stem cell therapy in animal models of cerebral palsy, and discuss potential implications for current and future clinical trials.

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32. Clin Neurophysiol. 2011 Dec 6. [Epub ahead of print]

Motor cortical functional geometry in cerebral palsy and its relationship to disability.

Kesar TM, Sawaki L, Burdette JH, Cabrera MN, Kolaski K, Smith BP, O'Shea TM, Koman LA, Wittenberg GF.

Dept. of Physical Therapy, University of Delaware, Newark, DE, United States.

OBJECTIVE: To investigate motor cortical map patterns in children with diplegic and hemiplegic cerebral palsy (CP), and the relationships between motor cortical geometry and motor function in CP. **METHODS:** Transcranial magnetic stimulation (TMS) was used to map motor cortical representations of the first dorsal interosseus (FDI) and tibialis anterior (TA) muscles in 13 children with CP (age 9-16years, 6 males.) The Gross Motor Function Measure

(GMFM) and Melbourne upper extremity function were used to quantify motor ability. RESULTS: In the hemiplegic participants (N=7), the affected (right) FDI cortical representation was mapped on the ipsilateral (N=4), contralateral (N=2), or bilateral (N=1) cortex. Participants with diplegia (N=6) showed either bilateral (N=2) or contralateral (N=4) cortical hand maps. The FDI and TA motor map center-of-gravity mediolateral location ranged from 2-8cm and 3-6cm from the midline, respectively. Among diplegics, more lateral FDI representation locations were associated with lower Melbourne scores, i.e. worse hand motor function (Spearman's rho=-0.841, p=0.036). CONCLUSIONS: Abnormalities in TMS-derived motor maps cut across the clinical classifications of hemiplegic and diplegic CP. The lateralization of the upper and lower extremity motor representation demonstrates reorganization after insults to the affected hemispheres of both diplegic and hemiplegic children.

SIGNIFICANCE: The current study is a step towards defining the relationship between changes in motor maps and functional impairments in CP. These results suggest the need for further work to develop improved classification schemes that integrate clinical, radiologic, and neurophysiologic measures in CP.

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33. J Perinatol. 2011 Dec 15. doi: 10.1038/jp.2011.185. [Epub ahead of print]

Cerebellar hemorrhage: a major morbidity in extremely preterm infants.

Zayek MM, Benjamin JT, Maertens P, Trimm RF, Lal CV, Eyal FG.

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Objective: To determine the impact of cerebellar hemorrhage (CH) on mortality and adverse neurodevelopmental (ND) outcome rates in extremely preterm infants admitted to a tertiary neonatal unit. Study Design: A total of 1120 eligible infants (<28 weeks gestation) were born from 1998 to 2008 and had at least one cranial ultrasound. ND outcome was determined at 12 to 18 months corrected age. Results: Most CH (75%) occurred in infants <25 weeks gestation. CH did not affect mortality rates, however, it was associated with both mental and motor impairments, with incidence rate ratios of 3.08 (1.71 to 4.84) and 2.12 (1.12 to 3.45), respectively. Moreover, the risk of cerebral palsy (CP) was increased in infants with CH involving the medial part of the cerebellum. Conclusion: Our findings substantiate recent reports about the cerebellum, highlighting its role in cognitive and executive functions, and associating early cerebellar injury not only with CP but also with learning, affective and behavioral disorders. Journal of Perinatology advance online publication, 15 December 2011; doi:10.1038/jp.2011.185.

[PMID: 22173133](#) [PubMed - as supplied by publisher]

34. Neuroradiology. 2011 Dec 16. [Epub ahead of print]

Comparing quantitative tractography metrics of motor and sensory pathways in children with periventricular leukomalacia and different levels of gross motor function.

Rha DW, Chang WH, Kim J, Sim EG, Park ES.

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INTRODUCTION: The neural tracts responsible for gross motor dysfunction in children with spastic cerebral palsy (CP) caused by periventricular leukomalacia remain unknown. This study investigated both sensory and motor tracts using diffusion tensor tractography (DTT). METHODS: Brain MRIs with diffusion tensor imaging (DTI) performed on 19 children (ten boys and nine girls) with bilateral spastic CP were analyzed. DTT was reconstructed from DTI. Participants were classified according to gross motor function measured with Gross Motor Function Classification System (GMFCS). Those with GMFCS levels I-III comprised the high-functioning group (n = 11), and those with GMFCS levels IV-V comprised the low-functioning group (n = 8). We compared DTT-based metrics, such as fractional anisotropy, apparent diffusion coefficient, and fiber number and volume, between the groups. RESULTS: In the corticospinal tract, the volume and number of fibers were significantly higher in the high-functioning group (p < 0.001), whereas the fractional anisotropy and apparent diffusion coefficient of the

corticospinal tract did not differ significantly between the groups. In the somatosensory tract and posterior thalamic radiation, none of the DTT parameters differed significantly between the groups. CONCLUSIONS: Children with bilateral spastic CP with differing levels of gross motor function have corresponding differences detectable on DTT in their corticospinal tracts but not in their somatosensory tracts and posterior thalamic radiations. In addition, the number and volume of fibers, but not fractional anisotropy values or apparent diffusion coefficients, are lower in the corticospinal tracts in children with low gross motor function than in those with high gross motor function.

[PMID: 22170081](#) [PubMed - as supplied by publisher]

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