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## Interventions and Management

### 1. Phys Occup Ther Pediatr. 2016 Jun 9:1-15. [Epub ahead of print]

Comparison of the Properties of the Handwriting Speed Test (HST) and Detailed Assessment of Speed of Handwriting (DASH): An Exploratory Study.

Francis A, Wallen M, Bundy A.

**BACKGROUND:** Handwriting speed is an important component of students' ability to adequately express their ideas, knowledge and creativity in a timely and effective manner. **AIMS:** Psychometric properties of the Handwriting Speed Test (HST) and Detailed Assessment of Speed of Handwriting (DASH) and accuracy of the norms for identifying current Australian students with handwriting speed difficulties were examined. **METHODS:** An exploratory, cross-sectional study was conducted involving students, with and without handwriting difficulties, in Years 3-12 (mean age: 12.0 yrs, SD = 3.0 yrs; range = 7 to 18 yrs) in New South Wales (NSW; Australia). Participants were recruited through occupational therapists and schools. Students completed the HST and all DASH subtests. **RESULTS:** Thirty-two students with, and 139 students without, handwriting difficulties participated. Intra-rater and inter-rater reliability were found to be excellent; sensitivity was low and specificity high for the HST and DASH. No significant differences were found between test scores and normative data for students without handwriting difficulties (year/age groups with  $n > 10$ ). **CONCLUSIONS:** The HST and DASH are reliable assessments of handwriting speed. Further research is required into discriminant validity of the HST and DASH and need for updated norms.

[PMID: 27282190](#)

### 2. Child Care Health Dev. 2016 Jun 9. doi: 10.1111/cch.12366. [Epub ahead of print]

Associations between recurrent musculoskeletal pain and visits to the family doctor (GP) and specialist multi-professional team in 74 Norwegian youth with cerebral palsy.

Ramstad K, Jahnsen R, Diseth TH.

**BACKGROUND:** Musculoskeletal pain in cerebral palsy (CP) is common, but probably undertreated. The aim of the study was to explore if recurrent musculoskeletal pain (RMP) related to the CP condition was associated with visits to the family doctor [general practitioner (GP)] and specialist habilitation centre in youth with CP. **METHODS:** Seventy-four youth with CP (mean age 16.5 years, 40 boys) from the same geographical area were assessed by clinical examination, semi-structured interview on pain (adolescent and parent together), the two questions on pain from the Child Health Questionnaire (parents only) and a structured interview on health care services. Gross Motor Function Classification System was level I 39%, level II 23%, level III 8% and levels IV and V 30%. **RESULTS:** Thirty-five participants (47%) had visited their GP last year, and 49 (66%) had visited the specialist habilitation centre. The presence of RMP ( $n = 58$ ; 78%) was not significantly associated with

having visited the GP or the specialist habilitation centre. Still, in participants with RMP, increasing pain severity was associated with having visited the GP. Rest, massage, change of position and oral drugs were the most common measures taken to relieve RMP. Three adolescents with RMP did not take any measures to relieve pain. **CONCLUSION:** Youth with RMP do take measures to relieve pain, but usually not in the direction of consulting the health care services available unless the pain is severe. Both youth with CP and their caregivers should be encouraged to discuss RMP with their professional network of care.

[PMID: 27283955](#)

### **3. Clin Rehabil. 2016 Jun 7. pii: 0269215516651980. [Epub ahead of print]**

Randomized controlled trial of web-based multimodal therapy for children with acquired brain injury to improve gross motor capacity and performance.

Baque E, Barber L, Sakzewski L, Boyd RN.

**OBJECTIVE:** To compare efficacy of a web-based multimodal training programme, 'Move it to improve it' (Mitii™), to usual care on gross motor capacity and performance for children with an acquired brain injury. **DESIGN:** Randomized waitlist controlled trial. **SETTING:** Home environment. **PARTICIPANTS:** A total of 60 independently ambulant children (30 in each group), minimum 12 months post-acquired brain injury were recruited and randomly allocated to receive either 20 weeks of Mitii™ training (30 minutes/day, six days/week, total 60 hours) immediately, or waitlisted (usual care control group) for 20 weeks. A total of 58 children completed baseline assessments (32 males; age 11 years 11 months ± 2 years 6 months; Gross Motor Function Classification System equivalent I = 29, II = 29). **INTERVENTION:** The Mitii™ program comprised of gross motor, upper limb and visual perception/cognitive activities. **MAIN MEASURES:** The primary outcome was 30-second, repetition maximum functional strength tests for the lower limb (sit-to-stand, step-ups, half-kneel to stand). Secondary outcomes were the 6-minute walk test, High-level Mobility Assessment Tool, Timed Up and Go Test and habitual physical activity as captured by four-day accelerometry. **RESULTS:** Groups were equivalent at baseline on demographic and clinical measures. The Mitii™ group demonstrated significantly greater improvements on combined score of functional strength tests (mean difference 10.19 repetitions; 95% confidence interval, 3.26-17.11;  $p = 0.006$ ) compared with the control group. There were no other between-group differences on secondary outcomes. **CONCLUSION:** Although the Mitii™ programme demonstrated statistically significant improvements in the functional strength tests of the lower limb, results did not exceed the minimum detectable change and cannot be considered clinically relevant for children with an acquired brain injury.

[PMID: 27271374](#)

### **4. Phys Occup Ther Pediatr. 2016 Jun 9:1-11. [Epub ahead of print]**

Assisting Hand Assessment and Children's Hand-use Experience Questionnaire - Observed Versus Perceived Bimanual Performance in Children with Unilateral Cerebral Palsy.

Ryll UC, Bastiaenen CH, Eliasson AC.

**AIMS:** To explore the differences, relationship, and extent of agreement between the Assisting Hand Assessment (AHA), measuring observed ability to perform bimanual tasks, and the Children's Hand-Use Experience Questionnaire (CHEQ), assessing experienced bimanual performance. **METHODS:** This study investigates a convenience sample of 34 children (16 girls) with unilateral cerebral palsy aged 6-18 years (mean 12.1, SD 3.9) in a cross-sectional design. **RESULTS:** The AHA and CHEQ subscales share 8-25% of their variance ( $R^2$ ). Bland-Altman plots for AHA and all three CHEQ subscales indicate good average agreement, with a mean difference approaching zero but large 95% confidence intervals. Limits of agreement were extremely wide, indicating considerable disagreement between AHA and CHEQ subscales. **CONCLUSION:** AHA and CHEQ seem to measure different though somewhat related constructs of bimanual performance. Results of this investigation reinforce the recommendation to use both instruments to obtain complementary information about bimanual performance including observed and perceived performance of children with unilateral cerebral palsy.

[PMID: 27283785](#)

### 5. Disabil Rehabil. 2016 Jun 7:1-7. [Epub ahead of print]

Parents' experience of undertaking an intensive cognitive orientation to daily occupational performance (CO-OP) group for children with cerebral palsy.

Jackman M, Novak I, Lannin N, Froude E.

**PURPOSE:** The purpose of this study was to explore the experience of parents of children with cerebral palsy (CP) who participated in an intensive cognitive orientation to daily occupational performance (CO-OP) group program addressing child chosen goals. **METHOD:** Participants were six parents of children with CP who participated in a CO-OP upper limb task-specific training program. Parents participated in semi-structured interviews conducted via phone. A grounded theory approach was used. Interviews were transcribed verbatim and coded to identify categories and overarching themes of the parent experience of CO-OP. **RESULTS:** The theory of CO-OP for children with CP was one of offering a unique and motivating learning experience for both the child and the parent, differing from other therapeutic approaches that families had previously been involved in. Five categories were identified: the unique benefits of CO-OP; the importance of intensity; the child's motivation; challenging the parent role; and the benefits and challenges of therapy within a group context. **CONCLUSION:** Parents felt that CO-OP was a worthwhile intervention that leads to achievement of goals involving upper limb function and had the capacity to be transferred to future goals. Intensity of therapy and a child's motivation were identified as important factors in improvements. Further studies using quantitative research methods are warranted to investigate the benefits of CO-OP for children with neurological conditions. Implications for rehabilitation The cognitive orientation to daily occupational performance (CO-OP) is a promising upper limb cognitive motor training intervention for children with cerebral palsy. In a small sample, parents perceived that CO-OP leads to achievement of upper limb goals. Intensity of therapy, the child's motivation and the parents' ability to "step-back" were identified as important to the success of CO-OP.

[PMID: 27269440](#)

### 6. J Pediatr Orthop. 2016 Jun 8. [Epub ahead of print]

Outcomes of Isolated Varus Derotational Osteotomy in Children With Cerebral Palsy Hip Dysplasia and Predictors of Resubluxation.

Chang FM, May A, Faulk LW, Flynn K, Miller NH, Rhodes JT, Zhaoxing P, Novais EN.

**BACKGROUND:** The appropriate intervention for hip subluxation or dislocation in children affected by cerebral palsy (CP) remains controversial. The purpose of this retrospective study was to report radiographic and clinical outcomes following isolated femoral varus derotational osteotomy (VDRO) in children with CP hip dysplasia. Risk factors for resubluxation and avascular necrosis (AVN) were also examined. **METHODS:** A cohort of 100 patients (199 hips) with CP treated with isolated VDRO between 2003 and 2009 was reviewed. All but 1 patient received bilateral surgery. Patients were followed for an average of 5.4 years (range, 1.03 to 10.20 y). Anteroposterior pelvic radiographs were used to assess migration percentage (MP), Shenton's line, and presence of AVN. Resubluxation was defined as a postoperative break in Shenton's line. Radiographic outcomes and risk analysis was performed in the 91 subjects (179 hips) with radiographic follow-up >1 year. **RESULTS:** Significant improvement was observed in MP, and all hips had a reconstituted Shenton's line following surgery. Over the course of follow-up, 16% of hips were noted to have a repeat break in Shenton's line. Univariate risk analysis showed preoperative MP, Gross Motor Function Classification System (GMFCS) level, and age at surgery were risk factors for a recurrent line break. Preoperative MP and GMFCS level were found to be predictors of resubluxation in multivariate analysis. AVN was detected in 10 hips (5.7%). GMFCS level V patients were more at risk for resubluxation, but less at risk for AVN when compared with ambulatory (GMFCS I/II/II) patients and GMFCS level IV patients. **CONCLUSIONS:** Performing a VDRO without additional procedures provided a stable and concentrically reduced hip joint in this population of children with CP. Attention should be paid to initial ambulatory status during the postoperative period. Concomitant procedures such as pelvic osteotomy should be considered for patients of GMFCS level IV and V, as these patients were more at risk for recurrent subluxation.

[PMID: 27280898](#)

**7. Rev Bras Ortop. 2016 May 3;51(3):329-32. doi: 10.1016/j.rboe.2015.07.012.**

Hip dislocation in cerebral palsy: evolution of the contralateral side after reconstructive surgery.

Abdo JC, Forlin E.

**OBJECTIVE:** To evaluate the progression of the contralateral hip after unilateral reconstruction of hip dislocation in patients classified as GMFCS IV-V; and to identify potential prognostic factors for their evolution. **METHODS:** This was a retrospective study on 17 patients with spastic cerebral palsy, who were classified on the GMFCS scale (Gross Motor Functional Classification System) as degrees IV and V, and who underwent unilateral reconstruction surgery to treat hip dislocation (adductor release, femoral varus osteotomy and acetabuloplasty). The minimum postoperative follow-up was 30 months. The clinical parameters evaluated were sex, age at time of surgery, length of follow-up after surgery and range of abduction. The treatment parameters were use/nonuse of femoral shortening, application of botulinum toxin and any previous muscle releases. The radiographic parameters were Reimer's extrusion index (REI), acetabular angle (AA) and the continuity of Shenton's line. **RESULTS:** Among the 17 patients evaluated, eight presented dislocation (group I) and nine did not (group II). Group I comprised three males and five females; group II comprised one male and eight females. The mean age at the time of surgery among the group I patients was 62 months and the mean follow-up was 62 months. In group II, these were 98 and 83 months, respectively. There was a trend in which patients of greater age did not evolve with contralateral dislocation. Among the nine patients with the combination of REI < 30% and AA < 25°, only one presented dislocation during the follow-up. Contralateral subluxation occurred within the first two years after the surgery. **CONCLUSION:** Hips presenting REI < 30° and AA < 25° do not tend to evolve to subluxation and can be kept under observation. Preoperative clinical and radiographic measurements alone are not useful for indicating the natural evolution of non-operated hips. The critical period for subluxation is the first two years after surgery.

[PMID: 27274487](#)

**8. J Pediatr Orthop. 2016 Jun 2. [Epub ahead of print]**

Performing a Definitive Fusion in Juvenile CP Patients is a Good Surgical Option.

Yaszay B1, Sponseller PD, Shah SA, Asghar J, Miyanji F, Samdani AF, Bartley C, Newton PO.

**BACKGROUND:** In juveniles with progressive curves, there is debate regarding the use of growth friendly implants versus definitive fusion. This study presents outcomes of juvenile cerebral palsy (CP) scoliosis patients who underwent definitive fusion before age 11. **METHODS:** A review of a prospective, multicenter registry identified patients 10 years and younger who had a definitive posterior fusion for their CP scoliosis. Preoperative and postoperative demographic and radiographic changes were evaluated with descriptive statistics. Repeated measures analysis of variance were utilized to compare outcome scores. **RESULTS:** Fourteen children with a mean age of 9.7 years (8.3 to 10.8 y) and a minimum of 2 years follow-up (range 2 to 3 y) were identified. The mean preoperative curve magnitude and pelvic obliquity was 84±25 degrees (range 63 to 144 degrees) and 25±14 degrees, respectively. All patients were skeletally immature with open triradiate cartilage. Three patients had unit rods with wires while the rest incorporated pedicle screws. Immediately postoperation, the average major curve was 25±17 degrees (P≤0.001, 71% correction rate). At most recent follow-up, the average major curve increased to 30±18 degrees (P≤0.001) for a 65% correction rate. Pelvic obliquity improved to 4±4 degrees (84% correction, P≤0.001) immediately postoperation and to 6±5 degrees (P=0.002) at latest follow-up for a 76% correction rate. None of the patients required revision surgery for progression. From pre to most recent follow-up, the CPchild Health outcome scores improved from 47 to 58 (P=0.019). One patient had a deep infection, and 1 patient had a broken rod that did not require any further treatment. **CONCLUSIONS:** Progressive scoliosis in juvenile CP patients requires the surgeon to balance the need for further growth with the risks of progression or repeated surgical procedures. Our study demonstrates that definitive fusion once the curves approach 90 degrees results in significant radiographic and quality of life improvements, but further follow-up is needed to determine whether those results remain after skeletal maturity.

[PMID: 27261965](#)

**9. Phys Occup Ther Pediatr. 2016 Jun 9:1-16. [Epub ahead of print]**

Cognitive Orientation to daily Occupational Performance (CO-OP): A New Approach for Children with Cerebral Palsy.

Cameron D, Craig T, Edwards B, Missiuna C, Schweltnus H, Polatajko HJ.

**AIMS:** The results of a small single-case study series suggested that Cognitive Orientation to daily Occupational Performance (CO-OP) may be a successful approach for children with cerebral palsy (CP). Therefore a pilot randomized controlled trial was conducted with the following research questions-is CO-OP a feasible approach to use with children with CP, what are the effects of CO-OP when compared to usual practice, and is a larger study warranted? **METHODS:** 18 children between age 7 and 12 (nine in CO-OP group and nine in Current Usual Practice Approach (CUPA) group) received ten 1-hour sessions of intervention on average once per week at home. Primary outcome measures were the Canadian Occupational Performance Measure and the Performance Quality Rating Scale (PQRS). PQRS assessors were blind to group allocation and timing of assessment. **RESULTS:** All children in the CO-OP group were able to learn the strategies and achieve their chosen goals, thus demonstrating the feasibility of the approach. Both approaches equally promoted skill acquisition and skill maintenance at follow-up. Effect sizes suggest that CO-OP may show some advantage for transfer and maintenance. **CONCLUSION:** Based on these initial findings, further research is warranted.

[PMID: 27282077](#)

**10. Dev Med Child Neurol. 2016 Jun 8. doi: 10.1111/dmcn.13162. [Epub ahead of print]**

Mini-MACS: development of the Manual Ability Classification System for children younger than 4 years of age with signs of cerebral palsy.

Eliasson AC, Ullenhag A, Wahlström U, Krumlinde-Sundholm L.

**AIM:** To develop the Mini-Manual Ability Classification System (Mini-MACS) and to evaluate the extent to which its ratings are valid and reliable when children younger than 4 years are rated by their parents and therapists. **METHOD:** The Mini-MACS was created by making adjustments to the MACS. The development involved a pilot project, consensus discussions within an expert group, and the creation of a test version of the Mini-MACS that was evaluated for content validity and interrater reliability. A convenience sample of 61 children with signs of cerebral palsy aged 12 to 51 months (mean age 30.2mo [SD 10.1]) were classified by one parent and two occupational therapists across a total of 64 assessments. Agreement between the parents' and therapists' ratings was evaluated using the intraclass correlation coefficient (ICC) and the percentage of agreement. **RESULTS:** The first sentence of the five levels in the MACS was kept, but other descriptions within the Mini-MACS were adjusted to be more relevant for the younger age group. The ICC between parents and therapists was 0.90 (95% confidence interval [CI] 0.79-0.92), and for the two therapists it was 0.97 (95% CI 0.78-0.92). Most parents and therapists found the descriptions in the Mini-MACS suitable and easy to understand. **INTERPRETATION:** The Mini-MACS seems applicable for children from 1 to 4 years of age.

[PMID: 27273427](#)

**11. Dev Med Child Neurol. 2016 Jun 10. doi: 10.1111/dmcn.13186. [Epub ahead of print]**

Classifying the manual abilities of young children with cerebral palsy.

Jeevanantham D.

[PMID: 27283983](#)

**12. Child Care Health Dev. 2016 Jun 9. doi: 10.1111/cch.12354. [Epub ahead of print]**

Is a family-centred initiative a family-centred service? A case of a Conductive Education setting for children with cerebral palsy.

Schenker R, Parush S, Rosenbaum P, Rigbi A, Yochman A.

**BACKGROUND:** From the moment a child is diagnosed as having cerebral palsy, families have to cope on a daily basis with the multifaceted challenges of life-long disability management. Family-centred service is embraced as a 'best practice' model because of accumulating evidence supporting its positive influence on parents and children's outcomes. Nevertheless, research comparing parent and provider perspectives on family-centred practices of educational service providers in education settings is scarce. The aims of this study were to compare the extent to which parents and conductors experience the service delivery in Tsad Kadima, the Association for Conductive Education in Israel, as being family-centred, as well as comparing parents' perception of different educational settings as being family-centred. **METHODS:** Measurements of family-centeredness, the Israeli Measure of Processes of Care for families (MPOC-20) and for service providers (MPOC-SP), were administered to 38 teacher conductors and 83 families of children with cerebral palsy (aged 1-14), from different conductive educational settings. **RESULTS:** Parents and conductors perceive Conductive Education service as being highly family centred in most domains, rating respectful and supportive care the highest and providing general information the lowest, thus indicating an area where improvements should be made. Parents perceived the service they receive to be more family-centred than conductor's perception about their own activities. In addition, educational setting (day care, pre-school and school) was found to be associated with parent's scores. **CONCLUSIONS:** The current study, which is the first to examine family-centred service provision in a conductive special education setting, from the perspectives of both parents and conductors, provides significant evidence for high-quality services in these settings.

[PMID: 27283848](#)

**13. Child Neuropsychol. 2016 Jun 10:1-26. [Epub ahead of print]**

Body representation in children with hemiplegic cerebral palsy.

Fontes PL, Cruz TK, Souto DO, Moura R, Haase VG.

Clinical observations indicate that many children with hemiplegic cerebral palsy refrain from using or disregard the affected upper limb. The aim of the present study is to investigate deficits in different body representations (body schema, body structural description, and body image) in children with hemiplegic cerebral palsy (HCP) compared to typically-developing (TD) children. Three groups of children participated in this study: 42 TD children (aged 5.17-10.91 years), 23 children with right HCP (aged 5.83-10.92 years), and 22 children with left HCP (aged 5.67-10.90 years). The results demonstrate generalized deficits in all three body representations in children with HCP, and do not offer evidence for an effect of hemiplegia laterality.

[PMID: 27282627](#)

**14. J Pediatr Rehabil Med. 2016 May 31;9(2):83-99. doi: 10.3233/PRM-160375.**

Does therapeutic electrical stimulation improve function in children with disabilities? A comprehensive literature review.

Bosques G, Martin R, McGee L, Sadowsky C.

The use of therapeutic electrical stimulation for medical purposes is not new; it has been described in medical textbooks since the 18th century, but its use has been limited due to concerns for tolerance and lack of research showing efficacy. The purpose of this review is to discuss the potential clinical applicability, while clarifying the differences in electrical stimulation (ES) treatments and the theory behind potential benefits to remediate functional impairments in youth. The literature review was performed as follows: A total of 37 articles were reviewed and the evidence for use in pediatric diagnoses is reported. The synthesis of the literature suggests that improvements in various impairments may be possible with the integration of ES. Most studies were completed on children with cerebral palsy (CP). Electrical stimulation may improve muscle mass and strength, spasticity, passive range of motion (PROM), upper extremity function, walking speed, and positioning of the foot and ankle kinematics during walking. Sitting posture and static/dynamic sitting balance may be improved with ES to trunk musculature.

Bone mineral density may be positively affected with the use of Functional Electrical Stimulation (FES) ergometry. ES may also be useful in the management of urinary tract dysfunction and chronic constipation. Among all reviewed studies, reports of direct adverse reactions to electrical stimulation were rare. In conclusion, NMES and FES appear to be safe and well tolerated in children with various disabilities. It is suggested that physiatrists and other healthcare providers better understand the indications and parameters in order to utilize these tools effectively in the pediatric population. MeSH terms: Electrical stimulation; child; review.

[PMID: 27285801](#)

**15. Dan Med J. 2016 Jun;63(6). pii: A5238.**

Environmental needs in childhood disability analysed by the WHO ICF, Child and Youth Version.

Illum NO, Bonderup M, Gradel KO.

**INTRODUCTION:** The WHO has launched a common classification for disabilities in children, the International Classification of Functioning, Disability and Health, Child and Youth Version (ICF-CY). We wanted to determine whether categories of the environmental (e) and the body functions (b) components of the classification could address environmental needs in children with different disorders and various disability severities. **METHODS:** A set of 16 e categories and 47 b categories were selected and worded to best enable parents to describe children's everyday support needs and environmental influences through interviews in their own homes. **RESULTS:** Of the 367 invited parents, 332 (90.5%) participated, providing data on children with spina bifida, spinal muscular atrophy, muscular disorders, cerebral palsy, visual impairments, hearing impairments, mental disability and disabilities following brain tumour treatment. The mean age of children across disabilities was 9.4 years (range: 1.0-15.9). The mean e code score was 35.7 (range: 4.0-64.0), and the mean b code score was 32.2 (range: 0.0-159.0). The most urgent needs as detected by qualifier 4 environmental categories scores were common among children with complex disorders and issues related to health professionals, legal services and health services. **CONCLUSIONS:** Parents understand the environmental and body function components in a meaningful manner and the codes seem to be valid. Special emphasis should be given to environmental issues for children with more complex disabilities. There was no correlation between the severity of a disability and environmental issues, indicating that each child's needs were basically met, irrespective of disability severity.

[PMID: 27264942](#)

**16. Tohoku J Exp Med. 2016;239(2):139-46. doi: 10.1620/tjem.239.139.**

Serum Leptin as a Nutritional Biomarker in Children with Cerebral Palsy.

Amarase C, Weerasopone S, Osateerakun P, Honsawek S, Limpaphayom N.

Adequate nutrition is crucial for children with cerebral palsy (CCP). However, conventional nutritional assessments may be inadequate for defining undernourished CCP. Leptin, an adipocyte hormone controlling energy expenditure, could be a useful marker. Objectives of this cross-sectional analytic study were to explore correlations between serum leptin level and nutritional status, anthropometric measurements, and biochemical parameters in 86 CCP (aged  $9 \pm 2$  years). Subscapular (SST) and triceps (TST) skinfold thicknesses, weight, and calculated height were obtained. Body mass index and weight-for-height (WH) Z-scores were calculated. Complete blood count and serum levels of leptin and albumin were collected. CCP were classified as undernourished if their WHZ was  $< -2$  according to the World Health Organization criteria. Correlations between anthropometric measurements, biochemical data, and serum leptin levels were evaluated. From 86 CCP, 11 (12%) children were undernourished, and SST, hemoglobin, and hematocrit were significantly lower. Serum leptin levels of nourished and undernourished CCP were  $5.4 \pm 6.2$  and  $2.9 \pm 1.6$  ng/mL ( $p < 0.001$ ), while the reported value from normal children was 4.9 ng/mL. Serum leptin levels demonstrated a significant correlation with SST and TST ( $r = 0.83$  and  $0.72$ ;  $p < 0.001$ ). Serum leptin was the only marker significantly correlated with WHZ ( $r = 0.45$ ,  $p < 0.001$ ) while adjusting for covariates. A serum leptin level of 2.2 ng/mL was the optimal cutoff point for defining adequate nutritional status ( $WHZ \geq -2$ ). The measurement of serum leptin should be included in a care scheme of CCP especially during surgical evaluation.

[PMID: 27265160](#)

**17. J Pediatr (Rio J). 2016 Jun 6. pii: S0021-7557(16)30044-4. doi: 10.1016/j.jpmed.2016.03.006. [Epub ahead of print]**

Sialorrhea in children with cerebral palsy.

Dias BL, Fernandes AR, Filho HS.

**OBJECTIVE:** To review the literature on sialorrhea in children with cerebral palsy. **SOURCE OF DATA:** Non-systematic review using the keywords "sialorrhea" and "child" carried out in the PubMed®, LILACS®, and SciELO® databases during July 2015. A total of 458 articles were obtained, of which 158 were analyzed as they were associated with sialorrhea in children; 70 had content related to sialorrhea in cerebral palsy or the assessment and treatment of sialorrhea in other neurological disorders, which were also assessed. **DATA SYNTHESIS:** The prevalence of sialorrhea is between 10% and 58% in cerebral palsy and has clinical and social consequences. It is caused by oral motor dysfunction, dysphagia, and intraoral sensitivity disorder. The severity and impact of sialorrhea are assessed through objective or subjective methods. Several types of therapeutic management are described: training of sensory awareness and oral motor skills, drug therapy, botulinum toxin injection, and surgical treatment. **CONCLUSIONS:** The most effective treatment that addresses the cause of sialorrhea in children with cerebral palsy is training of sensory awareness and oral motor skills, performed by a speech therapist. Botulinum toxin injection and the use of anticholinergics have a transient effect and are adjuvant to speech therapy; they should be considered in cases of moderate to severe sialorrhea or respiratory complications. Atropine sulfate is inexpensive and appears to have good clinical response combined with good safety profile. The use of trihexyphenidyl for the treatment of sialorrhea can be considered in dyskinetic forms of cerebral palsy or in selected cases.

[PMID: 27281791](#)

**18. J Pediatr Orthop. 2016 Jun 2. [Epub ahead of print]**

Incidence of and Risk Factors for Loss of 1 Blood Volume During Spinal Fusion Surgery in Patients With Cerebral Palsy.

Jain A, Sponseller PD, Shah SA, Yaszay B, Njoku DB, Miyajima F, Newton PO, Bastrom TP, Marks MC; Harms Study Group.

**BACKGROUND:** Spinal fusion surgery is associated with greater blood loss in patients with cerebral palsy (CP) than in patients with adolescent idiopathic scoliosis. Risk factors for loss of 1 blood volume (LOBV) in patients with CP have not been well studied. We investigated the incidence of and risk factors for LOBV during spinal fusion surgery in young patients with CP. **METHODS:** We queried a multicenter registry of CP patients for all patients 21 years or younger who had undergone spinal fusion from 2008 through 2013; 272 patients met these criteria. We analyzed data on patient characteristics, preoperative laboratory values, radiographic measures, and surgical characteristics. For univariate analysis, we used  $\chi$  tests and logistic regression models. Factors that were significant in the univariate analysis were used to construct a multivariate logistic regression model. Significance was set at  $P < 0.01$ . **RESULTS:** Incidence of LOBV was 39.7%. On multivariate analysis, unit rod construct and coronal curve magnitude were significantly associated with LOBV ( $P < 0.01$ ). The multivariate model accounted for 32.2% of variance in LOBV. Compared with patients with pedicle screw-rod constructs, patients with unit rod constructs had 12.6-fold higher odds of LOBV ( $P < 0.01$ ). For each 1-degree increase in coronal curve magnitude, odds of LOBV increased 1.03-fold ( $P < 0.01$ ). **CONCLUSIONS:** In patients with CP, there is a substantial risk of LOBV during spinal fusion surgery. Use of unit rod constructs and greater preoperative coronal curves were significant risk factors for LOBV during surgery.

[PMID: 27261969](#)

**19. Pediatr Neurol. 2016 May;58:90-7. doi: 10.1016/j.pediatrneurol.2016.01.002. Epub 2016 Jan 7.**

A Cross-sectional Survey of Growth and Nutritional Status in Children With Cerebral Palsy in West China.

Wang F, Cai Q, Shi W, Jiang H, Li N, Ma D, Wang Q, Luo R, Mu D.

**BACKGROUND:** We describe the growth and nutritional status of children with cerebral palsy (2 to 18 years old) in West China and to explore the correlation between the nutritional status and age, gender, and gross and fine motor function. **METHODS:** We performed a cross-sectional survey of children registered as having cerebral palsy in the China Disabled

Persons' Federation branch in Chengdu. Growth (height and weight) and nutritional (body mass index) status were recorded. Gross Motor Function Classification System (GMFCS) and Manual Ability Classification System (MACS) were used to determine gross and fine motor function, respectively. The association between nutritional status and age, GMFCS and MACS levels was evaluated. RESULTS: We enrolled 377 children (53.6% male), among whom 160 (42.4%) were stunting, 48 (12.7%) underweight, 81 (21.5%) thin, and 70 (18.5%) overweight and obese. Thinness was the main nutritional problem in older patients (12 to 18 years), whereas overweight and obesity were the major issues in younger patients (2 to 12 years). Growth deviation and malnutrition were significantly more prevalent in patients with severe motor impairments. A significant negative correlation was found between nutritional status and age, GMFCS and MACS levels, and between growth and GMFCS and MACS levels. CONCLUSIONS: Growth abnormality is common in children with cerebral palsy. Malnutrition and overnutrition both exist in children with cerebral palsy. Characteristics at different age stages and motor functional levels should be taken into consideration in the management of growth and nutrition in this population.

[PMID: 27268760](#)

**20. Res Dev Disabil. 2016 Jun 2;56:83-98. doi: 10.1016/j.ridd.2016.04.009. [Epub ahead of print]**

Measuring intellectual ability in cerebral palsy: The comparison of three tests and their neuroimaging correlates.

Ballester-Plané J, Laporta-Hoyos O, Macaya A, Póo P, Meléndez-Plumed M, Vázquez É, Delgado I, Zubiaurre-Elorza L, Narberhaus A, Toro-Tamargo E, Russi ME, Tenorio V, Segarra D, Pueyo R.

Standard intelligence scales require both verbal and manipulative responses, making it difficult to use in cerebral palsy and leading to underestimate their actual performance. This study aims to compare three intelligence tests suitable for the heterogeneity of cerebral palsy in order to identify which one(s) could be more appropriate to use. Forty-four subjects with bilateral dyskinetic cerebral palsy (26 male, mean age 23 years) conducted the Raven's Coloured Progressive Matrices (RCPM), the Peabody Picture Vocabulary Test-3rd (PPVT-III) and the Wechsler Nonverbal Scale of Ability (WNV). Furthermore, a comprehensive neuropsychological battery and magnetic resonance imaging were assessed. The results show that PPVT-III gives limited information on cognitive performance and brain correlates, getting lower intelligence quotient scores. The WNV provides similar outcomes as RCPM, but cases with severe motor impairment were unable to perform it. Finally, the RCPM gives more comprehensive information on cognitive performance, comprising not only visual but also verbal functions. It is also sensitive to the structural state of the brain, being related to basal ganglia, thalamus and white matter areas such as superior longitudinal fasciculus. So, the RCPM may be considered a standardized easy-to-administer tool with great potential in both clinical and research fields of bilateral cerebral palsy.

[PMID: 27262445](#)

## Prevention and Cure

### 21. *Acta Paediatr.* 2016 Jun 8. doi: 10.1111/apa.13499. [Epub ahead of print]

More than two-thirds of adolescents who received active perinatal care after extremely preterm birth had mild or no disabilities.

Holsti A, Adamsson M, Serenius F, Hägglöf B, Farooqi A.

**AIM:** Active perinatal care (APC) increases the survival of extremely preterm (EPT) infants, but may increase the rate of disabilities. We examined neurodevelopmental outcomes in adolescents aged 10-15 years who were born EPT and received APC in two Swedish tertiary care centres. **METHODS:** Cognitive function was assessed using the Wechsler Intelligence Scale for Children and neurosensory impairments were assessed by reviewing the case records and a standard parent health questionnaire. The outcomes were compared to term-born controls. **RESULTS:** We assessed 132 EPT adolescents and 103 controls. The rates of cerebral palsy, moderate to severe visual impairment and moderate to severe hearing impairment were 9%, 4% and 6%, respectively, for the EPT children and zero for the controls. Serious cognitive impairment was present in 31% of the EPT adolescents and 5% of the controls. Combining impairments across domains showed that 34% of EPT adolescents had moderate and severe disabilities compared with 5% of the controls. Impairments were more common at 23-24 weeks of gestational age (43%) than at 25 weeks (28.4%). **CONCLUSION:** Just over two-thirds (66%) of adolescents born EPT who received APC had mild or no disabilities. Our results are relevant for healthcare providers and clinicians counselling families. This article is protected by copyright. All rights reserved.

[PMID: 27275954](#)

### 22. *An Pediatr (Barc).* 2016 Jun 6. pii: S1695-4033(16)30184-9. doi: 10.1016/j.anpedi.2016.04.015. [Epub ahead of print]

[Prenatal treatment with magnesium sulphate: Initial clinical outcomes in pre-term infants less than 29 weeks and correlation with neonatal magnesium levels].

[Article in Spanish]

García Alonso L, Pumarada Prieto M, González Colmenero E, Concheiro Guisán A, Suárez Albo M, Durán Fernández-Feijoo C, González Durán L, Fernández Lorenzo JR.

**INTRODUCTION:** Antenatal magnesium sulphate (MgSO<sub>4</sub>) administration has shown to be effective in minimising cerebral palsy and severe motor dysfunction at the age of 2 years. The aim of this study is to analyse the initial clinical outcome of pre-term neonates less than 29 weeks who have received prenatal MgSO<sub>4</sub>, as well as to determine the relationship between the magnesium dose delivered to the mother and the magnesium concentration in the neonates. **MATERIAL AND METHODS:** A prospective cohort study was conducted on neonates of less than 29 weeks gestation admitted to the Neonatal Intensive Care Unit (NICU) of Hospital Universitario de Vigo from December 2012 to July 2015. Comparative analysis was performed on the perinatal outcomes, neonatal morbidity, mortality, and magnesium levels between the groups of neonates exposed to magnesium sulphate and the control group. **RESULTS:** A total of 42 neonates were included in the study. The mothers of 28 of them had received MgSO<sub>4</sub> as a neuroprotective agent. Statistical significance was obtained in the mortality variable. There were no significant differences in the rest of studied variables. There was a significant correlation between the full dose of MgSO<sub>4</sub> received by the mother and the levels of magnesium in the neonate in the first 24 hours of life ( $r=0.436$ ;  $P<0.001$ ). **CONCLUSIONS:** A lower mortality was observed in the group that had been exposed to MgSO<sub>4</sub>. No significant side effects were found as a result of administering of MgSO<sub>4</sub>. The MgSO<sub>4</sub> dose received by mother has a linear relationship with the magnesium levels obtained in neonates.

[PMID: 27282203](#)

**23. Biomaterials. 2016 May 26;101:96-107. doi: 10.1016/j.biomaterials.2016.05.044. [Epub ahead of print]**

Nanoscale effects in dendrimer-mediated targeting of neuroinflammation.

Nance E, Zhang F, Mishra MK, Zhang Z, Kambhampati SP, Kannan RM, Kannan S.

Neuroinflammation, mediated by activated microglia and astrocytes, plays a key role in the pathogenesis of many neurological disorders. Systemically-administered dendrimers target neuroinflammation and deliver drugs with significant efficacy, without the need for ligands. Elucidating the nanoscale aspects of targeting neuroinflammation will enable superior nanodevices for eventual translation. Using a rabbit model of cerebral palsy, we studied the in vivo contributions of dendrimer physicochemical properties and disease pathophysiology on dendrimer brain uptake, diffusion, and cell specific localization. Neutral dendrimers move efficiently within the brain parenchyma and rapidly localize in glial cells in regions of injury. Dendrimer uptake is also dependent on the extent of blood-brain-barrier breakdown, glial activation, and disease severity (mild, moderate, or severe), which can lend the dendrimer to be used as an imaging biomarker for disease phenotype. This new understanding of the in vivo mechanism of dendrimer-mediated delivery in a clinically-relevant rabbit model provides greater opportunity for clinical translation of targeted brain injury therapies.

[PMID: 27267631](#)

**24. BMC Complement Altern Med. 2016 Jun 8;16(1):172. doi: 10.1186/s12906-016-1161-6.**

Protocol for a prospective observational study of conventional treatment and traditional Korean medicine combination treatment for children with cerebral palsy.

Yoo JE, Yun YJ, Shin YB, Kim NK, Kim SY, Shin MJ, Yu SA.

**BACKGROUND:** Cerebral palsy leads to many complications as well as delayed motor development, and early intensive rehabilitation in infancy, which is based on the theory of brain plasticity, is emphasized. In addition to conventional treatment, including physical, occupational, or speech-language therapies, children also have a demand for traditional Korean medicine interventions such as acupuncture or herbal medicine; however, a lack of evidence has made traditional Korean medicine difficult to implement in practice. We planned a multicentre, prospective, observational study to assess the effectiveness, safety and cost-effectiveness of conventional treatment and traditional Korean medicine combination treatment for children with cerebral palsy. **METHODS/DESIGN:** Three hundred children with cerebral palsy aged 6 to 78 months will be recruited from six institutions. Data from each child are collected every month for a one-year period, during which time treatment might be changed or discontinued. A qualified investigator visits the sites to measure effectiveness variables, including Gross Motor Function Measure and Paediatric Evaluation of Disability Inventory. Adverse events and cost-effectiveness variables are collected using surveys conducted at baseline, mid-study, and end of study, as well as monthly tracking surveys. In the analyses, participants will be classified into two groups: group A children will be the conventional treatment group with physical, occupational, speech-language or other conventional rehabilitation therapies, whereas group B children will be the combination treatment group with traditional Korean medicine interventions, that is, herbal medicine, chuna, moxibustion and acupuncture, in addition to conventional treatment. **DISCUSSION:** Only a few clinical case reports have evaluated the effectiveness and safety of traditional Korean medicine; therefore, more data are required to provide optimal information to children with cerebral palsy and their guardians. We hypothesized that traditional Korean medicine combination treatment for children with cerebral palsy would have benefits compared with conventional therapy alone. The findings of this study might provide informative data for conducting economic evaluations and developing clinical research on combination treatment for cerebral palsy in South Korea.

[PMID: 27267182](#)

**25. J Obstet Gynaecol Res. 2016 Jun 8. doi: 10.1111/jog.13046. [Epub ahead of print]**

Analysis of antenatal-onset cerebral palsy secondary to transient ischemia in utero using a national database in Japan.

Fukushima K, Morokuma S, Kitadai Y, Tazaki Y, Sumie M, Nakanami N, Ushiro S, Matsuda Y, Tsukimori K.

**AIM:** We conducted a retrospective analysis of summary medical reports of children diagnosed with cerebral palsy (CP) to identify clinical features of antenatal onset of CP secondary to transient ischemia in utero. **METHODS:** The 658 brief summary reports available in the Japan Obstetric Compensation System for Cerebral Palsy were screened, and we identified cases of singleton pregnancy, delivered at gestational age  $\geq 33$  weeks and those with cord blood gas pH  $\geq 7.20$ . Of the 137 cases identi-

fied, 84 were excluded for the following reasons: no evidence of ischemic brain lesion, clear post-natal causative factor of CP, presence of a congenital condition, and sentinel hypoxic event, such as uterine rupture. The demographic profiles of the 53 cases included in our analysis were compared to identify those with and without an abnormal variability in fetal heart rate. RESULTS: Between-group comparison identified an association between abnormal heart rate variability and a lower Apgar score at 1 min (2 vs 6;  $P < 0.001$ ) and 5 min (5.5 vs 8;  $P = 0.002$ ), and more frequent episodes of fetal movement loss (41% vs 10%;  $P = 0.027$ ). An hypoxic event  $\leq 1$  week before delivery was more likely to be associated with abnormal heart rate variability (89%) and low Apgar score (82%), while events at  $> 1$  week were associated with development of polyhydramnios (44%). CONCLUSION: In utero transient ischemic events can contribute to term or near-term CP. Careful follow-up is recommended for fetuses with a history of fetal movement loss, abnormal variability in heart rate, and polyhydramnios of unknown causes.

[PMID: 27279463](#)

## 26. J Pediatr Rehabil Med. 2016 May 31;9(2):125-32. doi: 10.3233/PRM-160373.

An electromyographic protocol that distinguishes spasticity from dystonia.

Beattie C, Gormley M, Wervey R, Wendorf H.

PURPOSE: The purpose of this proof of concept study is to demonstrate that electromyographic (EMG) activation patterns of leg muscles differ predictably among patients with predominantly spasticity, patients with predominantly dystonia, and typically developing control subjects during rest, volitional movement, and passively induced movement. METHODS: Eight control subjects, 6 subjects with dystonia, and 7 subjects with spasticity were recruited, ages 6-25 years. Surface EMG sensors were applied over 4 muscle groups of each leg. EMG recordings and video were obtained during rest, quick stretch, and volitional movement. The number of muscles active during 3 resting, 4 quick stretch, and 8 volitional movement items were averaged and compared across subject groups. RESULTS: Control subjects showed minimal numbers of muscles active during resting, quick stretch, or volitional movement activities. Spastic subjects showed multiple muscles responding with high amplitude to quick stretch but not to volitional movement activities. Dystonic subjects showed multiple muscles responding to volitional movement activities but not to quick stretch. Analysis with a Kruskal-Wallis test indicated significant differences between the three groups in numbers of muscles activated during quick stretch activities ( $p = 0.017$ ) and volitional movement activities ( $p = 0.005$ ). CONCLUSION: EMG data collected with this protocol may be useful for distinguishing spastic from dystonic hypertonia.

[PMID: 27285805](#)

## 27. Minerva Pediatr. 2016 Jun 8. [Epub ahead of print]

Usefulness of the most popular neurodevelopmental tests in preschool assessment of children born with very low birth weight.

Gilarska M, Klimek M, Nitecka M, Dutkowska G, Gasinska M, Kwinta P.

BACKGROUND: The aim of our study was multifaceted neurodevelopmental examination of children born prematurely with very low birth weight (VLBW) in order to evaluate the usefulness of popularly used tests. The second aim of the study was exploration of risk and protective factors of neurodevelopmental impairment. METHODS: Eighty-nine VLBW patients were evaluated at the age of 50 months. All children underwent anthropometric measurements and psychomotor tests: functional independence measure scale (WeeFIM), Gross Motor Function Measurement (GMFM), non-verbal psychometric evaluation (Leiter test), Developmental Test of Visual Perception (DTVP-2), temperament questionnaire (EAS-C) and children vocabulary test (TSD). RESULTS: Most severe deficits in ex-preterms' neurodevelopment were associated with verbal abilities, visual perception and temper abnormalities. WeeFIM, DTVP-2, Leiter and vocabulary tests' results correlated with each other. The lowest percent of children with deficits in WeeFIM test indicates, that it seems to be the most valuable tool for identification of the most seriously impaired children. Due to the highest percent of children with visual perception deficits, DTVP test seems to be good second choice in assessment of children born prematurely. In motor assessment GMFM appears to be more adequate than cerebral palsy (CP) diagnosis. Almost one fifth of VLBW did not reach 85% in Gross Motor Function Measurement, although only 9% of children had CP. CONCLUSION: Children born with VLBW had deficits in every part of psychometric evaluation. We believe that the most useful tests in assessment VLBW patients are WeeFIM, GMFM and DTVP. Children with severe prematurity complications could require more precise evaluation.

[PMID: 27271040](#)

**28. Res Dev Disabil. 2016 Jun 6;55:368-376. doi: 10.1016/j.ridd.2016.04.007. [Epub ahead of print]**

Extent of altered white matter in unilateral and bilateral periventricular white matter lesions in children with unilateral cerebral palsy.

Scheck SM, Fripp J, Reid L, Pannek K, Fiori S, Boyd RN, Rose SE.

**AIMS:** To investigate the extent of white matter damage in children with unilateral cerebral palsy (UCP) caused by periventricular white matter lesions comparing between unilateral and bilateral lesions; and to investigate a relationship between white matter microstructure and hand function. **METHODS AND PROCEDURES:** Diffusion MRI images from 46 children with UCP and 18 children with typical development (CTD) were included. Subjects were grouped by side of hemiparesis and unilateral or bilateral lesions. A voxel-wise white matter analysis was performed to identify regions where fractional anisotropy (FA) was significantly different between UCP groups and CTD; and where FA correlated with either dominant or impaired hand function (using Jebsen Taylor Hand Function Test). **OUTCOMES AND RESULTS:** Children with unilateral lesions had reduced FA in the corticospinal tract of the affected hemisphere. Children with bilateral lesions had widespread reduced FA extending into all lobes. In children with left hemiparesis, impaired hand function correlated with FA in the contralateral corticospinal tract. Dominant hand function correlated with FA in the posterior thalamic radiations as well as multiple other regions in both left and right hemiparesis groups. **CONCLUSIONS AND IMPLICATIONS:** Periventricular white matter lesions consist of focal and diffuse components. Focal lesions may cause direct motor fibre insult resulting in motor impairment. Diffuse white matter injury is heterogeneous, and may contribute to more global dysfunction.

[PMID: 27280312](#)