

Science Infos

Paralysie Cérébrale

N°36 MAI-2017



FONDATION
PARALYSIE CÉRÉBRALE
LA FONDATION MOTRICE

Focus

**Congrès EACD - European Academy of Childhood Disability
Amsterdam, Pays-Bas, – 17-20 Mai 2017**

What is the matter with muscle in cerebral palsy?

Richard Lieber (Chicago, USA) La Fondation Motrice 's lecture

Video recording: <http://edu.eacd.org/node/295>

Dr. Lieber is currently Chief Scientific Officer and Senior Vice President at the Rehabilitation Institute of Chicago. His work is characterized by its interdisciplinary nature—an approach that is relevant to those who study biomechanics, rehabilitation and orthopaedic surgery. Currently, he is focused on developing state-of-the-art approaches to understanding muscle contractures that result from cerebral palsy, stroke and spinal cord injury

Spasticity, secondary to upper motor neuron lesion, can result in muscle contractures. We have studied the mechanics and biology of muscle from children with wrist flexion contractures secondary to Cerebral Palsy (CP). Dramatic architectural changes are observed in these children whereby sarcomere lengths are dramatically altered relative to patients without upper motor neuron lesions¹. This suggests dramatic alterations in the regulation of muscle growth in these children. Biomechanical studies of isolated single muscle cells reveal an increased passive modulus and decreased resting sarcomere length suggesting alterations in the cellular cytoskeleton². Similar studies on small bundles of muscle fiber reveal an increase in the compliance of the extracellular matrix and a proliferation of endomysial connective tissue^{3,4}. Thus, passive biomechanical properties of muscle from children with CP are dramatically altered in ways that are unparalleled by other altered use models. Expression profiling reveals a number of “conflicting” biological pathways in spastic muscle^{5,6}. Specifically, this muscle adapts by altering processes related to extracellular matrix production, fiber type determination, fiber hypertrophy and myogenesis. We also obtained evidence that calcium handling is altered secondary to cerebral palsy and may be a significant component of this disease. These transcriptional adaptations were not characteristic of muscle adaptations observed in Duchenne muscular dystrophy or limb immobilization. Superimposed upon the dramatic biological and structural adaptations is a loss in the number of satellite cells that are located throughout the muscle^{7,8}. Even the remaining satellite cells have epigenetic changes that can dramatically influence our ability to rehabilitate these muscles. Taken together, these results support the notion that, while spasticity is multifactorial and neural in origin, significant structural alterations in muscle also occur. An understanding of the specific changes that occur in the muscle and extracellular matrix may facilitate the development of new conservative or surgical therapies for this devastating problem. Thus, there are a number of structural and biological defects in muscle from children with CP that must be addressed in order to relieve contractures and improve function.

Literature References

1 Lieber RL, Fridén J. *Spasticity causes a fundamental rearrangement of muscle-joint interaction*. Muscle Nerve

2002;25:265-270.

2 Fridén J, Lieber RL. *Spastic muscle cells are shorter and stiffer than normal cells*. Muscle Nerve 2003;27:157-164.

3 Lieber RL, Runesson E, Einarsson F, Fridén J. *Inferior mechanical properties of spastic muscle bundles due to hypertrophic but compromised extracellular matrix material*. Muscle Nerve 2003;28:464-471.

4 Smith LR, Lee KS, Ward SR, Chambers HG, Lieber RL. *Hamstring contractures in children with spastic cerebral palsy result from a stiffer extracellular matrix and increased in vivo sarcomere length*. J Physiol 2011;589:2625-2639.

5 Smith LR, Chambers HG, Subramaniam S, Lieber RL. *Transcriptional abnormalities of hamstring muscle contractures in children with cerebral palsy*. PloS one 2012;7:e40686.

6 Smith LR, Pontén E, Ward SR, Chambers H, Subramaniam S, Lieber RL. *Novel transcriptional profile in wrist muscles from cerebral palsy patients*. BMC Med Genomics 2009;14:44-56.

7 Dayanidhi S, Lieber RL. *Skeletal muscle satellite cells: mediators of muscle growth during development and implications for developmental disorders*. Muscle Nerve 2014;50:723-732.

8 Smith LR, Chambers HG, Lieber RL. *Reduced satellite cell population may lead to contractures in children with cerebral palsy*. Dev Med Child Neurol 2013;55:264-270.

Manifestations et congrès

Publications scientifiques

Cerebral palsy: is the concept still viable? 9

Clinical Spectrum, Comorbidities, and Risk Factor Profile of Cerebral Palsy Children: A Prospective Study. 9

MRI classification system (MRICS) for children with cerebral palsy: development, reliability, and recommendations. 9

Epidémiologie

• Prévalence – Incidence

Completeness and correctness of cerebral palsy diagnoses in two health registers: implications for estimating prevalence. 10

Estimation of the number of children with cerebral palsy using nationwide health insurance claims data in Japan. 10

Neurodevelopmental Outcomes Among Extremely Preterm Infants 6.5 Years After Active Perinatal Care in Sweden. 11

• Facteurs de risque – Causes

Both antenatal and postnatal inflammation contribute information about the risk of brain damage in extremely preterm newborns. 12

Is vaginal breech delivery associated with higher risk for perinatal death and cerebral palsy compared with vaginal cephalic birth? Registry-based cohort study in Norway. 12

Sex differences in cerebral palsy on neuromotor outcome: a critical review. 13

• Génétique

TPase-deficient mitochondrial inner membrane protein ATAD3A disturbs mitochondrial dynamics in dominant hereditary spastic paraplegia. 13

The genetic basis of cerebral palsy. 13

Lésions - Prévention des lésions

• Données fondamentales

A model of Periventricular Leukomalacia (PVL) in neonate mice with histopathological and neurodevelopmental outcomes mimicking human PVL in neonates. 14

Intranasal C3a treatment ameliorates cognitive impairment in a mouse model of neonatal hypoxic-ischemic brain injury. 15

Intravenous injection of umbilical cord-derived mesenchymal stromal cells attenuates reactive gliosis and hypomyelination in a neonatal intraventricular hemorrhage model. 15

Region specific oligodendrocyte transcription factor expression in a model of neonatal hypoxic injury. 16

Treadmill exercise improves motor and memory functions in cerebral palsy rats through activation of PI3K-Akt pathway. Je l'aurais peut être mis dans lésion/données fondamentales 17

• Données cliniques

Association between the use of magnesium sulfate as neuroprotector in prematurity and the neonatal hemodynamic effects. 17

Effect of early intervention in infants at very high risk of cerebral palsy: a systematic review. 17

Proximity of magnesium exposure to delivery and neonatal outcomes. 18

ST-analysis in electronic foetal monitoring is cost-effective from both the maternal and neonatal perspective. 18

Détection – Diagnostic

• Données Fondamentales

Neurodevelopmental Reflex Testing in Neonatal Rat Pups. 19

• Données cliniques

Using diffusion tensor imaging to identify corticospinal tract projection patterns in children with unilateral spastic cerebral palsy. Je l'aurais mis dans Détection/Diagnostic – Données cliniques 20

Motricité - Mobilité – Posture

An Acceleration-Based Gait Assessment Method for Children with Cerebral Palsy. 20

Clinical motion analyses over eight consecutive years in a child with crouch gait: a case report. 21

Development and Validation of the Both Hands Assessment for Children With Bilateral Cerebral Palsy. 21

Dystonic storm: a practical clinical and video review. 22

Growth characteristics in cerebral palsy subtypes: a comparative assessment. 22

Knee Recurvatum in Children With Spastic Diplegic Cerebral Palsy. 23

Measuring changes of manual ability with ABILHAND-Kids following intensive training for children with unilateral cerebral palsy. 23

Mini-MACS: development of the Manual Ability Classification System for children younger than 4 years of age with signs of cerebral palsy. 24

Motorized versus manual instrumented spasticity assessment in children with Cerebral palsy. 24

Multiprofessional evaluation in clinical practice: establishing a core set of outcome measures for children with cerebral palsy. 25

Prevalence of specific gait abnormalities in children with cerebral palsy revisited: influence of age, prior surgery, and Gross Motor Function Classification System level. 25

Prospective pilots of routine data capture by paediatricians in clinics and validation of the Disabilities Complexity Scale. 25

Psychometric properties of a revised version of the Assisting Hand Assessment (Kids-AHA 5.0). A mettre dans Motricité Mobilité Posture 26

Quantifying multifaceted needs captured at the point of care. Development of a Disabilities Terminology Set and Disabilities Complexity Scale. 26

Relationship Between Mobility and Self-Care Activity in Children With Cerebral Palsy. 27

Selective Control of the Upper Extremity Scale: validation of a clinical assessment tool for children with hemiplegic cerebral palsy. 27

Spasticity, dyskinesia and ataxia in cerebral palsy: Are we sure we can differentiate them? 28

The Gross Motor Function Classification System Family Report Questionnaire: reliability between special-education teachers and caregivers. 28

Traitement - Rééducation motrice et cognitive

Pharmacologie Efficacité Tolérance

Adverse drug reactions of botulinum neurotoxin type A in children with cerebral palsy: a pharmaco-epidemiological study in VigiBase. 29

Intrathecal baclofen pump infection treated by adjunct intrareservoir teicoplanin instillation. 29

Negative effects of submandibular botulinum neurotoxin A injections on oral motor function in children with drooling due to central nervous system disorders. 30

Pelvic-Spinal Analysis and the Impact of Onabotulinum toxin A Injections on Spinal Balance in one Child With Cerebral Palsy. 31

Should botulinum toxin A injections be repeated in children with cerebral palsy? A systematic review. 31

Chirurgie

Curve flexibility in cerebral palsy-related neuromuscular scoliosis: does the intraoperative prone radiograph reveal more flexibility than preoperative radiographs? 32

Limits of Calcaneal Lengthening for Treating Planovalgus Foot Deformity in Children With Cerebral Palsy. 32

Long-term outcomes of external femoral derotation osteotomies in children with cerebral palsy. 33

Post-operative Hypertension following Correction of Flexion Deformity of the Knees in a Spastic Diplegic Child: A Case Report. 33

Recurrence of Deep Surgical Site Infection in Cerebral Palsy After Spinal Fusion Is Rare. 33

Réadaptation fonctionnelle

Anaerobic exercise testing in rehabilitation: A systematic review of available tests and protocols. 34

Caregiver-directed home-based intensive bimanual training in young children with unilateral spastic cerebral palsy: a randomized trial. 34

Current Practice "Constraints" in the Uptake and Use of Intensive Upper Extremity Training: A Canadian Perspective. 35

Comparative Efficacy of Progressive Resistance Exercise and Biomechanical Ankle Platform System on Functional Indices of Children with Cerebral Palsy. 35

Effectiveness of motor interventions in infants with cerebral palsy: a systematic review. 36

Effectiveness of Rehabilitation Interventions to Improve Gait Speed in Children With Cerebral Palsy: Systematic Review and Meta-analysis. 36

Immediate Effect of a Single Session of Whole Body Vibration on Spasticity in Children With Cerebral Palsy. 37

Improving balance, mobility, and dual-task performance in an adolescent with cerebral palsy: A case report. 37

Neuromuscular electrical stimulation-assisted gait increases muscle strength and volume in children with unilateral spastic cerebral palsy. 38

Obstacle Crossing During Gait in Children With Cerebral Palsy: Cross-Sectional Study With Kinematic Analysis of Dynamic Balance and Trunk Control. 38

'Remind-to-move' treatment versus constraint-induced movement therapy for children with hemiplegic cerebral palsy: a randomized controlled trial. 39

The effectiveness of taping on children with cerebral palsy: a systematic review. 39

The influence of a constraint and bimanual training program using a variety of modalities on endurance and on the cardiac autonomic regulation system of children with unilateral cerebral palsy: A self-control clinical trial. 40

The relation between mirror movements and non-use of the affected hand in children with unilateral cerebral palsy. 40

Robots – Exosquelette 41

Pediatric robotic rehabilitation: Current knowledge and future trends in treating children with sensorimotor impairments. 41

Stimulation transcrânienne

Brain stimulation and constraint for perinatal stroke hemiparesis: The PLASTIC CHAMPS Trial. 41

Combined transcranial Direct Current Stimulation and robotic upper limb therapy improves upper limb function in an adult with cerebral palsy. 42

Transcranial direct current stimulation for children with perinatal stroke and hemiparesis. 42

Douleur

Assessments of pain in children and adolescents with cerebral palsy: a retrospective population-based registry study. 43

Change in pain status in children with cerebral palsy. 43

Pain management for children with cerebral palsy in school settings in two cultures: action and reaction approaches. 44

Language -Communication

Alignment of classification paradigms for communication abilities in children with cerebral palsy. 44

Assessment With Children Who Need Augmentative and Alternative Communication (AAC): Clinical Decisions of AAC Specialists. 45

Babbling in children with neurodevelopmental disability and validity of a simplified way of measuring canonical

babbling ratio. 45

Language outcomes of children with cerebral palsy aged 5 years and 6 years: a population-based study. 46

Speech and language interventions for infants aged 0 to 2 years at high risk for cerebral palsy: a systematic review. 46

Autres Troubles / Troubles concomitants

Informing evidence-based clinical practice guidelines for children with cerebral palsy at risk of osteoporosis: an update. 47

Muscle growth is reduced in 15-month-old children with cerebral palsy. 47

Relations between muscle endurance and subjectively reported fatigue, walking capacity, and participation in mildly affected adolescents with cerebral palsy. 48

✚ ● Troubles de la croissance

Growth characteristics in cerebral palsy subtypes: a comparative assessment. 48

Growth during infancy and early childhood in children with cerebral palsy: a population-based study. 48

✚ ● Sphère bucco-dentaire – Troubles de la déglutition

Risk factors for dental caries among children with cerebral palsy in a low-resource setting. 49

✚ ● Nutrition - Metabolisme

Association between gross motor function and nutritional status in children with cerebral palsy: a cross-sectional study from Colombia. 49

Differences in body composition according to gross motor function in children with cerebral palsy. 50

The Pediatric Version of the Eating Assessment Tool: a caregiver administered dysphagia-specific outcome instrument for children. 50

✚ ● Troubles visuels

Optic nerve morphology as marker for disease severity in cerebral palsy of perinatal origin. 51

✚ ● Troubles neurologiques

Risk of stroke among patients with cerebral palsy: a population-based cohort study. 51

✚ ● Fatigue

Fatigue and its relationship with physical activity, age, and body composition in adults with cerebral palsy. 52

✚ ● Sommeil

Co-sleeping in school-aged children with a motor disability: a comparative population-based study. 52

Qualité de vie et rapport au monde

✚ ● Qualité de vie – Retentissement dans la vie quotidienne

Leisure participation-preference congruence of children with cerebral palsy: a Children's Assessment of Participation and Enjoyment International Network descriptive study. 53

Relationship between activity limitation and health-related quality of life in school-aged children with cerebral palsy: a cross-sectional study. 53

School success and participation for students with cerebral palsy: a qualitative study exploring multiple perspectives. 54

● **Passage à l'âge adulte – Vieillesse**

Participation trajectories: impact of school transitions on children and adolescents with cerebral palsy. 54

● **Activité physique -Sport**

Ability of independently ambulant children with cerebral palsy to ride a two-wheel bicycle: a case-control study. 55

Exercise and physical activity recommendations for people with cerebral palsy. 55

Psychosocial effects of competitive Boccia program in persons with severe chronic disability. 56

● **Prise en charge et Accompagnant/Accompagnement**

Hospital admissions in children with cerebral palsy: a data linkage study. 56

Learn From Every Patient': implementation and early results of a learning health system. 57

Predictors of parents' adherence to home exercise programs for children with developmental disabilities, regarding both exercise frequency and duration: a survey design. 57

Quality of life of primary caregivers of children with cerebral palsy: a comparison between mother and grandmother caregivers in Anhui province of China. 58

Manifestations et congrès

Juin 2017

Congrès Réseau Breizh - Sferhe – CDI

"La paralysie cérébrale au fil du temps »

26-27 juin 2017

Saint Malo, France

<http://www.tmsevents.fr/congres/2017/sferhe/>

Octobre 2017

32e congrès de la SOFMER

05-07 octobre 2017

Nancy, France

<http://nancy.sofmer2017.com/index.php?pageID=09eb828f52123930a2186e7b5a4db890>

European Congress of NeuroRehabilitation (ECNR)

24-27 octobre 2017

Lausanne, Suisse

<http://www.ecnr-congress.org/>

Novembre 2017

Journées d'études polyhandicap Paralysie cérébrale 2017

16-17 Novembre 2017

Paris, France

<https://www.institutmc.org/index.php/annonce-journee-es-polyhandicap-paralysie-ce-re-brale-novembre-2017>

Décembre 2017

Journées d'études annuelles du CDI

« L'axe corporel du paralysé cérébral dans ses dimensions motrice, perceptives et orthopédiques »

11-12 décembre 2017

Lyon, France

<https://www.institutmc.org/index.php/24-news-colloques/133-journee-d-etude-du-cdi-2017-a-lyon>

Juillet 2018

12 th International Society of Physical and Rehabilitation Medicine (ISPRM) World Congress

08-12 juillet 2018

Paris, France

<http://www.isprm2018.com/>

Publications scientifiques

Méthodologie de la recherche

Le profil de veille a été mis en place sur Pubmed avec le mot clé "Cerebral Palsy" pour des publications majoritairement en français ou en anglais, avec abstract ou full text

Free article indique le lien vers les articles dont le texte intégral est librement disponible

Cerebral palsy: is the concept still viable?

Rosenbaum P.

Dev Med Child Neurol. 2017 Jun;59(6):564. doi: 10.1111/dmcn.13418.

DOI: 10.1111/dmcn.13418

PMID: 28463457

Clinical Spectrum, Comorbidities, and Risk Factor Profile of Cerebral Palsy Children: A Prospective Study.

Minocha P, Sitaraman S, Sachdeva P.

J Pediatr Neurosci. 2017 Jan-Mar;12:15-18. doi: 10.4103/1817-1745.205622.

AIM AND OBJECTIVE: Cerebral palsy (CP) is the most common motor disability in childhood. This study aimed to describe clinical spectrum, comorbidities, and risk factors associated with CP children.

MATERIALS AND METHODS: This hospital-based observational study was conducted in tertiary level hospital in Jaipur including 180 CP children aged 1-12 years, attending the Paediatric Neurology Outdoor and Child Development Centre. A detailed history of antenatal, natal, and postnatal events taken and thorough examination was performed to stratify children in proper topographical and physiological classification.

RESULTS: Mothers of 47.7% CP children were primigravida and 17.7% mothers had anemia during pregnancy. Among natal factors, asphyxia contributed to maximum cases (52.2%). Seizure in postnatal life was the second most common risk factor for CP after asphyxia. Spastic CP (84.4%) was the most common physiological type, and quadriplegia (56.6%) was the most common topographical type observed in this study. Intellectual disability (47.7%) followed by epilepsy (41.6%) was the most common comorbidity.

CONCLUSION: Even with the advancement of health-care system, asphyxia is the most common risk factor, and spastic quadriplegia is the most common type of CP. There is still a need of improving the health facilities to overcome this costly and common neuromotor disability. Widespread knowledge of common risk factors that can predispose to CP can prevent the CP development to some extent and knowledge of clinical spectrum, and comorbidities can improve their targeted treatment which can improve their growth and social participation.

Free PMC Article

DOI: 10.4103/1817-1745.205622

PMCID: PMC5437780

PMID: 28553372

Conflict of interest statement: There are no conflicts of interest.

MRI classification system (MRICS) for children with cerebral palsy: development, reliability, and recommendations.

Himmelman K, Horber V, De La Cruz J, Horridge K, Mejaski-Bosnjak V, Hollody K, Krägeloh-Mann I; SCPE Working Group. Collaborators: Cans C, Bakel V, Arnaud C, Delobel M, Chalmers J, McManus V, Lyons A, Parkes J, Dolk H, Pahlman M, Dowding V, Colver A, Pennington L, Kurinczuk J, Surman G, Platt MJ, Udall P, Rackauskaite G, Torrioli MG, Marcelli M, Andersen G, Julsen Hollung S, Bottos M, Gaffney G, Gaffney G, Pallas C, Jekovec-Vrhovšek M, Virella D, Andrada M, Greitane A, Sigurdardottir S, Einarsson I, Honold M, Rostasy K.

Dev Med Child Neurol. 2017 Jan;59(1):57-64. doi: 10.1111/dmcn.13166. Epub 2016 Jun 21.

AIM: To develop and evaluate a classification system for magnetic resonance imaging (MRI) findings of children with cerebral palsy (CP) that can be used in CP registers.

METHOD: The classification system was based on pathogenic patterns occurring in different periods of brain development. The MRI classification system (MRICS) consists of five main groups: maldevelopments, predominant white matter injury, predominant grey matter injury, miscellaneous, and normal findings. A detailed manual for the descriptions of these patterns was developed, including test cases (www.scpenetwork.eu/en/my-scope/rtm/neuroimaging/cp-neuroimaging/). A literature review was performed and MRICS was compared with other classification systems. An exercise was carried out to check applicability and interrater reliability. Professionals working with children with CP or in CP registers were invited to participate in the exercise and chose to classify either 18 MRIs or MRI reports of children with CP.

RESULTS: Classification systems in the literature were compatible with MRICS and harmonization possible. Interrater reliability was found to be good overall ($k=0.69$; $0.54-0.82$) among the 41 participants and very good ($k=0.81$; $0.74-0.92$) using the classification based on imaging reports.

INTERPRETATION: Surveillance of Cerebral Palsy in Europe (SCPE) proposes the MRICS as a reliable tool. Together with its manual it is simple to apply for CP registers.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13166

PMID: 27325153 [Indexed for MEDLINE]

Epidémiologie

Prévalence – Incidence

Completeness and correctness of cerebral palsy diagnoses in two health registers: implications for estimating prevalence.

Hollung SJ, Vik T, Wiik R, Bakken IJ, Andersen GL.

Dev Med Child Neurol. 2017 Apr;59:402-406. doi: 10.1111/dmcn.13341. Epub 2016 Nov 29.

AIM: To assess completeness and correctness of cerebral palsy (CP) diagnoses in the Cerebral Palsy Register of Norway (CPRN) and the Norwegian Patient Register (NPR), and to estimate CP prevalence.

METHOD: Among 747 883 Norwegian residents born from 1996 to 2007, 2231 had a diagnosis of CP in the NPR while 1441 were registered in the CPRN. Children registered in the CPRN were considered to have a valid CP diagnosis. For those with a diagnosis of CP only in the NPR, two paediatricians reviewed the hospital records. The prevalence rate of CP with 95% confidence intervals (CI) was calculated on the basis of the combined data sets.

RESULTS: One thousand three hundred and ninety-eight children were registered with a diagnosis of CP in both registers, 43 children were only registered in the CPRN, and 824 only in the NPR. The review of hospital records revealed that 464 (59.5%) had CP. Thus, the NPR was 98% complete, and for 86% the diagnosis was correct. The completeness of the CPRN was 76%, while the diagnosis was considered correct for all children (100%). The resulting prevalence of CP was 2.5 (95% CI 2.4-2.7) per 1000.

INTERPRETATION: To gain accurate estimates of prevalence rates of CP, it is essential to combine data sources and to validate register data.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13341

PMID: 27896812 [Indexed for MEDLINE]

Estimation of the number of children with cerebral palsy using nationwide health insurance claims data in Japan.

Toyokawa S, Maeda E, Kobayashi Y.

Dev Med Child Neurol. 2017 Mar;59:317-321. doi: 10.1111/dmcn.13278. Epub 2016 Sep 20.

AIM: Japan lacks a population-based registration system for cerebral palsy (CP), therefore the nationwide prevalence of CP is unknown. Our aim was to estimate the number of children with CP using the National Database of Health Insurance Claims and Specific Health Checkups of Japan, which has been recently developed by the government.

METHOD: Study participants were children and adolescents aged below 20 years, who had been assigned CP diagnosis codes more than once in claims issued between June 2012 and May 2013 from all health insurance schemes in Japan, except for Social Welfare and Elderly Health Insurance.

RESULTS: The number of participants with diagnosed CP was 44 381. The number of males with CP (25 237) was greater than the number of females (19 144). Peak CP prevalence per 1000 population was 2.39 at age 4 years, and this gradually declined with age. The prevalence of CP per 1000 population was 2.27 at age 5 to 9 years. The numbers of inpatients and outpatients with CP were 9126 (20.6%) and 35 255 (79.4%) respectively.

INTERPRETATION: Our estimation of CP prevalence per 1000 population at age 5 to 9 years lay in the higher range of figures from previous studies in Japan, and was close to figures reported by European countries.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13278

PMID: 27644438 [Indexed for MEDLINE]

Neurodevelopmental Outcomes Among Extremely Preterm Infants 6.5 Years After Active Perinatal Care in Sweden.

Serenius F, Ewald U, Farooqi A, Fellman V, Hafström M, Hellgren K, Maršál K, Ohlin A, Olhager E, Stjernqvist K, Strömberg B, Ådén U, Källén K; Extremely Preterm Infants in Sweden Study Group.

JAMA Pediatr. 2016 Oct 1;170(10):954-963. doi: 10.1001/jamapediatrics.2016.1210.

Importance: Active perinatal care increases the rate of survival of extremely preterm infants, but there are concerns that improved survival might increase the rate of disabled survivors.

Objective: To determine the neurodevelopmental outcomes of a national cohort of children 6.5 years of age who had been born extremely preterm (<27 weeks' gestational age) in Sweden. Design, Setting, and Participants: Population-based prospective cohort study of consecutively born extremely preterm infants. All of these infants were born in Sweden during the period from April 1, 2004, to March 31, 2007. Of 707 live-born extremely preterm infants, 486 (68.7%) survived to 6.5 years of age. These children were assessed and compared with matched controls who had been born at term. Comparison estimates were adjusted for demographic differences. Assessments ended in February 2014, and analysis started thereafter.

Main Outcomes and Measures: Cognitive ability was measured with the fourth edition of the Wechsler Intelligence Scale for Children (WISC-IV), and the mean (SD) scores of the children who had been born extremely preterm were compared with those of the controls. Clinical examinations and parental questionnaires were used for diagnosis of cerebral palsy, hearing and vision impairments, and cognition for the children who were not assessed with the WISC-IV.

Results: Of 486 eligible infants who were born extremely preterm, 441 (90.7%) were assessed at 6.5 years of age (59 by medical record review only) alongside 371 controls. The adjusted mean (SD) full-scale WISC-IV score was 14.2 (95% CI, 12.1-16.3) points lower for children who had been born extremely preterm than for controls. Cognitive disability was moderate for 18.8% of extremely preterm children and 2.2% of controls ($P < .001$), and it was severe for 11.1% of extremely preterm children and 0.3% of controls ($P < .001$). Cerebral palsy was observed in 9.5% of extremely preterm children and 0.0% of controls ($P < .001$), blindness was observed in 2.0% of extremely preterm children and 0.0% of controls ($P < .001$), and hearing impairment was observed in 2.1% of extremely preterm children and 0.5% of controls ($P = .07$). Overall, 36.1% (95% CI, 31.7%-40.6%) of extremely preterm children had no disability, 30.4% (95% CI 26.3%-34.8%) had mild disability, 20.2% (95% CI, 16.6%-24.2%) had moderate disability, and 13.4% (95% CI, 10.5%-16.9%) had severe disability. For extremely preterm children, moderate or severe overall disability decreased with gestational age at birth (adjusted odds ratio per week, 0.65 [95% CI, 0.54-0.79]; $P < .001$) and increased from 26.6% to 33.5% ($P = .01$) for children assessed both at 2.5 and 6.5 years.

Conclusions and Relevance: Of the 441 extremely preterm infants who had received active perinatal care, 293 (66.4%) had no or mild disability at 6.5 years; of the 371 controls, 11 (3.0%) had moderate or severe disability. Disability rates at 6.5 years increased relative to the rates at 2.5 years. Results are relevant for health care professionals and planners, and for clinicians counseling families facing extremely preterm births.

DOI: 10.1001/jamapediatrics.2016.1210

PMID: 27479919 [Indexed for MEDLINE]

Facteurs de risque – Causes

Both antenatal and postnatal inflammation contribute information about the risk of brain damage in extremely preterm newborns.

Yanni D, Korzeniewski S, Allred EN, Fichorova RN, O'Shea TM, Kuban K, Dammann O, Leviton A.
Pediatr Res. 2017 May 26. doi: 10.1038/pr.2017.128. [Epub ahead of print]

BACKGROUND Preterm newborns exposed to intrauterine inflammation are at increased risk of neurodevelopmental disorders. We hypothesized that adverse outcomes are more strongly associated with a combination of antenatal and postnatal inflammation than with either of them alone.

METHODS We defined antenatal inflammation as histologic inflammation in the placenta. We measured the concentrations of seven inflammation-related proteins in blood obtained on postnatal days 1, 7, and 14 from 763 infants born before 28 weeks of gestation. We defined postnatal inflammation as a protein concentration in the highest quartile on at least 2 days. We used logistic regression models to evaluate the contribution of antenatal and postnatal inflammation to the risk of neurodevelopmental disorders.

RESULTS The risk of white matter damage was increased when placental inflammation was followed by sustained elevation of CRP or ICAM-1. We found the same for spastic cerebral palsy when placental inflammation was followed by elevation of TNF- α or IL-8. The presence of both placental inflammation and elevated levels of IL-6, TNF- α , or ICAM-1 was associated with an increased risk for microcephaly.

CONCLUSION Compared to a single hit, two inflammatory hits are associated with stronger risk for abnormal cranial ultrasound, spastic cerebral palsy, and microcephaly at 2 years.

Pediatric Research accepted article preview online, 26 May 2017. doi:10.1038/pr.2017.128.

DOI: 10.1038/pr.2017.128

PMID: 28549057

Is vaginal breech delivery associated with higher risk for perinatal death and cerebral palsy compared with vaginal cephalic birth? Registry-based cohort study in Norway.

Bjellmo S, Andersen GL, Martinussen MP, Romundstad PR, Hjelle S, Moster D, Vik T.
BMJ Open. 2017 May 4;7:e014979. doi: 10.1136/bmjopen-2016-014979.

OBJECTIVE: This paper aims to study if vaginal breech delivery is associated with increased risk for neonatal mortality (NNM) or cerebral palsy (CP) in Norway where vaginal delivery accounts for 1/3 of all breech deliveries.

DESIGN: Cohort study using information from the national Medical Birth Register and Cerebral Palsy Register.

SETTING: Births in Norway 1999-2009.

PARTICIPANTS: 520 047 term-born singletons without congenital malformations.

MAIN OUTCOME MEASURES: NNM, CP and a composite outcome of these and death during birth.

RESULTS: Compared with cephalic births, breech births had substantially increased risk for NNM but not for CP. Vaginal delivery was planned for 7917 of 16 700 fetuses in breech, while 5561 actually delivered vaginally. Among these, NNM was 0.9 per 1000 compared with 0.3 per 1000 in vaginal cephalic delivery, and 0.8 per 1000 in those actually born by caesarean delivery (CD) in breech. Compared with planned cephalic delivery, planned vaginal delivery was associated with excess risk for NNM (OR 2.4; 95% CI 1.2 to 4.9), while the OR associated with planned breech CD was 1.6 (95% CI 0.7 to 3.7). These risks were attenuated when NNM was substituted by the composite outcome. Vaginal breech delivery was not associated with excess risk for CP compared with vaginal cephalic delivery.

CONCLUSION: Vaginal breech delivery, regardless of whether planned or actual, and actual breech CD were associated with excess risk for NNM compared with vaginal cephalic delivery, but not with CP. The risk for NNM and CP in planned breech CD did not differ significantly from planned vaginal cephalic delivery. However, the absolute risk for these outcomes was low, and taking into consideration potential long-term adverse consequences of CD for the child and later deliveries, we therefore conclude that vaginal breech delivery may be recommended, provided competent obstetric care and strict criteria for selection to vaginal delivery.

© Article author(s) (or their employer(s) unless otherwise stated in the text of the article) 2017. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

[Free Article](#)

DOI: 10.1136/bmjopen-2016-014979

PMID: 28473516

Conflict of interest statement: Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/cio_disclosure.pdf

Sex differences in cerebral palsy on neuromotor outcome: a critical review.

Romeo DM, Sini F, Brogna C, Albamonte E, Ricci D, Mercuri E.

Dev Med Child Neurol. 2016 Aug;58(8):809-13. doi: 10.1111/dmcn.13137. Epub 2016 Apr 21.

Sex differences have been reported in children with cerebral palsy (CP), with males having a higher risk of developing CP, but it is not entirely clear whether sex may also affect the severity of motor impairment. The aim of the present study was to critically review the existing literature on sex influence on neuromotor outcome in children with CP. The published papers confirm that CP occurs more frequently in males than in females. Within different types of CP or individual level of impairment, however, there was limited evidence that sex also had an effect on their performance.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13137

PMID: 27098195 [Indexed for MEDLINE]

Génétique

TPase-deficient mitochondrial inner membrane protein ATAD3A disturbs mitochondrial dynamics in dominant hereditary spastic paraplegia.

Cooper HM, Yang Y, Ylikallio E, Khairullin R, Woldegebriel R, Lin KL, Euro L, Palin E, Wolf A, Trokovic R, Isohanni P, Kaakkola S, Auranen M, Lönnqvist T, Wanrooij S, Tynismaa H.

Hum Mol Genet. 2017 Apr 15;26(8):1432-1443. doi: 10.1093/hmg/ddx042.

De novo mutations in ATAD3A (ATPase family AAA-domain containing protein 3A) were recently found to cause a neurological syndrome with developmental delay, hypotonia, spasticity, optic atrophy, axonal neuropathy, and hypertrophic cardiomyopathy. Using whole-exome sequencing, we identified a dominantly inherited heterozygous variant c.1064G > A (p.G355D) in ATAD3A in a mother presenting with hereditary spastic paraplegia (HSP) and axonal neuropathy and her son with dyskinetic cerebral palsy, both with disease onset in childhood. HSP is a clinically and genetically heterogeneous disorder of the upper motor neurons. Symptoms beginning in early childhood may resemble spastic cerebral palsy. The function of ATAD3A, a mitochondrial inner membrane AAA ATPase, is yet undefined. AAA ATPases form hexameric rings, which are catalytically dependent on the co-operation of the subunits. The dominant-negative patient mutation affects the Walker A motif, which is responsible for ATP binding in the AAA module of ATAD3A, and we show that the recombinant mutant ATAD3A protein has a markedly reduced ATPase activity. We further show that overexpression of the mutant ATAD3A fragments the mitochondrial network and induces lysosome mass. Similarly, we observed altered dynamics of the mitochondrial network and increased lysosomes in patient fibroblasts and neurons derived through differentiation of patient-specific induced pluripotent stem cells. These alterations were verified in patient fibroblasts to associate with upregulated basal autophagy through mTOR inactivation, resembling starvation. Mutations in ATAD3A can thus be dominantly inherited and underlie variable neurological phenotypes, including HSP, with intrafamilial variability. This finding extends the group of mitochondrial inner membrane AAA proteins associated with spasticity.

© The Author 2017. Published by Oxford University Press.

[Free PMC Article](#)

DOI: 10.1093/hmg/ddx042

PMCID: PMC5393146

PMID: 28158749 [Indexed for MEDLINE]

The genetic basis of cerebral palsy.

Fahey MC, Maclennan AH, Kretzschmar D, Geicz J, Krüer MC.

Dev Med Child Neurol. 2017 May;59:462-469. doi: 10.1111/dmcn.13363. Epub 2017 Jan 1.

Although prematurity and hypoxic-ischaemic injury are well-recognized contributors to the pathogenesis of cerebral palsy (CP), as many as one-third of children with CP may lack traditional risk factors. For many of these children, a genetic basis to their condition is suspected. Recent findings have implicated copy number variants and mutations in single genes in children with CP. Current studies are limited by relatively small patient numbers, the underlying genetic heterogeneity identified, and the paucity of validation studies that have been performed. However, several genes mapping to intersecting pathways controlling neurodevelopment and neuronal connectivity have been identified. Analogous to other neurodevelopmental disorders such as autism and intellectual disability, the genomic architecture of CP is likely to be highly complex. Although we are just beginning to understand genetic contributions to CP, new insights are anticipated to serve as a unique window into the neurobiology of CP and suggest new targets for intervention.

© 2017 Mac Keith Press.

DOI: 10.1111/dmcn.13363

PMID: 28042670 [Indexed for MEDLINE]

Lésions - Prévention des lésions

+Données fondamentales

A model of Periventricular Leukomalacia (PVL) in neonate mice with histopathological and neurodevelopmental outcomes mimicking human PVL in neonates.

Zaghloul N, Patel H, Ahmed MN.

PLoS One. 2017 Apr 13;12:e0175438. doi: 10.1371/journal.pone.0175438. eCollection 2017.

Periventricular leukomalacia (PVL), a brain injury affecting premature infants is commonly associated with cerebral palsy. PVL results from hypoxia-ischemia (HI) with or without infection and is characterized by white matter necrotic lesions, hypomyelination, microglial activation, astrogliosis, and neuronal death. It is important to study a PVL mouse model that mimics human PVL in symptomatology, anatomic and molecular basis. In our neonate mice model, bilateral carotid arteries were temporary ligated at P5 followed by hypoxic exposure (FiO₂ of 8% for 20 min.). At P5 in mice, the white matter is more vulnerable to HI injury than the grey matter. In our PVL model, mice suffer from significant hind limb paresis, incoordination and feeding difficulties. Histologically they present with ventriculomegaly, white matter loss, microglial activation and neuronal apoptosis. HI injury increases proinflammatory cytokines, activates NF-κB, activates microglia and causes oxidative stress. All these inflammatory mediators lead to oligodendroglial injury and white matter loss. Neurobehavioral analysis in the PVL mice model at P60 showed that the HI group had a significant decrease in hind limb strength, worsening rotarod testing and worsening performance in the open field test. This new PVL model has great advantages far beyond just mimicking human PVL in clinical features and histopathology. Long term survival, the development of cerebral palsy and the ability of using this model in transgenic animals will increase our understanding of the mechanistic pathways underlying PVL and defining specific targets for the development of suitable therapeutics.

[Free PMC Article](#)

DOI: 10.1371/journal.pone.0175438

PMCID: PMC5391059

PMID: 28406931 [Indexed for MEDLINE]

Characterization of a cerebral palsy-like model in rats: Analysis of gait pattern and of brain and spinal cord motor areas.

Dos Santos AS, de Almeida W, Popik B, Sbardelotto BM, Torrejais MM, de Souza MA, Centenaro LA.

Int J Dev Neurosci. 2017 Aug;60:48-55. doi: 10.1016/j.ijdevneu.2017.04.005. Epub 2017 May 1.

In an attempt to propose an animal model that reproduces in rats the phenotype of cerebral palsy, this study evaluated the effects of maternal exposure to bacterial endotoxin associated with perinatal asphyxia and sensorimotor restriction on gait pattern, brain and spinal cord morphology. Two experimental groups were used: Control Group (CTG) - offspring of rats injected with saline during pregnancy and Cerebral Palsy Group (CPG) - offspring of rats injected with lipopolysaccharide during pregnancy, submitted to perinatal asphyxia and

sensorimotor restriction for 30days. At 29days of age, the CPG exhibited coordination between limbs, weight-supported dorsal steps or weight-supported plantar steps with paw rotation. At 45days of age, CPG exhibited plantar stepping with the paw rotated in the balance phase. An increase in the number of glial cells in the primary somatosensory cortex and dorsal striatum were observed in the CPG, but the corpus callosum thickness and cross-sectional area of lateral ventricle were similar between studied groups. No changes were found in the number of motoneurons, glial cells and soma area of the motoneurons in the ventral horn of spinal cord. The combination of insults in the pre, peri and postnatal periods produced changes in hindlimbs gait pattern of animals similar to those observed in diplegic patients, but motor impairments were attenuated over time. Besides, the greater number of glial cells observed seems to be related to the formation of a glial scar in important sensorimotor brain areas.

Copyright © 2017 ISDN. Published by Elsevier Ltd. All rights reserved.

DOI: 10.1016/j.ijdevneu.2017.04.005

PMID: 28473192

Intranasal C3a treatment ameliorates cognitive impairment in a mouse model of neonatal hypoxic-ischemic brain injury.

Morán J, Stokowska A, Walker FR, Mallard C, Hagberg H, Pekna M.

Exp Neurol. 2017 Apr;290:74-84. doi: 10.1016/j.expneurol.2017.01.001. Epub 2017 Jan 4.

Perinatal asphyxia-induced brain injury is often associated with irreversible neurological complications such as intellectual disability and cerebral palsy but available therapies are limited. Novel neuroprotective therapies as well as approaches stimulating neural plasticity mechanism that can compensate for cell death after hypoxia-ischemia (HI) are urgently needed. We previously reported that single i.c.v. injection of complement-derived peptide C3a 1h after HI induction prevented HI-induced cognitive impairment when mice were tested as adults. Here, we tested the effects of intranasal treatment with C3a on HI-induced cognitive deficit. Using the object recognition test, we found that intranasal C3a treated mice were protected from HI-induced impairment of memory function assessed 6weeks after HI induction. C3a treatment ameliorated HI-induced reactive gliosis in the hippocampus, while it did not affect the extent of hippocampal tissue loss, neuronal cell density, expression of the pan-synaptic marker synapsin I or the expression of growth associated protein 43. In conclusion, our results reveal that brief pharmacological treatment with C3a using a clinically feasible non-invasive mode of administration ameliorates HI-induced cognitive impairment. Intranasal administration is a plausible route to deliver C3a into the brain of asphyxiated infants at high risk of developing hypoxic-ischemic encephalopathy.

Copyright © 2017 Elsevier Inc. All rights reserved.

DOI: 10.1016/j.expneurol.2017.01.001

PMID: 28062175 [Indexed for MEDLINE]

Intravenous injection of umbilical cord-derived mesenchymal stromal cells attenuates reactive gliosis and hypomyelination in a neonatal intraventricular hemorrhage model.

Mukai T, Mori Y, Shimazu T, Takahashi A, Tsunoda H, Yamaguchi S, Kiryu S, Tojo A, Nagamura-Inoue T.

Neuroscience. 2017 Jul 4;355:175-187. doi: 10.1016/j.neuroscience.2017.05.006. Epub 2017 May 11.

Intraventricular hemorrhage (IVH) is a frequent complication of preterm newborns, resulting in cerebral palsy and cognitive handicap as well as hypoxic ischemic encephalopathy and periventricular leukomalacia. In this study, we investigated the restorative effect on neonatal IVH by umbilical cord-derived mesenchymal stromal cells (UC-MSCs) cultured in serum-free medium (RM medium) for clinical application. UC-MSCs were cultured with α MEM medium supplemented with FBS or RM. A neonatal IVH mouse model at postnatal day 5 was generated by intraventricular injection of autologous blood, and mice were intravenously administered 1×10^5 UC-MSCs two days after IVH. Brain magnetic resonance imaging was performed at postnatal day 15, 22 and neurological behavioral measurements were performed at postnatal day 23, accompanied by histopathological analysis and cytokine bead assays in serum after IVH with or without UC-MSCs. Both UC-MSCs cultured with α MEM and RM met the criteria of MSCs and improved behavioral outcome of IVH mice. Moreover the RM group exhibited significant behavioral improvement compared to the control group. Histopathological analysis revealed UC-MSCs cultured with RM significantly attenuated periventricular reactive gliosis, hypomyelination, and periventricular cell death observed after IVH. Furthermore, human brain-derived neurotrophic factor and hepatocyte growth factor were elevated in the serum, cerebrospinal fluid and brain tissue of neonatal IVH model mice 24h after UC-MSCs administration. These results

suggest UC-MSCs attenuate neonatal IVH by protecting gliosis and apoptosis of the injured brain, and intravenous injection of UC-MSCs cultured in RM may be feasible for neonatal IVH in clinic.

Copyright © 2017 IBRO. Published by Elsevier Ltd. All rights reserved.

DOI: 10.1016/j.neuroscience.2017.05.006

PMID: 28504197

Preterm white matter brain injury is prevented by early administration of umbilical cord blood cells.

Li J, Yawno T, Sutherland A, Loose J, Nitsos I, Bischof R, Castillo-Melendez M, McDonald CA, Wong FY, Jenkin G, Miller SL.

Exp Neurol. 2016 Sep;283(Pt A):179-87. doi: 10.1016/j.expneurol.2016.06.017. Epub 2016 Jun 16.

Infants born very preterm are at high risk for neurological deficits including cerebral palsy. In this study we assessed the neuroprotective effects of umbilical cord blood cells (UCBCs) and optimal administration timing in a fetal sheep model of preterm brain injury. 50 million allogeneic UCBCs were intravenously administered to fetal sheep (0.7 gestation) at 12h or 5d after acute hypoxia-ischemia (HI) induced by umbilical cord occlusion. The fetal brains were collected at 10d after HI. HI (n=7) was associated with reduced number of oligodendrocytes (Olig2+) and myelin density (CNPase+), and increased density of activated microglia (Iba-1+) in cerebral white matter compared to control fetuses (P<0.05). UCBCs administered at 12h, but not 5d after HI, significantly protected white matter structures and suppressed cerebral inflammation. Activated microglial density showed a correlation with decreasing oligodendrocyte number (P<0.001). HI caused cell death (TUNEL+) in the internal capsule and cell proliferation (Ki-67+) in the subventricular zone compared to control (P<0.05), while UCBCs at 12h or 5d ameliorated these effects. Additionally, UCBCs at 12h induced a significant systemic increase in interleukin-10 at 10d, and reduced oxidative stress (malondialdehyde) following HI (P<0.05). UCBC administration at 12h after HI reduces preterm white matter injury, via anti-inflammatory and antioxidant actions.

Crown Copyright © 2016. Published by Elsevier Inc. All rights reserved.

DOI: 10.1016/j.expneurol.2016.06.017

PMID: 27317990 [Indexed for MEDLINE]

Region specific oligodendrocyte transcription factor expression in a model of neonatal hypoxic injury.

Affeldt BM, Obenaus A, Chan J, Pardo AC.

Int J Dev Neurosci. 2017 May 22;61:1-11. doi: 10.1016/j.ijdevneu.2017.05.001. [Epub ahead of print]

White matter injury (WMI) of prematurity is associated with a spectrum of neurological disorders ranging from mild cognitive and behavioral deficits to cerebral palsy. Translational studies have implicated impaired oligodendrocyte development after hypoxia as the primary cause of WMI, but the underlying mechanisms remain poorly understood. The goal of this study was to identify alterations in the expression of oligodendrocyte precursor cell transcription factors in a mouse model of transient mild global hypoxia. Postnatal day (P) 7 mouse pups were exposed to hypoxia (7.5% O₂) for 60minutes. We compared oligodendrocyte differentiation and subsequent myelin formation between hypoxia and sham animals at P9, P14 and P28 by examining the expression of key transcription factor regulators of oligodendrocyte differentiation (Ascl1, Olig1, Olig2, and Nkx2.2), as well as APC, a mature oligodendrocyte marker, in the major white matter regions including the corpus callosum, external capsule and anterior commissure. We also examined the effect on myelin formation by examining two myelin specific protein constituents, myelin associated glycoprotein (MAG) and myelin basic protein (MBP), in white matter tracts and whole brain lysate respectively. We found that transient hypoxia at P7 altered the expression of Ascl1, Olig1 and Nkx2.2, resulting in delayed myelination in the external capsule. In addition, our study showed that oligodendrocyte progenitor cells specified several days prior to a hypoxic event are more susceptible to maturation arrest than those specified shortly prior to hypoxia. Our results suggest that alterations of Ascl1, Olig1 and Nkx2.2 underlie impaired oligodendrocyte differentiation and deficient myelination in WMI. These transcription factors are potential therapeutic targets for the treatment of WMI in preterm infants.

Copyright © 2017 ISDN. Published by Elsevier Ltd. All rights reserved.

DOI: 10.1016/j.ijdevneu.2017.05.001

PMID: 28546087

Treadmill exercise improves motor and memory functions in cerebral palsy rats through activation of PI3K-Akt pathway. Je l'aurais peut être mis dans lésion/données fondamentales

Jung SY, Kim DY.

J Exerc Rehabil. 2017 Apr 30;13(2):136-142. doi: 10.12965/jer.1734964.482. eCollection 2017 Apr.

Cerebral palsy (CP) is a chronic disorder characterized by physical disability and disruption of brain function. We evaluated the effects of treadmill exercise on motor and memory functions in relation with phosphatidylinositol 3-kinase (PI3K)-Akt pathway using CP rat model. Rota-rod test, step-down avoidance task, 5-bromo-2'-deoxyuridine (BrdU) immunohistochemistry, and western blot for synapsin I, postsynaptic density-95 (PSD-95), PI3K, Akt, and glycogen synthase kinase-3 β (GSK-3 β) were performed. CP was induced by maternal lipopolysaccharide (LPS)-injection with sensorimotor restriction. Five weeks after birth, the rats in the exercise groups were made to run on the treadmill for 30 min per one day, 5 times a week, during 4 weeks. Motor and memory functions were impaired in the LPS-induced CP rats and treadmill exercise increased motor and memory functions in the CP rats. Cell proliferation in the hippocampus was suppressed in the LPS-induced CP rats and treadmill exercise increased hippocampal cell proliferation in the CP rats. Expressions of synapsin I, PSD-95, phosphorylated (p)-PI3K, and p-Akt were decreased in the LPS-induced CP rats and treadmill exercise enhanced the expressions of synapsin I, PSD-95, p-PI3K, and p-Akt in the CP rats. GSK-3 β expression was increased in the LPS-induced CP rats and treadmill exercise suppressed GSK-3 β expression in the CP rats. The present results suggest that treadmill exercise might improve motor and memory functions through activation of PI3K-Akt pathway.

[Free PMC Article](#)

DOI: 10.12965/jer.1734964.482

PMCID: PMC5412485

PMID: 28503524

Conflict of interest statement: CONFLICT OF INTEREST No potential conflict of interest relevant to this article was reported.

Données cliniques

Association between the use of magnesium sulfate as neuroprotector in prematurity and the neonatal hemodynamic effects.

Nunes RD, Schutz FD, Traebert JL.

J Matern Fetal Neonatal Med. 2017 Jun 2:1-6. doi: 10.1080/14767058.2017.1332033. [Epub ahead of print]

PURPOSE: Cerebral palsy is often associated with prematurity and magnesium sulfate (MgSO₄) has been used as a neuroprotector, with favorable results. However, its mechanism of action has not been fully elucidated. This study aimed to evaluate the association between MgSO₄ at the imminent premature delivery and neonatal hemodynamic effects.

MATERIALS AND METHODS: A cross-sectional study involving 94 newborns (NB) between 24 and 32 weeks at a Brazilian hospital was performed. Bivariate analysis between the use or the non-use of MgSO₄ and hemodynamic characteristics was performed, using the Chi-square test.

RESULTS: NB were evaluated between those who received MgSO₄ (27.7) and those who did not (72.3%). Normal heart rate was verified in 62.8% of NB, normal respiratory rate in 70.2%, and normal temperature in 22.3%. Oxygen saturation higher or equal than 95% was evidenced in 85.1% of NB, normal hemoglucoest in 74.5%, and hemoglobin greater or equal than 16.4 g/dL in 30.9%. Non-invasive ventilation was performed in 48.9% of NB, while 51.1% were submitted to endotracheal ventilation. There was no significance relation detected between the use of MgSO₄ and the hemodynamic characteristics. **CONCLUSIONS:** MgSO₄ does not appear to influence hemodynamic factors as a cause of the neuroprotection in premature NB.

DOI: 10.1080/14767058.2017.1332033

PMID: 28521581

Effect of early intervention in infants at very high risk of cerebral palsy: a systematic review.

Hadders-Algra M, Boxum AG, Hielkema T, Hamer EG.

Dev Med Child Neurol. 2017 Mar;59:246-258. doi: 10.1111/dmcn.13331. Epub 2016 Dec 7.

AIM: First, to systematically review the evidence on the effect of intervention applied during the first postnatal year in infants with or at very high risk of cerebral palsy (CP) on child and family outcome. Second, to assess whether type and dosing of intervention modify the effect of intervention.

METHOD: Relevant literature was identified by searching the PubMed, Embase, and CINAHL databases. Selection criteria included infants younger than 12 months corrected age with or at very high risk of CP. Methodological quality including risk of bias was scrutinized.

RESULTS: Thirteen papers met the inclusion criteria. Seven studies with moderate to high methodological quality were analysed in detail; they evaluated neurodevelopmental treatment only (n=2), multisensory stimulation (n=1), developmental stimulation (n=2), and multifaceted interventions consisting of a mix of developmental stimulation, support of parent-infant interaction, and neurodevelopmental treatment (n=2). The heterogeneity precluded conclusions. Yet, two suggestions emerged: dosing may be critical for effectiveness; (2) multifaceted intervention may offer best opportunities for child and family.

INTERPRETATION: The literature on early intervention in very high-risk infants with sufficient methodological quality is limited, heterogeneous, and provides weak evidence on the effect. More studies are urgently needed. Suggestions for future research are provided.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcr.13331

PMID: 27925172 [Indexed for MEDLINE]

Proximity of magnesium exposure to delivery and neonatal outcomes.

Turitz AL, Too GT, Gyamfi-Bannerman C.

Am J Obstet Gynecol. 2016 Oct;215:508.e1-6. doi: 10.1016/j.ajog.2016.05.004. Epub 2016 May 10.

BACKGROUND: In infants delivered preterm, magnesium sulfate reduces cerebral palsy in survivors. The benefit of magnesium given remote from delivery is unclear.

OBJECTIVE: Our objective was to evaluate the association of time from last exposure to magnesium with cerebral palsy.

STUDY DESIGN: This was a secondary analysis of a multicenter trial evaluating magnesium for neuroprotection. For this study, we included women with live, nonanomalous, singleton gestations who received magnesium. Pregnancies with missing information at the 2 year follow-up were excluded. Women were divided into 2 groups based on exposure timing: last infusion of magnesium <12 hours and last infusion of magnesium ≥12 hours prior to delivery. The primary outcome was cerebral palsy of any severity at 2 years of life. Secondary outcomes were moderate/severe cerebral palsy and moderate/severe cerebral palsy or death. A χ^2 test, Student t test, and Mann-Whitney U test were used for bivariate associations. We fit a multivariable logistic regression model to adjust for confounders.

RESULTS: A total of 906 infants were analyzed. Five hundred sixty-eight were last exposed to magnesium <12 hours prior to delivery and 338 were last exposed ≥12 hours. Cerebral palsy occurred in 28 offspring (3%), 2.3% of those last exposed <12 hours vs 4.4% last exposed ≥12 hours prior to delivery (P = .07). On adjusted analyses, last exposure to magnesium <12 hours prior to delivery was associated with a significant reduction in cerebral palsy compared with last exposure ≥12 hours (adjusted odds ratio, 0.41, 95% confidence interval, 0.18-0.91, P = .03). There was no difference in secondary outcomes.

CONCLUSION: Exposure to magnesium proximal to delivery (<12 hours) is associated with a reduced odds of cerebral palsy compared with more remote exposure. This highlights the importance of the timing of magnesium for neuroprotection for women at risk of preterm delivery.

Copyright © 2016 Elsevier Inc. All rights reserved.

DOI: 10.1016/j.ajog.2016.05.004

PMID: 27177525 [Indexed for MEDLINE]

ST-analysis in electronic foetal monitoring is cost-effective from both the maternal and neonatal perspective.

van 't Hooft J, Vink M, Opmeer BC, Ensing S, Kwee A, Mol BW.

J Matern Fetal Neonatal Med. 2016 Oct;29(20):3260-5. doi: 10.3109/14767058.2015.1126820. Epub 2016 Jan 14.

OBJECTIVE: Electronic foetal monitoring (EFM) together with non-invasive ST-analysis (STAN) has been suggested as a superior technique to EFM alone for foetal surveillance to prevent metabolic acidosis. This study aims to compare

Science Infos Paralysie Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

the cost-effectiveness of these two techniques from both maternal (short term) as neonatal (long term) perspective to guide clinical decision-making.

METHODS: We created two models: a maternal model, focused on the difference in mode of delivery as most important outcome, and a neonatal Markov model focused on the differences in metabolic acidosis - and its relationship to cerebral palsy (CP) - as the most relevant outcome to estimate the long-term cost-effectiveness. The cost to prevent one instrumental delivery was estimated in the maternal model. The costs to prevent one metabolic acidosis and the costs per quality adjusted life years were calculated in the neonatal model.

RESULTS: The average costs of STAN are only €34 higher when compared to EFM alone. From maternal perspective the cost of preventing one instrumental delivery was estimated at €2602. From neonatal perspective the cost to prevent one case of metabolic acidosis was €14 509. Over the long term, STAN becomes a dominant (cost saving) strategy if >1% of the patients exposed to metabolic acidosis acquire CP.

CONCLUSIONS: Our study suggests that STAN, when compared to EFM alone, can be a cost-effective strategy from both a maternal and neonatal perspective.

DOI: 10.3109/14767058.2015.1126820

PMID: 26767304 [Indexed for MEDLINE]

Détection – Diagnostic

+Données Fondamentales

Neurodevelopmental Reflex Testing in Neonatal Rat Pups.

Nguyen AT, Armstrong EA, Yager JY.

J Vis Exp. 2017 Apr 24;(122). doi: 10.3791/55261.

Neurodevelopmental reflex testing is commonly used in clinical practice to assess the maturation of the nervous system. Neurodevelopmental reflexes are also referred to as primitive reflexes. They are sensitive and consistent with later outcomes. Abnormal reflexes are described as an absence, persistence, reappearance, or latency of reflexes, which are predictive indices of infants that are at high risk for neurodevelopmental disorders. Animal models of neurodevelopmental disabilities, such as cerebral palsy, often display aberrant developmental reflexes, as would be observed in human infants. The techniques described assess a variety of neurodevelopmental reflexes in neonatal rats. Neurodevelopmental reflex testing offers the investigator a testing method that is not otherwise available in such young animals. The methodology presented here aims to assist investigators in examining developmental milestones in neonatal rats as a method of detecting early-onset brain injury and/or determining the effectiveness of therapeutic interventions. The methodology presented here aims to provide a general guideline for investigators.

DOI: 10.3791/55261

PMID: 28518104

+Données cliniques

Limitations in the Activity of Mobility at Age 6 Years After Difficult Birth at Term: Prospective Cohort Study.

van Iersel PA, Algra AM, Bakker SC, Jonker AJ, Hadders-Algra M.

Phys Ther. 2016 Aug;96(8):1225-33. doi: 10.2522/ptj.20150201. Epub 2016 Feb 4.

BACKGROUND: A difficult birth at term (DBAT) may manifest as fetal acidosis and low Apgar scores and is often referred to as "perinatal asphyxia," especially when infants show signs of neonatal encephalopathy (NE). In contrast to DBAT resulting in moderate-to-severe NE, which is associated with neurodevelopmental disorders, little is known about the prognosis of less severe forms of DBAT, with or without NE.

OBJECTIVE: The purpose of this study was to evaluate the International Classification of Functioning, Disability and Health, Children & Youth Version activity "mobility" and other neurodevelopmental sequelae in infants with DBAT at age 6 years.

METHODS: The index cohort (n=62; 35 boys, 27 girls) consisted of consecutive term infants with DBAT based on clinical criteria in a Dutch nonacademic hospital from 1999 to 2005. Neonatal encephalopathy was assessed according to the Sarnat grading system and excluded infants with severe NE. The matched reference cohort (n=81;

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud 19
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

49 boys, 32 girls) consisted of healthy term infants. The primary outcome at 6 years was limited mobility (Movement Assessment Battery for Children score ≤ 15 th percentile). Secondary outcomes included learning and behavioral problems and the presence of minor neurological dysfunction.

RESULTS: Three children developed cerebral palsy and were excluded from analyses. Children with DBAT more often had limited mobility than children without DBAT (risk ratio [RR]=2.44; 95% confidence interval [95% CI]=1.16, 5.14). The risk of limited mobility rose with increasing severity of NE (mild NE: RR=3.38; 95% CI=1.40, 8.16; moderate NE: RR=4.00; 95% CI=1.54, 10.40), and manual abilities especially were affected (RR=4.12; 95% CI=1.40, 12.14). Learning problems, need for physical therapy, and complex minor neurological dysfunction were more common in children with DBAT than in children without DBAT.

CONCLUSIONS: Term infants who develop mild or moderate NE following DBAT are at increased risk for limited mobility at age 6 years. Routine monitoring of neuromotor development in these children is warranted.

© 2016 American Physical Therapy Association.

DOI: 10.2522/ptj.20150201

PMID: 26847013 [Indexed for MEDLINE]

Using diffusion tensor imaging to identify corticospinal tract projection patterns in children with unilateral spastic cerebral palsy. Je l'aurais mis dans Détection/Diagnostic – Données cliniques

Kuo HC, Ferre CL, Carmel JB, Gowatsky JL, Stanford AD, Rowny SB, Lisanby SH, Gordon AM, Friel KM.

Dev Med Child Neurol. 2017 Jan;59:65-71. doi: 10.1111/dmcn.13192. Epub 2016 Jul 27.

AIM: To determine whether diffusion tensor imaging (DTI) can be an independent assessment for identifying the corticospinal tract (CST) projecting from the more-affected motor cortex in children with unilateral spastic cerebral palsy (CP).

METHOD: Twenty children with unilateral spastic CP participated in this study (16 males, four females; mean age 9y 2mo [standard deviation (SD) 3y 2mo], Manual Ability Classification System [MACS] level I-III). We used DTI tractography to reconstruct the CST projecting from the more-affected motor cortex. We mapped the motor representation of the more-affected hand by stimulating the more- and the less-affected motor cortex measured with single-pulse transcranial magnetic stimulation (TMS). We then verified the presence or absence of the contralateral CST by comparing the TMS map and DTI tractography. Fisher's exact test was used to determine the association between findings of TMS and DTI.

RESULTS: DTI tractography successfully identified the CST controlling the more-affected hand (sensitivity=82%, specificity=78%).

INTERPRETATION: Contralateral CST projecting from the lesioned motor cortex assessed by DTI is consistent with findings of TMS mapping. Since CST connectivity may be predictive of response to certain upper extremity treatments, DTI-identified CST connectivity may potentially be valuable for determining such connectivity where TMS is unavailable or inadvisable for children with seizures.

© 2016 The Authors. *Developmental Medicine & Child Neurology* published by John Wiley & Sons Ltd on behalf of Mac Keith Press.

[Free PMC Article](#)

DOI: 10.1111/dmcn.13192

PMCID: PMC5215687

PMID: 27465858 [Indexed for MEDLINE]

Motricité - Mobilité – Posture

An Acceleration-Based Gait Assessment Method for Children with Cerebral Palsy.

Chen X, Liao S, Cao S, Wu, Zhang X.

Sensors (Basel). 2017 May 2;17(5). pii: E1002. doi: 10.3390/s17051002.

With the aim of providing an objective tool for motion disability assessment in clinical diagnosis and rehabilitation therapy of cerebral palsy (CP) patients, an acceleration-based gait assessment method was proposed in this paper. To capture gait information, three inertial measurement units (IMUs) were placed on the lower trunk and thigh, respectively. By comparing differences in the gait acceleration modes between children with CP and healthy

subjects, an assessment method based on grey relational analysis and five gait parameters, including Pearson coefficient, variance ratio, the number of extreme points, harmonic ratio and symmetry was established. Twenty-two children with cerebral palsy (7.49 ± 2.86 years old), fourteen healthy adults (24.2 ± 1.55 years old) and ten healthy children (7.03 ± 1.49 years old) participated in the gait data acquisition experiment. The results demonstrated that, compared to healthy subjects, the symptoms and severity of motor dysfunction of CP children could result in abnormality of the gait acceleration modes, and the proposed assessment method was able to effectively evaluate the degree gait abnormality in CP children.

DOI: 10.3390/s17051002

PMCID: PMC5469525

PMID: 28468319

Clinical motion analyses over eight consecutive years in a child with crouch gait: a case report.

Butler EE, Steele KM, Torburn L, Gamble JG, Rose J.

J Med Case Rep. 2016 Jun 15;10:157. doi: 10.1186/s13256-016-0920-9.

BACKGROUND: This case report provides a unique look at the progression of crouch gait in a child with cerebral palsy over an 8-year time period, through annual physical examinations, three-dimensional gait analyses, and evaluation of postural balance. Our patient received regular botulinum toxin-A injections, casting, and physical therapy but no surgical interventions.

CASE PRESENTATION: A white American boy with spastic diplegic cerebral palsy was evaluated annually by clinical motion analyses, including physical examination, joint kinematics, electromyography, energy expenditure, and standing postural balance tests, from 6 to 13 years of age. These analyses revealed that the biomechanical factors contributing to our patient's crouch gait were weak plantar flexors, short and spastic hamstrings, moderately short hip flexors, and external rotation of the tibiae. Despite annual recommendations for surgical lengthening of the hamstrings, the family opted for non-surgical treatment through botulinum toxin-A injections, casting, and exercise. Our patient's crouch gait improved between ages 6 and 9, then worsened at age 10, concurrent with his greatest body mass index, increased plantar flexor weakness, increased standing postural sway, slowest normalized walking speed, and greatest walking energy expenditure. Although our patient's maximum knee extension in stance improved by 14 degrees at 13 years of age compared to 6 years of age, peak knee flexion in swing declined, his ankles became more dorsiflexed, his hips became more internally rotated, and his tibiae became more externally rotated. From 6 to 9 years of age, our patient's minimum stance-phase knee flexion varied in an inverse relationship with his body mass index; from 10 to 13 years of age, changes in his minimum stance-phase knee flexion paralleled changes in his body mass index.

CONCLUSIONS: The motor deficits of weakness, spasticity, shortened muscle-tendon lengths, and impaired selective motor control were highlighted by our patient's clinical motion analyses. Overall, our patient's crouch gait improved mildly with aggressive non-operative management and a supportive family dedicated to regular home exercise. The annual clinical motion analyses identified changes in motor deficits that were associated with changes in the child's walking pattern, suggesting that these analyses can serve to track the progression of children with spastic cerebral palsy.

[Free PMC Article](#)

DOI: 10.1186/s13256-016-0920-9

PMCID: PMC4908800

PMID: 27301473 [Indexed for MEDLINE]

Development and Validation of the Both Hands Assessment for Children With Bilateral Cerebral Palsy.

Elvrum AG, Zethræus BM, Vik T, Krumlinde-Sundholm L.

Phys Occup Ther Pediatr. 2017 May 3;1-14. doi: 10.1080/01942638.2017.1318431.[Epub ahead of print]

AIMS: To develop a hand function test for children with bilateral cerebral palsy (CP) measuring bimanual performance, including quantification of possible asymmetry of hand use.

METHOD: The Both Hands Assessment (BoHA) content was developed through adaptation of the Assisting Hand Assessment (version 5.0). Data from 171 children with bilateral CP, 22-months to 13 years olds (75 females; mean

age: 6 years and 6 months) classified at Manual Ability Classification System (MACS) levels I-III, was entered into Rasch measurement model analyses to evaluate internal scale validity and aspects of reliability.

RESULTS: Sixteen items (11 unimanual and 5 bimanual) exhibited evidence for good internal scale validity and item and person reliability when analyzed separately for children with asymmetric or symmetric hand use. By calibrating the BoHA logit measures into the same frame of reference through linking, the overall measure of bimanual performance is comparable between children with asymmetric or symmetric hand use, still allowing use of separate item difficulty hierarchies.

CONCLUSIONS: The Both Hands Assessment (BoHA), showed strong evidence of internal construct validity for measuring effectiveness of bimanual performance and the extent of asymmetric hand use in children with bilateral cerebral palsy, MACS levels I-III.

DOI: 10.1080/01942638.2017.1318431

PMID: 28467140

Dystonic storm: a practical clinical and video review.

Termsarasab P, Frucht SJ.

J Clin Mov Disord. 2017 Apr 28;4:10. doi: 10.1186/s40734-017-0057-z. eCollection 2017.

Dystonic storm is a frightening hyperkinetic movement disorder emergency. Marked, rapid exacerbation of dystonia requires prompt intervention and admission to the intensive care unit. Clinical features of dystonic storm include fever, tachycardia, tachypnea, hypertension, sweating and autonomic instability, often progressing to bulbar dysfunction with dysarthria, dysphagia and respiratory failure. It is critical to recognize early and differentiate dystonic storm from other hyperkinetic movement disorder emergencies. Dystonic storm usually occurs in patients with known dystonia, such as DYT1 dystonia, Wilson's disease and dystonic cerebral palsy. Triggers such as infection or medication adjustment are present in about one-third of all events. Due to the significant morbidity and mortality of this disorder, we propose a management algorithm that divides decision making into two periods: the first 24 h, and the next 2-4 weeks. During the first 24 h, supportive therapy should be initiated, and appropriate patients should be identified early as candidates for pallidal deep brain stimulation or intrathecal baclofen. Management in the next 2-4 weeks aims at symptomatic dystonia control and supportive therapies.

[Free PMC Article](#)

DOI: 10.1186/s40734-017-0057-z

PMCID: PMC5410090

PMID: 28461905

Growth characteristics in cerebral palsy subtypes: a comparative assessment.

Stanek JL, Emerson JA, Murdock FA, Petroski GF.

Dev Med Child Neurol. 2016 Sep;58(9):931-5. doi: 10.1111/dmcn.13116. Epub 2016 Apr 5.

AIM: Children with quadriplegic cerebral palsy (CP) have been found to have growth rates that differ from those of children with typical development. Little research has been performed to distinguish whether growth patterns in hemiplegic, diplegic, and quadriplegic CP differ from one another. The purpose of this study was to compare growth of children with quadriplegic, hemiplegic, and diplegic CP. METHOD: Retrospective data were collected from the electronic medical record of patients with CP at an outpatient center. Linear mixed models were used to examine growth by diagnosis, using International Classification of Diseases, Ninth Revision (ICD-9) diagnosis codes 343.0 (diplegia), 343.1 (hemiplegia), and 343.2 (quadriplegia).

RESULTS: Heights and weights of children with quadriplegic CP were consistently lower than those with hemiplegic or diplegic CP. Children with hemiplegic CP had greater heights and weights than other CP subtypes. There were statistically significant differences in weight gain curves among the three diagnoses for males ($p < 0.05$).

INTERPRETATION: Our study reveals differences in growth rates between hemiplegic, diplegic, and quadriplegic CP subtypes.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13116

PMID: 27059686 [Indexed for MEDLINE]

Knee Recurvatum in Children With Spastic Diplegic Cerebral Palsy.

Bauer J, Patrick Do K, Feng J, Pierce R, Aiona M.

J Pediatr Orthop. 2017 May 17. doi: 10.1097/BPO.0000000000000985. [Epub ahead of print]

BACKGROUND: The purpose of this study is to determine which factors drive patients with diplegic cerebral palsy to walk without knee recurvatum despite hyperextension of the knee on physical examination.

METHODS: A retrospective review was conducted of all data collected in the Gait Analysis Laboratory between 1999 and 2014. Patients with spastic diplegic cerebral palsy and at least 5 degrees of knee extension on clinical examination were identified for the study. After IRB approval, a total of 60 children ranging in age from 4 to 17 were included in the study. There were 27 female patients. Gross Motor Function Classification System level was distributed in the population as follows: 34 patients at Gross Motor Function Classification System level I, 18 at level II, and 8 at level III. Patients were excluded from this study if they had extrapyramidal involvement, history of selective dorsal rhizotomy or lower extremity surgery. Patient who received botulinum toxin A injections within 1 year of the study were excluded as well. Patients were divided into 2 groups: children that walked with knee hyperextension (KH) and children that walked without knee hyperextension (KF, "knee flexion"). There were 15 subjects in the KH group and 45 subjects in the KF group. Motion Laboratory evaluation included a comprehensive examination, kinematics, and kinetic analysis with a VICOM system. All data were analyzed with unpaired t test to detect differences between the 2 groups. All statistical analysis was done only for the right legs (unless the right leg did not meet the exclusion then the left leg was analyzed) to meet the statistical requirement for independence. The Pearson correlation was applied to correlate the maximum knee extension in stance with maximum ankle dorsiflexion in stance.

RESULTS: The static measurement of dorsiflexion with knee flexed showed statistically significant difference ($P=0.004$) with KH group having 2.3 ± 11.6 degrees and KF group having 13.1 ± 12.2 degrees. There was also a statistically significant difference in the static measurement of dorsiflexion with knee extended ($P=0.0014$) with KH group having -3.3 ± 9.0 degrees and KF group having 5.8 ± 9.1 degrees. Maximum dorsiflexion in stance phase also showed significant difference ($P=0.0022$) with the KH group having 0.1 ± 14.0 degrees and KF group having 11.5 ± 11.2 degrees. Maximum dorsiflexion in stance phase also showed significant difference ($P<0.001$) with the KH group having 0.1 (SD) 14.0 degrees and KF group having 11.5 (SD) 11.2 degrees. There were no significant differences in popliteal angle measurements or any strength measurement.

CONCLUSIONS: Our study shows that the plantar flexion knee extension couple is the major contributing factor to cause patients with passive knee hyperextension to walk in a recurvatum pattern. This would have implications of further treatment of the knee hyperextension in stance.

LEVEL OF EVIDENCE: Level III-case-control study.

DOI: 10.1097/BPO.0000000000000985

PMID: 28520679

Measuring changes of manual ability with ABILHAND-Kids following intensive training for children with unilateral cerebral palsy.

Bleyenheuft Y, Gordon AM, Rameckers E, Thonnard JL, Arnould C.

Dev Med Child Neurol. 2017 May;59(5):505-511. doi: 10.1111/dmcn.13338. Epub 2016 Nov 29.

AIM: ABILHAND-Kids is a parent-reported questionnaire measuring manual ability in children with cerebral palsy (CP). Its psychometric properties have been established, with the exception of responsiveness, which is examined here. **METHOD:** In this cohort study, 98 children (46 males, 52 females; range 6-19y, mean 11y, standard deviation [SD] 3.3y) with unilateral CP underwent three assessments of upper extremity function: at baseline (T1); after 80 to 90 hours of intensive training (T2); and at follow-up (T3). The responsiveness was analyzed using global, group (based on age and on Manual Ability Classification System [MACS] level), and individual approaches during two time periods (T1-T2 and T2-T3). Effect size was used to quantify magnitude of changes.

RESULTS: The global approach showed significant improvements between T1 and T2 ($p<0.001$) but not between T2 and T3 ($p=0.222$). In the group analyses, effect size and SRM demonstrated large changes in younger children (6-12y, $n=52$, mean change= 1.06 logit, effect size >0.8) and small changes in the older children (13-19y, $n=46$, mean change= 0.71 logit, effect size >0.4). Children in MACS level II demonstrated larger changes than children in MACS level I or III.

INTERPRETATION: The ABILHAND-Kids exhibited responsiveness in detecting changes after intensive training. Therefore, this scale is potentially useful in assessing the functional status of children with unilateral CP in clinical trials.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13338

PMID: 27896811 [Indexed for MEDLINE]

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.

Dev Med Child Neurol. 2017 Jan;59(1):72-78. doi: 10.1111/dmnc.13162. Epub 2016 Jun 8.

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.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13162

PMID: 27273427 [Indexed for MEDLINE]

Motorized versus manual instrumented spasticity assessment in children with Cerebral palsy.

Sloot LH, Bar-On L, van der Krogt MM, Aertbeliën E, Buizer AI, Desloovere K, Harlaar J.

Dev Med Child Neurol. 2017 Feb;59:145-151. doi: 10.1111/dmnc.13194. Epub 2016 Jul 1.

AIM: We compared the outcomes of manual and motorized instrumented ankle spasticity assessments in children with cerebral palsy (CP).

METHOD: Ten children with spastic CP (three males, seven females; mean age 11y [standard deviation 3y], range 6-14y; Gross Motor Function Classification System levels I-III) were included. During motorized assessments, fast (100°/s) rotations were imposed around the ankle joint by a motor-driven footplate; during manual assessments, rotations of comparable speed were applied by a therapist using a foot orthotic. Angular range of motion, maximum velocity, acceleration, work, and muscle activity (electromyography [EMG]) of the triceps surae and tibialis anterior were compared during passive muscle stretch between motorized and manual assessments. Both movement profiles were also compared to CP gait ankle movement profile.

RESULTS: The imposed movement profile differed between methods, with the motorized assessment reaching higher maximum acceleration. Despite equal maximum velocity, the triceps surae were more often activated in motorized assessments, with low agreement of 44% to 72% ($\kappa \leq 0$) for EMG onset occurrence between methods. The manually applied ankle velocity profile matched more closely with the gait profile.

INTERPRETATION: The differences in acceleration possibly account for the different muscle responses, which may suggest acceleration, rather than velocity-dependency of the stretch reflex. Future prototypes of instrumented spasticity assessments should standardize movement profiles, preferably by developing profiles that mimic functional tasks such as walking.

© 2016 The Authors. Developmental Medicine & Child Neurology published by John Wiley & Sons Ltd on behalf of Mac Keith Press.

DOI: 10.1111/dmnc.13194

PMID: 27363603 [Indexed for MEDLINE]

Multiprofessional evaluation in clinical practice: establishing a core set of outcome measures for children with cerebral palsy.

Mäenpää H, Autti-Rämö I, Varho T, Forsten W, Haataja L.

Dev Med Child Neurol. 2017 Mar;59(3):322-328. doi: 10.1111/dmcn.13289. Epub 2016 Oct 7.

AIM: To develop a national consensus on outcome measures that define functional ability in children with cerebral palsy (CP) according to the International Classification of Functioning, Disability and Health (ICF) framework. **METHOD:** The project started in 2008 in neuropaediatric units of two university hospitals and one outpatient clinic. Each professional group selected representatives to be knowledge brokers for their own specialty. Based on the evidence, expert opinion, and the ICF framework, multiprofessional teams selected the most valid measures used in clinical practice (2009-2010). Data from 269 children with CP were analysed, classified by the Gross Motor Function Classification System, Manual Ability Classification System, and Communication Function Classification System, and evaluated.

RESULTS: The process aimed at improving and unifying clinical practice in Finland through a national consensus on the core set of measures. The selected measures were presented by professional groups, and consensus was reached on the recommended core set of measures to be used in all hospitals treating children with CP in Finland.

INTERPRETATION: A national consensus on relevant and feasible measures is essential for identifying differences in the effectiveness of local practices, and for conducting multisite intervention studies. This project showed that multiprofessional rehabilitation practices can be improved through respect for and inclusion of everyone involved.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13289

PMID: 27714777 [Indexed for MEDLINE]

Prevalence of specific gait abnormalities in children with cerebral palsy revisited: influence of age, prior surgery, and Gross Motor Function Classification System level.

Rethlefsen SA, Blumstein G, Kay RM, Dorey F, Wren TA.

Dev Med Child Neurol. 2017 Jan;59(1):79-88. doi: 10.1111/dmcn.13205. Epub 2016 Jul 15.

AIM: To examine the impact of age, surgery, and Gross Motor Function Classification System (GMFCS) level on the prevalence of gait problems in children with cerebral palsy (CP).

METHOD: Gait analysis records were retrospectively reviewed for ambulatory patients with CP. Gait abnormalities were identified using physical exam and kinematic data. Relationships among age, sex, previous surgery, GMFCS level, and prevalence of gait abnormalities associated with crouch and out-toeing, and equinus and in-toeing were assessed using univariable and multivariable logistic regression.

RESULTS: One-thousand and five records were reviewed. The most common gait problems were in-toeing, excessive knee flexion, stiff knee, hip flexion, internal rotation, adduction, and equinus (all >50%). Odds ratios (OR) for various gait problems associated with crouch and out-toeing increased (OR 1.07-1.32), and those associated with equinus and in-toeing decreased (OR 0.80-0.94) significantly with increasing age for patients in GMFCS levels I to III. The same trends were seen with prior surgery (OR for crouch and out-toeing: 1.86-7.14; OR for equinus and in-toeing: 0.16-0.59).

INTERPRETATION: The prevalence of gait abnormalities varies by GMFCS level, but similarities exist among levels. The study results suggest that in younger children, particularly those in GMFCS levels III and IV, treatments for equinus and in-toeing should be undertaken with caution because these problems tend to decrease with age even without orthopedic intervention. Such children may end up with the 'opposite' deformities of calcaneal crouch and out-toeing, which tend to increase in prevalence with age.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13205

PMID: 27421715 [Indexed for MEDLINE]

Prospective pilots of routine data capture by paediatricians in clinics and validation of the Disabilities Complexity Scale.

Horridge KA, McGarry K, Williams J, Whitlingum G; British Academy of Childhood Disability.

Science Infos Paralysie Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud 75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

Dev Med Child Neurol. 2016 Jun;58(6):581-8. doi: 10.1111/dmcn.13101. Epub 2016 Mar 26.

AIMS: To pilot prospective data collection by paediatricians at the point of care across England using a defined terminology set; demonstrate feasibility of data collection and utility of data outputs; and confirm that counting the number of needs per child is valid for quantifying complexity.

METHOD: Paediatricians in 16 hospital and community settings collected and anonymized data. Participants completed a survey regarding the process. Data were analysed using R version 3.1.2.

RESULTS: Overall, 8117 needs captured from 1224 consultations were recorded. Sixteen clinicians responded positively about the process and utility of data collection. The sum of needs varied significantly ($p < 0.01$) by level of gross motor function ascertained using the Gross Motor Function Classification System for children with cerebral palsy; epilepsy severity as defined by level of expertise required to manage it; and by severity of intellectual disability.

INTERPRETATION: Prospective data collection at the point of clinical care proved possible without disrupting clinics, even for those with the most complex needs, and took the least time when done electronically. Counting the number of needs was easy to do, and quantified complexity in a way that informed clinical care for individuals and related directly to validated scales of functioning. Data outputs could inform more appropriate design and commissioning of quality services.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13101

[Free Article](#)

PMID: 27016307 [Indexed for MEDLINE]

Psychometric properties of a revised version of the Assisting Hand Assessment (Kids-AHA 5.0). A mettre dans Motricité Mobilité Posture

Holmefur MM, Krumlinde-Sundholm L.

Dev Med Child Neurol. 2016 Jun;58(6):618-24. doi: 10.1111/dmcn.12939. Epub 2015 Oct 28.

AIM: The aim of this study was to scrutinize the Assisting Hand Assessment (AHA) version 4.4 for possible improvements and to evaluate the psychometric properties regarding internal scale validity and aspects of reliability of a revised version of the AHA.

METHOD: In collaboration with experts, scoring criteria were changed for four items, and one fully new item was constructed. Twenty-two original, one new, and four revised items were scored for 164 assessments of children with unilateral cerebral palsy aged 18 months to 12 years. Rasch measurement analysis was used to evaluate internal scale validity by exploring rating-scale functioning, item and person goodness-of-fit, and principal component analysis. Targeting and scalar reliability were also evaluated.

RESULTS: After removal of misfitting items, a 20-item scale showed satisfactory goodness-of-fit. Unidimensionality was confirmed by principal component analysis. The rating scale functioned well for the 20 items, and the item difficulty was well suited to the ability level of the sample. The person reliability coefficient was 0.98, indicating high separation ability of the scale. A conversion table of AHA scores between the previous version (4.4) and the new version (5.0) was constructed.

INTERPRETATION: The new, 20-item version of the Kids-AHA (version 5.0), demonstrated excellent internal scale validity, suggesting improved responsiveness to changes and shortened scoring time. For comparison of scores from version 4.4 to 5.0, a transformation table is presented.

© 2015 Mac Keith Press.

DOI: 10.1111/dmcn.12939

PMID: 26507383 [Indexed for MEDLINE]

Quantifying multifaceted needs captured at the point of care. Development of a Disabilities Terminology Set and Disabilities Complexity Scale.

Horridge KA, Harvey C, McGarry K, Williams J, Whitlingum G, Busk M, Fox S, Baird G, Spencer A.

Dev Med Child Neurol. 2016 Jun;58(6):570-80. doi: 10.1111/dmcn.13102. Epub 2016 Mar 23.

AIMS: To develop a Disabilities Terminology Set and quantify the multifaceted needs of disabled children and their families in a district disability clinic population.

METHOD: Data from structured electronic clinic letters of children attending paediatric disability clinics from June 2007 to May 2012 in Sunderland, north-east England collected at the point of clinical care were analysed to determine appropriate terms for consistent recording of each need and issue. Terms were collated to count the number of needs per child.

RESULTS: A Systemized Nomenclature of Medicine - Clinical Terms subset of 296 terms was identified and published, and 8392 consultations for 1999 children were reviewed. The required number of clinic appointments correlated strongly with the number of needs identified. Children with intellectual disabilities in addition to cerebral palsy and epilepsy had more than double the number of conditions, technology dependencies, and family-reported issues than those without. Disabled children who subsequently died had the highest burden of needs ($p=0.007$).

INTERPRETATION: Detailed data about needs generated outputs useful for local care pathway development and service planning. Sufficient evidence was provided for successful business cases leading to the appointment of additional paediatric disability consultants. Counting numbers of needs and issues quantifies complexity in a straightforward way. This could underpin needs-based commissioning of services.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13102

PMID: 27009933 [Indexed for MEDLINE]

Relationship Between Mobility and Self-Care Activity in Children With Cerebral Palsy.

Kim K, Kang JY, Jang DH.

Ann Rehabil Med. 2017 Apr;41(2):266-272. doi: 10.5535/arm.2017.41.2.266. Epub 2017 Apr 27.

OBJECTIVE: To investigate the factors influencing the development of self-care activity, and the association between mobility and self-care activity in children with cerebral palsy (CP).

METHODS: A total of 63 CP children aged ≥ 4 years, were studied retrospectively. Children with severe intellectual disability or behavioral problems were excluded. The relationship between the Gross Motor Function Classification System (GMFCS), the Manual Ability Classification System (MACS), and the Pediatric Evaluation of Disability Inventory (PEDI) was analyzed. Simple and multiple linear regression analyses were conducted for continuous variables, such as verbal intelligence quotient (IQ) and PEDI subscales.

RESULTS: Final evaluation was done for 25 children, ranging from 4 to 11 years of age. According to GMFCS levels, the differences in PEDI-self-care scores, showed statistically borderline significance ($p=0.051$). Conversely, differences in PEDI-self-care scores according to CP types and MACS levels were not statistically significant. Simple linear regression analysis showed that PEDI mobility and PEDI social function significantly influence the PEDI self-care. Multiple linear regression analysis showed that PEDI mobility was the only factor significantly influencing PEDI self-care in children aged ≥ 7 years ($R(2)=0.875$, $p=0.03$).

CONCLUSION: Mobility is important for the acquisition of self-care abilities in children with CP aged ≥ 7 years.

[Free PMC Article](#)

DOI: 10.5535/arm.2017.41.2.266

PMCID: PMC5426278

PMID: 28503460

Conflict of interest statement: CONFLICT OF INTEREST: No potential conflict of interest relevant to this article was reported.

Selective Control of the Upper Extremity Scale: validation of a clinical assessment tool for children with hemiplegic cerebral palsy.

Wagner LV, Davids JR, Hardin JW.

Dev Med Child Neurol. 2016 Jun;58(6):612-7. doi: 10.1111/dmcn.12949. Epub 2015 Nov 3.

AIM: The ability to determine the relationship between selective motor control and upper extremity function in children with unilateral cerebral palsy (CP), and to measure the functional outcome and efficacy of interventions designed to improve selective motor control, has been limited by the lack of an objective, validated tool. The primary objective of this study is to describe the development of a clinical tool entitled Selective Control of the Upper Extremity Scale (SCUES), and present evidence of its validity and reliability.

METHOD: Content validity was established through an expert panel (eight clinicians, mean and median of 17y of clinical experience, range 2-30y). Intra- and interrater reliability was determined by six occupational therapists who
[Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud 27 75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org](#)

scored 10 participant studies. Construct validity of the SCUES was established by comparison to the spontaneous functional analysis section of the Shriners Hospitals Upper Extremity Evaluation, the Manual Ability Classification System, and the Box and Block test for 25 children with unilateral CP.

RESULTS: The content validity ratio values were greater than 0 (indicating >50% agreement) for 33 of the 34 items (97%), and equal or greater than 0.5 (indicating $\geq 75\%$ agreement) for 26 of the 34 items (76%). Intrarater reliability was excellent (intraclass correlation coefficient [ICC] > 0.75) for all segments and joints of the affected extremity. Interrater reliability was excellent for all segments and joints of the affected extremity except the shoulder (ICC=0.72). The SCUES was strongly correlated with the SHUEE (Spearman's $\rho=0.69$, $p=0.003$). The SCUES was not correlated with the Manual Ability Classification System ($\rho=-0.24$, $p=0.369$) or the Box and Block test ($\rho=0.47$, $p=0.066$).

INTERPRETATION: Psychometric analysis of the SCUES revealed comparable validity to other accepted video-based clinical assessment tools for the upper extremity in children with CP.

© 2015 Mac Keith Press.

[Free Article](#)

DOI: 10.1111/dmnc.12949

PMID: 26526592 [Indexed for MEDLINE]

Spasticity, dyskinesia and ataxia in cerebral palsy: Are we sure we can differentiate them?

Eggink H, Kremer D, Brouwer OF, Contarino MF, van Egmond ME, Elema A, Folmer K, van Hoorn JF, van de Pol LA, Roelfsema V, Tijssen MAJ.

Eur J Paediatr Neurol. 2017 May 9. pii: S1090-3798(17)31604-5. doi: 10.1016/j.ejpn.2017.04.1333. [Epub ahead of print]

OBJECTIVE: Cerebral palsy (CP) can be classified as spastic, dyskinetic, ataxic or combined. Correct classification is essential for symptom-targeted treatment. This study aimed to investigate agreement among professionals on the phenotype of children with CP based on standardized videos.

METHODS: In a prospective, observational pilot study, videos of fifteen CP patients (8 boys, mean age 11 ± 5 y) were rated by three pediatric neurologists, three rehabilitation physicians and three movement disorder specialists. They scored the presence and severity of spasticity, ataxia or dyskinesias/dystonia. Inter- and intraobserver agreement were calculated using Cohen's and Fleiss' kappa.

RESULTS: We found a fair inter-observer ($\kappa = 0.36$) and moderate intra-observer agreement ($\kappa = 0.51$) for the predominant motor symptom. This only slightly differed within the three groups of specialists ($\kappa = 0.33-0.55$).

CONCLUSION: A large variability in the phenotyping of CP children was detected, not only between but also within clinicians, calling for a discussing on the operational definitions of spasticity, dystonia and ataxia. In addition, the low agreement found in our study questions the reliability of use of videos to measure intervention outcomes, such as deep brain stimulation in dystonic CP. Future studies should include functional domains to assess the true impact of management options in this highly challenging patient population.

Copyright © 2017 European Paediatric Neurology Society. Published by Elsevier Ltd. All rights reserved.

DOI: 10.1016/j.ejpn.2017.04.1333

PMID: 28549726

The Gross Motor Function Classification System Family Report Questionnaire:reliability between special-education teachers and caregivers.

Ramrit S, Yonglitthipagon P, Janyacharoen T, Emasithi A,Siritaratiwat W.

Dev Med Child Neurol. 2017 May;59(5):520-525. doi: 10.1111/dmnc.13356. Epub 2016 Dec 14.

AIM: The aim of this study was to investigate the reliability of the Thai Gross Motor Function Classification System Family Report Questionnaire (GMFCS-FR) and the possibility of special-education teachers and caregivers in the community using this system in children with cerebral palsy (CP).

METHOD: The reliability was examined by two teachers and two caregivers who classified 21 children with CP aged 2 to 12 years. A GMFCS-FR workshop was organized for raters. The teachers and caregivers classified the mobility of 362 children. The rater reliability was analysed using the weighted kappa coefficient. The possibility of using the GMFCS-FR is reported. The reliability of using the GMFCS-FR in the community was analysed by the intraclass correlation coefficient.

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

RESULTS: The intrarater reliability ranged from 0.91 to 1.00. The interrater reliability between teachers was 0.85 (95% confidence interval [CI] 0.69-0.97) and between caregivers was 0.84 (95% CI 0.70-0.97). Ninety-seven percent of raters used the Thai GMFCS-FR correctly. The overall intraclass correlation coefficient between raters was 0.90 (95% CI 0.88-0.92).

INTERPRETATION: The Thai GMFCS-FR is a reliable system for classifying the motor function of young children with CP by teachers and caregivers in the community. © 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13356

PMID: 27966216 [Indexed for MEDLINE]

Traitement - Rééducation motrice et cognitive

Pharmacologie Efficacite Tolérance

Adverse drug reactions of botulinum neurotoxin type A in children with cerebralpalsy: a pharmaco-epidemiological study in VigiBase.

Montastruc J, Marque P, Moulis F, Bourg V, Lambert V, Durrieu G, Montastruc JL, Montastruc F.
Dev Med Child Neurol. 2017 Mar;59(3):329-334. doi: 10.1111/dmnc.13286. Epub 2016 Sep 28.

AIM: The aim of this study was to assess the risk of adverse drug reactions (ADRs) with botulinum neurotoxin type A (BoNT-A) in children with cerebral palsy (CP) using the World Health Organization global individual case safety report (ICSR) database, VigiBase.

METHOD: We extracted all children ICSRs for ADRs with BoNT-A used as anti-spastic drug in CP recorded between 1995 and 2015 in VigiBase. We also performed a case/non-case method (disproportionality analysis) to assess the link between exposure to BoNT-A and each ADR of interest in children and adults, calculating reporting odds ratios (RORs).

RESULTS: In VigiBase, 162 ICSRs were registered. They involved mainly males (n=95, 59%) and mean (SD) age was 7 years 11 months (4y 4mo). The most frequent ADR was dysphagia (27 ICSRs, 17%) followed by asthenia and muscular weakness (25 ICSRs each, 16%). Nineteen ICSRs (12%) were lethal. There was a significant association between BoNT-A and death in children (ROR=11.1 95%, confidence interval [CI] 7.0-17.7) but not in adults.

INTERPRETATION: In children with CP, most ADRs seem to be linked to a systemic spread of BoNT-A. Our study suggests a higher risk of ADRs with BoNT-A in children than in adults.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13286

PMID: 27682175 [Indexed for MEDLINE]

Intrathecal baclofen pump infection treated by adjunct intrareservoir teicoplanin instillation.

Aristedis R, Dimitrios P, Nikolaos P, Alexandros B.

Surg Neurol Int. 2017 Mar 14;8:38. doi: 10.4103/sni.sni_418_16. eCollection 2017.

BACKGROUND: The delivery of intrathecal baclofen via pumps is gaining increasing use in the management of intractable spasticity. One of the rare but devastating complications of this method is infection. In the majority of cases, removal of the device is required, despite appropriate intravenous antibiotic therapy. We report a case that highlights the use of intrareservoir teicoplanin to achieve sterilization of the infected pump system in a patient in whom removal of the pump was not an easy option.

CASE DESCRIPTION: We describe our experience on a patient with cerebral palsy in whom Staphylococcus epidermidis pump infection developed due to contamination of the infusion reservoir during refilling procedure, which was successfully sterilized in situ by the combined use of systemic antibiotics and intrareservoir coadministration of baclofen with teicoplanin. The infection was eradicated and baclofen therapy was continued uninterrupted.

CONCLUSIONS: Removal of intrathecal baclofen pump is not necessary as the first measure in cases with mild clinical symptomatology. In view of the fact that pumps for intrathecal drug delivery are very costly, salvage of the device may be attempted in selected cases, although it is not generally recommended. Combined infusion of baclofen and

an antibiotic through the pump makes it possible to maintain treatment for spasticity, sterilize the pump reservoir and flow tubes, and effectively treat infections that develop during the use of these systems.

[Free PMC Article](#)

DOI: 10.4103/sni.sni_418_16

PMCID: PMC5369255

PMID: 28458952

Conflict of interest statement: There are no conflicts of interest.

**[Myths and evidence on the use of botulinum toxin: spasticity in adults and in children with cerebral palsy].
[Article in Spanish; Abstract available in Spanish from the publisher]**

Martinez-Castrillo JC, Pena-Segura JL, Sanz-Cartagena P, Alonso-Curco X, Arbelo-Gonzalez JM, Arriola-Pereda G, Coll-Bosch MD, Conejero-Casares JA, Garcia-Ribes A, Jauma-Classen S, Pagonabarraga J, Vidal-Valls J, Garcia-Ruiz PJ.
Rev Neurol. 2017 May 16;64(10):459-470.

INTRODUCTION: Spasticity is a medical problem with a high incidence that significantly impact on the quality of life of patients and their families.

AIM: To analyze and to answer different questions about the use of botulinum toxin type A (BTA) in our clinical practice.

DEVELOPMENT: A group of experts in neurology develop a list of topics related with the use of BTA. Two big groups were considered: spasticity in adults and in children with cerebral palsy. A literature search at PubMed for English, French, and Spanish language articles published up to June 2016 was performed. The manuscript was structured as a questionnaire that includes those questions that, according to the panel opinion, could generate more controversy or doubt. The initial draft was reviewed by the expert panel members to allow for modifications, and after subsequent revisions for achieving the highest degree of consensus, the final text was then validated. Different questions about diverse aspects of spasticity in adults, such as methods for evaluating spasticity, infiltration techniques, doses, number of infiltration points, etc. Regarding spasticity in children with cerebral palsy, the document included questions about minimum age of infiltration, methods of analgesia, etc.

CONCLUSIONS: This review is a tool for continuous training for neurologist and rehabilitation specialist and residents of both specialties, about different specific areas of the management of BTA.

[Free Article](#)

PMID: 28497442

Negative effects of submandibular botulinum neurotoxin A injections on oral motor function in children with drooling due to central nervous system disorders.

van Hulst K, Kouwenberg CV, Jongerius PH, Feuth T, van den Hoogen FJ, Geurts AC, Erasmus CE.
Dev Med Child Neurol. 2017 May;59(5):531-537. doi: 10.1111/dmcn.13333. Epub 2016 Nov 30.

AIM: The aims of this study were: to determine the incidence and nature of adverse effects on oral motor function after first injections of botulinum neurotoxin A (BoNT-A) in submandibular glands for excessive drooling in children with central nervous system disorders; and (2) to identify independent predictors of these adverse effects.

METHOD: A cohort study involved 209 children (123 males, 86 females, aged 4-27y, median 8y 4mo), who received submandibular BoNT-A injections for drooling. Adverse effects were categorized into swallowing, eating, drinking, articulation, and other problems. Univariable logistic regression was used to study differences in patients with and without adverse effects. Possible predictors were identified using multivariable logistic regression.

RESULTS: Transient adverse effects occurred in 33% of the 209 BoNT-A treatments. Almost 80% of these were mild, versus 8.7% severe. Approximately 54% of the adverse effects spontaneously resolved within 4 weeks; 3% still existed after 32 weeks. A diagnosis of cerebral palsy, higher range of BoNT-A dosage, and a pre-treatment drooling quotient <18% were found to be independent predictors of adverse effects.

INTERPRETATION: Before using submandibular BoNT-A injections for drooling, potential adverse effects should be discussed. Oral motor function needs to be monitored, because existing dysphagia may be worsened. The identified clinical predictors could be helpful to optimize patient selection.

© 2016 The Authors. *Developmental Medicine & Child Neurology* published by John Wiley & Sons Ltd on behalf of Mac Keith Press.

DOI: 10.1111/dmcn.13333

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

PMID: 27901263 [Indexed for MEDLINE]

Pelvic-Spinal Analysis and the Impact of Onabotulinum toxin A Injections on Spinal Balance in one Child With Cerebral Palsy.

Chaléat-Valayer E, Bernard JC, Deceuninck J, Roussouly P.

Child Neurol Open. 2016 Nov 16;3:2329048X16679075. doi: 10.1177/2329048X16679075. eCollection 2016 Jan-Dec.

BACKGROUND: In children with cerebral palsy, primary (eg, abnormal muscle tone and weakness) and secondary impairments (eg, contractures) can modify pelvic-spinal alignment. The main aim of this article was to establish a new approach to pelvic-spinal analysis in children with cerebral palsy, taking into account the whole pelvis-spine complex, illustrated by a case study.

METHODS: This is a case study of an ambulatory child with cerebral palsy (spastic diplegia) who underwent analysis of the pelvic-spine complex from X-ray images taken in standing position from C2 to the proximal femur. Pelvic shape was characterized by the pelvic incidence angle, which is the sum of sacral slope and pelvic tilt, before and after the treatment by regular onabotulinumtoxinA injections into the hip flexors, and the use of soft lumbar brace over 5 years.

RESULTS: The sagittal balance of the spine was improved following the treatment, with a reduction in lumbar lordosis and sacral slope. The reduction in lumbar hyperextension likely reduced the risk of spondylolysis, low back pain, and degenerative spondylolisthesis in adulthood.

CONCLUSION: A biomechanical approach to the evaluation of the pelvic-spinal complex offers new perspectives to increase the understanding of spinal balance in children with cerebral palsy, providing more options for treatment, such as onabotulinumtoxinA.

[Free PMC Article](#)

DOI: 10.1177/2329048X16679075

PMCID: PMC5417343

PMID: 28503621

Conflict of interest statement: Declaration of Conflicting Interests: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Should botulinum toxin A injections be repeated in children with cerebral palsy? A systematic review.

Kahraman A, Seyhan K, Değer Ü, Kutlutürk S, Mutlu A.

Dev Med Child Neurol. 2016 Sep;58(9):910-7. doi: 10.1111/dmcn.13135. Epub 2016 Apr 22.

AIM: The aim of this study was to determine the effects of repeat botulinum toxin A (BoNT-A) injections in children with spastic cerebral palsy (CP) on the basis of a best evidence synthesis.

METHOD: This study included 13 original articles after searching the literature to retrieve information. We used the critical review form produced by McMaster University to determine the methodological quality of the studies, and then confirmed the levels of evidence from Sackett. The studies were also evaluated using the International Classification of Function, Disability and Health - Children and Youth Version (ICF-CY).

RESULTS: A total of 893 children with spastic CP who had been administered repeat BoNT-A injections were evaluated. The evidence level was II in four of the thirteen studies, III in four studies, and IV in five studies. The McMaster review form score was 14 in two studies, 13 in four studies, and 12 in seven studies. The results showed that repeat BoNT-A may be a safe and an effective approach. The first two injections/one repeat especially relieve spasticity and improve fine and gross motor activities.

INTERPRETATION: Future studies to investigate the effectiveness of repeat BoNT-A in children with spastic CP may be planned within the framework of the ICF-CY to include well-designed randomized controlled trials and those conducted on larger homogenous groups.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13135

PMID: 27103334 [Indexed for MEDLINE]

Chirurgie

Curve flexibility in cerebral palsy-related neuromuscular scoliosis: does the intraoperative prone radiograph reveal more flexibility than preoperative radiographs?

Chaudry Z, Anderson JT.

Scoliosis Spinal Disord. 2017 May 4;12:15. doi: 10.1186/s13013-017-0122-2. eCollection 2017.

BACKGROUND: Spinal flexibility is determined preoperatively by manipulating the spine and assessing, radiographically, to what extent the amount of deformity reduces. Quantifying spinal flexibility is important when determining the approach to the planned operation in order to achieve the most optimal spinal correction and balance. Currently, supine traction radiography is a popular method used in patients with severe, cerebral palsy-related neuromuscular scoliosis. The different methods for determining spinal flexibility have been studied extensively in the adolescent idiopathic scoliosis population. No such studies exist in the cerebral palsy population. The purpose of this study was to determine how predictive the intraoperative prone radiograph is in determining spinal flexibility in patients with severe, cerebral palsy related neuromuscular scoliosis. Furthermore, the intraoperative prone radiograph was compared to the preoperatively acquired supine and supine traction radiographs.

METHODS: Twenty-five consecutive patients with severe, cerebral palsy-related neuromuscular scoliosis were studied. The Cobb angles of the preoperative supine, preoperative supine traction, and intraoperative prone radiograph were measured and compared. The flexibility indices of these radiographs were calculated and compared. Traction was not applied during acquisition of the intraoperative prone radiograph. The radiograph was taken during the exposure to localize surgical levels, prior to instrumentation.

RESULTS: The supine traction radiograph and the intraoperative prone radiograph had higher flexibility indices than the preoperative supine radiograph. These comparisons were statistically significant. The comparison between the flexibility indices of the supine traction radiograph and intraoperative prone radiograph was not statistically significant. When looking at the preoperative supine traction radiograph separately, it was noted that the process of instrumentation led to 30% more correction of the Cobb angle.

CONCLUSIONS: The intraoperative prone radiograph is more predictive of spinal flexibility in patients with severe scoliosis related to cerebral palsy when compared to the preoperative supine radiograph but not the preoperative supine traction radiograph. The preoperative supine traction radiograph serves as the optimal method for determining spinal flexibility in patients with severe, cerebral palsy-related neuromuscular scoliosis.

[Free PMC Article](#)

DOI: 10.1186/s13013-017-0122-2

PMCID: PMC5415798

PMID: 28474006

Limits of Calcaneal Lengthening for Treating Planovalgus Foot Deformity in Children With Cerebral Palsy.

Luo CA, Kao HK, Lee WC, Yang WE, Chang CH.

Foot Ankle Int. 2017 May 1;1071100717702596. doi: 10.1177/1071100717702596. [Epub ahead of print]

BACKGROUND: Calcaneal lengthening is used to correct symptomatic planovalgus foot deformity, but outcomes have been less satisfactory in children with cerebral palsy. This study aimed to define limits of calcaneal lengthening by analyzing the risk factors for undercorrection of deformity.

METHODS: We retrospectively reviewed 20 cases of children with cerebral palsy who underwent calcaneal lengthening of 30 planovalgus feet at a mean age of 11.9 years. Foot deformities were evaluated by the anteroposterior talo-first metatarsal angle (normal, 10 ± 7.0 degrees), lateral talo-first metatarsal angle (normal, 13 ± 7.5 degrees), and lateral calcaneal pitch angle (normal, 17 ± 6.0 degrees) on standing foot radiographs. Among these parameters, a corrected foot was defined as 2 or 3 parameters being corrected to within a normal range, and an undercorrected foot was only 1 or no parameter being corrected to within a normal range. Factors were compared between the corrected group and undercorrected group for significant predictors, and cutoff values of predictors were calculated for use as a clinical guideline.

RESULTS: Seventeen planovalgus feet were corrected satisfactorily by calcaneal lengthening, while the other 13 feet were undercorrected. Undercorrected feet had a greater preoperative anteroposterior talonavicular angle (33.7 vs 22.8 degrees, $P = .001$) and a smaller lateral calcaneal pitch (-1.7 vs 5.6 degrees, $P = .03$). A talonavicular angle of more than 24 degrees and calcaneal pitch less than -5 degrees were identified as cutoff values using a receiver

operating characteristic curve. The predicted probability of undercorrection was 100% (9/9 feet) for 2 positive predictors, 50% (8/16 feet) for 1 positive predictor, and 0 (0/5 feet) for zero predictors.

CONCLUSION: A talonavicular lateral subluxation of more than 24 degrees on the anteroposterior radiograph and a calcaneal pitch angle less than -5 degrees on the lateral radiograph were 2 independent predictors that could be used to identify a planovalgus deformity that would be beyond the corrective capacity of calcaneal lengthening to restore normal alignment. Level of Evidence Retrospective case control study, level III.

DOI: 10.1177/1071100717702596

PMID: 28474963

Long-term outcomes of external femoral derotation osteotomies in children with cerebral palsy.

Öunpuu S, Solomito M, Bell K, Pierz K.

Gait Posture. 2017 Jul;56:82-88. doi: 10.1016/j.gaitpost.2017.04.029. Epub 2017 Apr 29.

External femoral derotation osteotomy (FDO) is an orthopaedic intervention to correct increased femoral anteversion and associated excessive internal hip rotation and internal foot progression during gait in children with cerebral palsy. The resulting functional issues may include clearance problems and hip abductor lever-arm dysfunction. The purpose of this study was to evaluate long-term gait outcomes of FDO. Twenty ambulatory patients (27 sides) with cerebral palsy who underwent pre-operative (P0) and a one year post-operative (P1) gait analysis as part of the standard of care had a second post-operative analysis (P2) approximately 11 years post-surgical intervention. Mean hip rotation in stance showed statistically significant decreases in internal rotation at P1 post-surgical intervention that were maintained long-term (mean hip rotation P0: 21±9, P1: 0±9 and P2: 6±12 degrees internal). Similar results were seen with mean foot progression (P0: 9±16 degrees internal, P1: 14±13 degrees external, P2: 13±16 degrees external). However, 2/27 sides (9%) showed a recurrence of internal hip rotation of >15° at the 11year follow-up. The reasons for this recurrence could include age, surgical location and ongoing disease process all of which need to be further examined. We conclude that FDO can show long-term kinematic and functional benefits when performed in the prepubescent child with cerebral palsy in comparison to the natural progression of hip rotation in cerebral palsy.

Copyright © 2017 Elsevier B.V. All rights reserved.

DOI: 10.1016/j.gaitpost.2017.04.029

PMID: 28521149

Post-operative Hypertension following Correction of Flexion Deformity of the Knees in a Spastic Diplegic Child: A Case Report.

Vipin M, Sujendra DM, Imthiaz VK, Hitesh-Shah.

Malays Orthop J. 2016 Nov;10(3):46-48. doi: 10.5704/MOJ.1611.006.

An adolescent boy with spastic diplegic cerebral palsy presented with crouch gait. He had bilateral severe flexion deformities of knees and hips. He was treated with single event multilevel surgery for the correction of deformities. Surgical procedures included bilateral adductor release, iliopsoas lengthening, bilateral femoral shortening and patella plication. Persistent hypertension was noted in the post-operative period. All causes of secondary hypertension were ruled out. Having persistent hypertension following the femoral shortening procedure is unusual. Antihypertensive medication controlled his blood pressure 15 months after surgery. Hypertension following correction of knee flexion deformity and limb lengthening is well known. Hypertension has not been described with the shortening osteotomy of the femur. Hypertension is a rare complication following the corrective surgery for the treatment of crouch gait. Blood pressure should be monitored during the post-operative period to detect such a rare complication.

[Free PMC Article](#)

DOI: 10.5704/MOJ.1611.006

PMCID: PMC5333685

PMID: 28553449

Recurrence of Deep Surgical Site Infection in Cerebral Palsy After Spinal Fusion Is Rare.

Jain A, Modhia UM, Njoku DB, Shah SA, Newton PO, Marks MC, Bastrom TP, Miyajji F, Sponseller PD.

Spine Deform. 2017 May;5(3):208-212. doi: 10.1016/j.jspd.2016.12.004.

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

STUDY DESIGN: Retrospective review of prospective registry.

OBJECTIVES: To assess the following in children with cerebral palsy (CP) who develop deep surgical site infection (DSSI) after spinal fusion: (1) rate of infection recurrence after treatment; (2) treatments used; (3) radiographic outcomes; and differences in Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) scores versus those of children with no infection (NI).

SUMMARY OF BACKGROUND DATA: Studies show high rates of surgical site infection in patients with CP but do not address late recurrence or quality-of-life effects. **METHODS:** One hundred fifty-one children with CP underwent spinal fusion surgery from 2008 through 2011 and had ≥ 2 -year follow-up. Patients who developed DSSI were compared with patients with NI. Student t tests were used to analyze deformity; analysis of variance was used to analyze CPOCHILD scores in both groups preoperatively and at final follow-up.

RESULTS: Eleven patients developed DSSI. Causative organisms were polymicrobial infection (5 cases), *Escherichia coli* (2 cases), and *Proteus mirabilis*, *Staphylococcus aureus*, *Enterococcus faecalis*, and *Peptostreptococcus* (1 case each). All patients underwent irrigation and debridement and received at least 6 weeks of antibiotics. Six had negative-pressure-dressing-assisted wound closure; 5 had primary closure. At mean 4-year follow-up (range, 3-5 years) no patient had recurrent infection. From immediate postoperative to final follow-up, no patient had significant loss of coronal curve ($p = .77$) or pelvic obliquity ($p = .71$) correction. However, at final follow-up, comfort and emotions, overall quality-of-life, and total CPOCHILD scores in the DSSI group were significantly lower compared with the NI group ($p = .005$, $.022$, and $.026$, respectively).

CONCLUSIONS: In children with CP who developed DSSI after spinal fusion, there was no recurrence of infection or deformity after infection treatment. CPOCHILD scores in patients with DSSI were lower compared with the NI group.

Copyright © 2016 Scoliosis Research Society. Published by Elsevier Inc. All rights reserved.

DOI: 10.1016/j.jspd.2016.12.004

PMID: 28449964

Réadaptation fonctionnelle

Anaerobic exercise testing in rehabilitation: A systematic review of available tests and protocols.

Krops LA, Albada T, van der Woude LH, Hijmans JM, Dekker R.

J Rehabil Med. 2017 Apr 6;49:289-303. doi: 10.2340/16501977-2213.

OBJECTIVE: Anaerobic capacity assessment in rehabilitation has received increasing scientific attention in recent years. However, anaerobic capacity is not tested consistently in clinical rehabilitation practice. This study reviews tests and protocols for anaerobic capacity in adults with various disabilities (spinal cord injury, cerebral palsy, cerebral vascular accident, lower-limb amputation(s)) and (able-bodied) wheelchair users.

DATA SOURCES: PubMed, CINAHL and Web of Science.

STUDY SELECTION: Papers were screened by 2 independent assessors, and were included when anaerobic exercise tests were performed on the above-selected subject groups.

DATA EXTRACTION: Included articles were checked for methodological quality.

DATA SYNTHESIS: A total of 57 papers was included. Upper-body testing [56 protocols] was conducted with arm crank [16] and wheelchair tests [40]. With a few [2] exceptions, modified Wingate (Wingate) protocols and wheelchair sprint tests dominated upper-body anaerobic testing. In lower-body anaerobic work [11], bicycle [3] and recumbent [1], and overground tests [7] were used, in which Wingate, sprint or jump protocols were employed.

CONCLUSION: When equipment is available a Wingate protocol is advised for assessment of anaerobic capacity in rehabilitation. When equipment is not available a 20-45 s sprint test is a good alternative. Future research should focus on standardized tests and protocols specific to different disability groups.

[Free Article](#)

DOI: 10.2340/16501977-2213

PMID: 28350415 [Indexed for MEDLINE]

Caregiver-directed home-based intensive bimanual training in young children with unilateral spastic cerebral palsy: a randomized trial.

Ferre CL, Brandão M, Surana B, Dew AP, Moreau NG, Gordon AM.

Dev Med Child Neurol. 2017 May;59(5):497-504. doi: 10.1111/dmcn.13330. Epub 2016 Nov 19.

AIM: To examine the efficacy of caregiver-directed, home-based intensive bimanual training in children with unilateral spastic cerebral palsy (USCP) using a randomized control trial.

METHOD: Twenty-four children (ages 2y 6mo-10y 1mo; 10 males, 14 females) performed home-based activities directed by a caregiver for 2 hours per day, 5 days per week, for 9 weeks (total=90h). Cohorts of children were age-matched into groups and randomized to receive home-based hand-arm bimanual intensive therapy (H-HABIT; n=12) or lower-limb functional intensive training (LIFT-control; n=12). Caregivers were trained before the intervention and supervised remotely via telerehabilitation. Dexterity and bimanual hand function were assessed using the Box and Blocks test (BBT) and the Assisting Hand Assessment (AHA) respectively. Caregiver perception of functional goals was measured using the Canadian Occupational Performance Measure (COPM).

RESULTS: H-HABIT showed greater improvement on the BBT compared to LIFT-control and no improvement on the AHA. H-HABIT demonstrated significant improvement in COPM-Performance compared to LIFT-control and both groups showed equal improvement in COPM-Satisfaction.

INTERPRETATION: H-HABIT improved dexterity and performance of functional goals, but not bimanual performance, in children with USCP compared to a control group receiving intervention of equal intensity/duration that also controlled for increased caregiver attention. Home-based models provide a valuable, family-centered approach to achieve increased treatment intensity.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13330

PMID: 27864822 [Indexed for MEDLINE]

Current Practice "Constraints" in the Uptake and Use of Intensive Upper Extremity Training: A Canadian Perspective.

Shikako-Thomas K, Fehlings D, Germain M(5), Gordon AM, Maynard D, Majnemer A.

Phys Occup Ther Pediatr. 2017 May 16:1-14. doi: 10.1080/01942638.2017.1303802. [Epub ahead of print]

BACKGROUND: Intensive upper extremity training (IUET) has demonstrated efficacy in clinical and functioning outcomes in children with hemiplegia. However, implementation in the clinical context requires novel service models and knowledge translation.

AIMS: To map implementation of IUET in Canada, to identify factors associated with the implementation and best practices for implementation.

METHODS: Mixed-methods design; descriptive statistics, chi-square tests. Individual phone interviews and focus groups with purposeful sampling. Thematic analysis; telephone surveys with managers of 31 pediatric rehabilitation centers across Canada. Four focus groups across Canada and one in the Netherlands.

RESULTS: Implementation of IUET group interventions is limited in Canada (7/31). Barriers included beliefs and values related to evidence-based practice, opportunities for continuing education, researchers-clinicians partnerships, access to scientific literature, and the presence of a champion. Pressure from parents and media presenting IUET as a novel and effective therapy, support and flexibility of families, having the critical mass of clients and a managerial willingness to accommodate new ideas and restructure service provision were some facilitators.

CONCLUSIONS: Uptake of the evidence requires many steps described in the knowledge translation cycle. Factors identified in the study could be considered in most clinical settings to facilitate the uptake of research evidence for IUET.

DOI: 10.1080/01942638.2017.1303802

PMID: 28509591

Comparative Efficacy of Progressive Resistance Exercise and Biomechanical Ankle Platform System on Functional Indices of Children with Cerebral Palsy.

Adepoju F, Hamzat T, Akinyinka O.

Ethiop J Health Sci. 2017 Jan;27(1):11-16.

BACKGROUND: Progressive Resistance Exercise (PRE) and Biomechanical Ankle Platform System (BAPS) are two of the protocols available in managing children with Cerebral Palsy (CP). The comparative effects of these modalities on selected functional indices of ambulatory type CP were the focus of this study.

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

METHODS: Twenty-eight children with hemiplegic or diplegic CP receiving care at a tertiary health facility in Ibadan were consecutively recruited. They were systematically assigned into two intervention groups. Namely PRE, BAPS. Both groups received intervention twice weekly for 16 weeks. At baseline, 8 and 16 weeks of intervention balance and functional mobility were assessed using Berg Balance Scale (BBS) and modified timed-up-and-go test (TUG) respectively. Chi-square, Fisher's Exact tests, One way and repeated measures ANOVA were carried out. Level of significance (p) was set at 0.05.

RESULTS: There were significant differences in the functional indices of participants in the BAPS group at the end of the intervention ($p < 0.05$). The two groups (BAPS and PRE) were not significantly different at baseline and 8 and 16 weeks ($p > 0.05$). All outcome measures increased in both groups from baseline to the end of the intervention period.

CONCLUSION: The two intervention protocols demonstrated improvements in the areas assessed. Comparatively, both PRE and BAPS could be used to promote function in CP.

[Free PMC Article](#)

PMCID: PMC5390224

PMID: 28458486

Conflict of interest statement: Competing Interests: The authors declare that this manuscript was approved by all authors in its form and that no competing interest exists.

Effectiveness of motor interventions in infants with cerebral palsy: a systematic review.

Morgan C, Darrah J, Gordon AM, Harbourne R, Spittle A, Johnson R, Fetters L.

Dev Med Child Neurol. 2016 Sep;58(9):900-9. doi: 10.1111/dmcn.13105. Epub 2016 Mar 29.

AIM: To systematically review the evidence on the effectiveness of motor interventions for infants from birth to 2 years with a diagnosis of cerebral palsy or at high risk of it.

METHOD: Relevant literature was identified by searching journal article databases (PubMed, Embase, CINAHL, Cochrane, Web of Knowledge, and PEDro). Selection criteria included infants between the ages of birth and 2 years diagnosed with, or at risk of, cerebral palsy who received early motor intervention.

RESULTS: Thirty-four studies met the inclusion criteria, including 10 randomized controlled trials. Studies varied in quality, interventions, and participant inclusion criteria. Neurodevelopmental therapy was the most common intervention investigated either as the experimental or control assignment. The two interventions that had a moderate to large effect on motor outcomes (Cohen's effect size > 0.7) had the common themes of child-initiated movement, environment modification/enrichment, and task-specific training.

INTERPRETATION: The published evidence for early motor intervention is limited by the lack of high-quality trials. There is some promising evidence that early intervention incorporating child-initiated movement (based on motor-learning principles and task specificity), parental education, and environment modification have a positive effect on motor development. Further research is crucial.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13105

PMID: 27027732 [Indexed for MEDLINE]

Effectiveness of Rehabilitation Interventions to Improve Gait Speed in Children With Cerebral Palsy: Systematic Review and Meta-analysis.

Moreau NG, Bodkin AW, Bjornson K, Hobbs A, Soileau M, Lahasky K.

Phys Ther. 2016 Dec;96(12):1938-1954. Epub 2016 Jun 16.

BACKGROUND: Children with cerebral palsy (CP) have decreased gait speeds, which can negatively affect their community participation and quality of life. However, evidence for effective rehabilitation interventions to improve gait speed remains unclear.

PURPOSE: The purpose of this study was to determine the effectiveness of interventions for improving gait speed in ambulatory children with CP.

DATA SOURCES: MEDLINE/PubMed, CINAHL, ERIC, and PEDro were searched from inception through April 2014.

STUDY SELECTION: The selected studies were randomized controlled trials or had experimental designs with a comparison group, included a physical therapy or rehabilitation intervention for children with CP, and reported gait speed as an outcome measure.

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

DATA EXTRACTION: Methodological quality was assessed by PEDro scores. Means, standard deviations, and change scores for gait speed were extracted. General study information and dosing parameters (frequency, duration, intensity, and volume) of the intervention were recorded.

DATA SYNTHESIS: Twenty-four studies were included. Three categories of interventions were identified: gait training (n=8), resistance training (n=9), and miscellaneous (n=7). Meta-analysis showed that gait training was effective in increasing gait speed, with a standardized effect size of 0.92 (95% confidence interval=0.19, 1.66; P=.01), whereas resistance training was shown to have a negligible effect (effect size=0.06; 95% confidence interval=-0.12, 0.25; P=.51). Effect sizes from negative to large were reported for studies in the miscellaneous category.

LIMITATIONS: Gait speed was the only outcome measure analyzed.

CONCLUSIONS: Gait training was the most effective intervention in improving gait speed for ambulatory children with CP. Strength training, even if properly dosed, was not shown to be effective in improving gait speed. Velocity training, electromyographic biofeedback training, and whole-body vibration were effective in improving gait speed in individual studies and warrant further investigation.

PARK© 2016 American Physical Therapy Association.

[Free PMC Article](#)

DOI: 10.2522/ptj.20150401

PMCID: PMC5131187

PMID: 27313240 [Indexed for MEDLINE]

Immediate Effect of a Single Session of Whole Body Vibration on Spasticity in Children With Cerebral Palsy.

Park C, Park ES, Choi JY, Cho Y, Rha DW.

Ann Rehabil Med. 2017 Apr;41(2):273-278. doi: 10.5535/arm.2017.41.2.273. Epub 2017 Apr 27.

OBJECTIVE: To investigate the immediate effect of a single session of whole body vibration (WBV) on lower extremity spasticity in children with cerebral palsy (CP).

METHODS: Seventeen children with spastic CP were included. A single session of WBV was administered: 10-minute WBV, 1-minute rest, and 10-minute WBV. The effects of WBV were clinically assessed with the Modified Ashworth Scale (MAS) and Modified Tardieu Scale (MTS) before and immediately, 30 minutes, 1 hour, 2 hours, 3 hours, and 4 hours after WBV.

RESULTS: Spasticity of the ankle plantarflexor, as assessed by MAS and MTS scores, was reduced after WBV. Post-hoc analysis demonstrated that, compared to baseline, the MAS significantly improved for a period of 1 hour after WBV, and the R1 and R2-R1 of the MTS significantly improved for a period of 2 hours after WBV.

CONCLUSION: A single session of WBV improves spasticity of ankle plantarflexors for 1-2 hours in children with CP. Future studies are needed to test whether WBV is an effective preparation before physiotherapy and occupational therapy.

[Free PMC Article](#)

DOI: 10.5535/arm.2017.41.2.273

PMCID: PMC5426268

PMID: 28503461

Conflict of interest statement: CONFLICT OF INTEREST: No potential conflict of interest relevant to this article was reported.

Improving balance, mobility, and dual-task performance in an adolescent with cerebral palsy: A case report.

Fisher-Pipher S Pt Dpt, Kenyon LK Pt Dpt PhD Pcs, Westman M Pt Dpt.

Physiother Theory Pract. 2017 Jul;33(7):586-595. doi: 10.1080/09593985.2017.1323359. Epub 2017 May 16.

BACKGROUND AND PURPOSE: Improving functional mobility is often a desired outcome for adolescents with cerebral palsy (CP). Traditional neurorehabilitation approaches are frequently directed at impairments; however, improvements may not be carried over into functional mobility. The purpose of this case report was to describe the examination, intervention, and outcomes of a task-oriented physical therapy intervention program to improve dynamic balance, functional mobility, and dual-task performance in an adolescent with CP.

CASE DESCRIPTION: The participant was a 15-year-old girl with spastic triplegic CP (Gross Motor Classification System Level II). Examination procedures included the Canadian Occupational Performance Measure, 6-minute [Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud 37 75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org](#)

walk test, Muscle Power Sprint Test, 10 x 5-meter sprint test, Timed Up and Down Stairs Test, Gross Motor Function Measure, Gillette Functional Assessment Questionnaire, and functional lower extremity strength tests. Intervention focused on task-oriented dynamic balance and mobility tasks that incorporated coordination and speed demands as well as task-specific lower extremity and trunk strengthening activities. Dual task demands were integrated into all intervention activities.

OUTCOMES: Post-intervention testing revealed improvements in cardiovascular endurance, anaerobic power, agility, stair climbing, gross motor skills, and mobility.

DISCUSSION: The participant appeared to benefit from a task-oriented program to improve dynamic balance, functional mobility, and dual-task performance.

DOI: 10.1080/09593985.2017.1323359

PMID: 28509631

Neuromuscular electrical stimulation-assisted gait increases muscle strength and volume in children with unilateral spastic cerebral palsy.

Pool D, Elliott C, Bear N, Donnelly CJ, Davis C, Stannage K, Valentine J.

Dev Med Child Neurol. 2016 May;58(5):492-501. doi: 10.1111/dmcn.12955. Epub 2015 Nov 11.

AIM: To determine if neuromuscular electrical stimulation (NMES) applied to the ankle dorsiflexors during gait improves muscle volume and strength in children with unilateral spastic cerebral palsy (CP).

METHOD: Thirty-two children (15 females, 17 males; mean age 10y 8mo, age range 5y 5mo-18y 1mo) with unilateral spastic CP and a Gross Motor Function Classification System of level I or level II were randomly assigned to either the 8-week daily NMES treatment group or control group (usual or conventional treatments). Outcomes at week 8 (post-NMES) and week 14 (carryover) included magnetic resonance imaging for muscle volumes (tibialis anterior, anterior compartment, and gastrocnemius), strength (hand-held dynamometry for isometric dorsiflexion strength and heel raises for functional strength), and clinical measures for lower limb selective motor control.

RESULTS: At week 8, the treatment group demonstrated significantly ($p < 0.05$) increased muscle volumes for tibialis anterior, anterior compartment, medial and lateral gastrocnemius, and dorsiflexion strength not only when compared to their baseline values but also when compared to the control group at week 8. At week 14, both tibialis anterior and lateral gastrocnemius volumes in the treatment group remained significantly increased when compared to their baseline values. However, only lateral gastrocnemius volumes had significantly greater values when compared to the control group at week 14. There were no between group differences in the clinical measures for lower limb selective motor control at week 8 and 14.

INTERPRETATION: Eight weeks of daily NMES-assisted gait increases muscle volume and strength of the stimulated ankle dorsiflexors in children with unilateral spastic CP. These changes are use-dependent and do not carry over after the 8-week treatment period. Gastrocnemius volume also increased post-treatment with carryover at week 14.

© 2015 Mac Keith Press.

[Free Article](#)

DOI: 10.1111/dmcn.12955

PMID: 26555148 [Indexed for MEDLINE]

Obstacle Crossing During Gait in Children With Cerebral Palsy: Cross-Sectional Study With Kinematic Analysis of Dynamic Balance and Trunk Control.

Malone A, Kiernan D, French H, Saunders V, O'Brien T.

Phys Ther. 2016 Aug;96(8):1208-15. doi: 10.2522/ptj.20150360. Epub 2016 Feb 18.

BACKGROUND: Balance problems are common in children who have cerebral palsy (CP) but are active and ambulant. Control of the whole-body center of mass is critical in maintaining dynamic stability during challenging mobility tasks, such as clearing an obstacle while walking.

OBJECTIVE: The objective of this study was to compare trunk and lower limb kinematics and center-of-mass control in children with CP and those in children with typical development during obstacle crossing.

DESIGN: This was a cross-sectional study. Thirty-four children who were 5 to 17 years of age (17 with CP and 17 with typical development) and matched in age and height completed 2 gait trials involving crossing a 10-cm obstacle.

METHODS: Three-dimensional kinematic and kinetic data were captured with a general-purpose 3-dimensional motion tracking system and forceplates. Trunk data were captured with a validated model.

RESULTS: All children cleared the obstacle with similar hip and knee kinematics, step length, and single-support duration. In children with CP, step width was increased by 4.81 cm, and center-of-mass velocity was significantly slower at lead limb toe-off (0.31 m/s) and during lead limb clearance (0.2 m/s). Children with CP showed altered trunk and pelvis movement, characterized by significantly greater pelvic obliquity, pelvic tilt, and trunk rotation throughout the task, increased lateral trunk lean during lead limb crossing (3.7°), and greater sagittal trunk movement as the trail limb crossed (5.1°). **LIMITATIONS:** The study was not powered to analyze differences between children with diplegia and those with hemiplegia.

CONCLUSIONS: Children with CP required greater adjustments at the trunk and pelvis to achieve successful obstacle crossing. The increase in trunk movement could have been compensatory for reduced stability distally or for a primary problem reflecting poor proximal control. The findings suggest that rehabilitation should focus on both proximal trunk control and distal stability to improve balance.

© 2016 American Physical Therapy Association.

DOI: 10.2522/ptj.20150360

PMID: 26893506 [Indexed for MEDLINE]

'Remind-to-move' treatment versus constraint-induced movement therapy for children with hemiplegic cerebral palsy: a randomized controlled trial.

Dong VA, Fong KN, Chen YF, Tseng SS, Wong LM.

Dev Med Child Neurol. 2017 Feb;59(2):160-167. doi: 10.1111/dmcn.13216. Epub 2016 Aug 9.

AIM: To evaluate 'remind-to-move' (RTM) treatment by comparing it with constraint-induced movement therapy (CIMT) and conventional rehabilitation of the upper extremity in children with hemiplegic cerebral palsy (CP).

METHOD: Seventy-three children (44 males, 29 females; mean age 11y 8mo, standard deviation [SD] 3y 1mo) - with 20, 38, and 15 in Manual Ability Classification System levels I, II, and III respectively - were recruited from three special schools and randomly selected for an RTM (n=25) or CIMT (n=24) programme (for 75h over 3wks) or for conventional rehabilitation (n=24). The Jebsen-Taylor Hand Function Test, the Bruininks-Oseretsky Test of Motor Proficiency (Subtest 3), the Caregiver Functional Use Survey, and arm movement duration captured by accelerometers were used at the baseline, post-test, and 1-month and 3-month follow-ups.

RESULTS: Both the RTM and CIMT treatments achieved significant gains in manual capacities and spontaneous hand use immediately after the intervention compared with conventional rehabilitation, but there were no significant differences between the two interventions.

INTERPRETATION: The RTM treatment demonstrated similar therapeutic effects with CIMT in manual dexterity and functional hand use, but both interventions were superior to conventional rehabilitation. RTM is recommended as an alternative treatment for the hemiplegic upper extremity in children with CP.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13216

PMID: 27503605 [Indexed for MEDLINE]

The effectiveness of taping on children with cerebral palsy: a systematic review.

Güçhan Z, Mutlu A.

Dev Med Child Neurol. 2017 Jan;59(1):26-30. doi: 10.1111/dmcn.13213. Epub 2016 Aug 1.

AIM: Taping is popular in a variety of paediatric clinical settings. The purpose of this study was to investigate the effectiveness of taping on the rehabilitation of children with cerebral palsy (CP).

METHOD: We used MEDLINE, Embase, PubMed, CINAHL, and the Cochrane Central Register of Controlled Trials as the electronic databases for the review. We reviewed all relevant studies published up to May 2015. We also analysed pertinent secondary references. We used Sackett's Levels of Evidence and the guidelines for critical review of McMaster University to criticize the reviewed articles.

RESULTS: Nine papers met the inclusion criteria. Five of these were randomized controlled trials, three were case series, and one was a single case study. Four papers were high quality according to the methodological critical forms of this review, and two of these found that taping was effective in increasing activity in children with CP.

INTERPRETATION: Although benefits of taping were found in the population, and functional gains according to the International Classification of Functioning, Disability and Health were obtained, the evidence was not conclusive. Randomized controlled trials with larger sample sizes and with more specific taping procedures are required to strengthen the evidence for the effectiveness of taping on children with CP.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13213

PMID: 27476831 [Indexed for MEDLINE]

The influence of a constraint and bimanual training program using a variety of modalities on endurance and on the cardiac autonomic regulation system of children with unilateral cerebral palsy: A self-control clinical trial.

Cohen-Holzer M, Sorek G, Schweizer M, Katz-Leurer M.

NeuroRehabilitation. 2017 May 11. doi: 10.3233/NRE-171463. [Epub ahead of print]

BACKGROUND: An intensive hybrid program, combining constraint with bimanual training, improves upper extremity function as well as walking endurance of children with unilateral cerebral palsy (UCP). Endurance improvement may be associated with the cardiac autonomic regulation system (CARS) adaptation, known to be impaired among these children.

OBJECTIVE: To examine the influence of an intensive hybrid program on CARS, walking endurance and the correlation with upper extremity function of children with UCP.

METHODS: 24 children aged 6-10 years with UCP participated in a hybrid program, 10 days, 6 hours per day. Data were collected pre-, post- and 3-months post-intervention. Main outcome measures included the Polar RS800CX for heart rate (HR) and heart rate variability (HRV) data, the 6-Minute Walk Test (6MWT) for endurance, and the Assisting Hand Assessment (AHA) and Jebsen-Taylor Test of Hand Function (JTTHF) for bimanual and unimanual function.

RESULTS: A significant reduction in HR and an increase in HRV at post- and 3-month post-intervention was noted ($\chi^2=8.3$, $p=0.016$) along with a significant increase in 6MWT with a median increase of 81 meters ($\chi^2=11.0$, $p=0.004$) at the same interval. A significant improvement was noted in unimanual and bimanual performance following the intervention.

CONCLUSIONS: An intensive hybrid program effectively improved CARS function as well as walking endurance and upper extremity function in children with UCP (213).

DOI: 10.3233/NRE-171463

PMID: 28505992

The relation between mirror movements and non-use of the affected hand in children with unilateral cerebral palsy.

Zielinski IM, Green D, Rudisch J, Jongsma ML, Aarts PB, Steenbergen B.

Dev Med Child Neurol. 2017 Feb;59(2):152-159. doi: 10.1111/dmnc.13204. Epub 2016 Jul 16.

AIM: In children with unilateral cerebral palsy (CP), it is widely believed that mirror movements contribute to non-use of the affected hand despite preserved capacity, a phenomenon referred to as developmental disregard. We aimed to test whether mirror movements are related to developmental disregard, and to clarify the relation between mirror movements and bimanual function. METHOD: A repetitive squeezing task simultaneously measuring both hands' grip-forces was developed to assess mirror movements by using maximum cross-correlation coefficient (CCCmax) as well as strength measures (MMstrength). Developmental disregard, bimanual performance, and capacity were assessed using a validated video-observation method. Twenty-one children with unilateral CP participated (Median age 10y 7mo, interquartile range [IQR] 10y 1mo-12y 9mo). Outcome measures of mirror movements were correlated to developmental disregard, bimanual performance, and capacity scores using Spearman's correlations (significance level: $\alpha<0.05$).

RESULTS: Mirror movements were not related to developmental disregard. However, enhanced mirror movements in the less-affected hand were related to reduced performance (CCCmax : $\rho=-0.526$, $p=0.007$; MMstrength : $\rho=-0.750$, $p<0.001$) and capacity (CCCmax : $\rho=-0.410$, $p=0.033$; MMstrength : $\rho=-0.679$, $p<0.001$). These relations were only moderate (performance:MMstrength : $\rho=-0.504$, $p=0.010$), low (capacity: MMstrength : $\rho=-0.470$, $p=0.016$) or absent for mirror movements in the affected hand. Additionally, seven children showed stronger movements in their less-affected hands when actually being asked to move their affected hand.

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

INTERPRETATION: These findings show no relation between mirror movements and developmental disregard, but support an association between mirror movements and bimanual function.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13204

PMID: 27421246 [Indexed for MEDLINE]

Robots – Exosquelette

Pediatric robotic rehabilitation: Current knowledge and future trends in treating children with sensorimotor impairments.

Michmizos KP, Krebs HI.

NeuroRehabilitation. 2017 May 11. doi: 10.3233/NRE-171458. [Epub ahead of print]

BACKGROUND: Robot-aided sensorimotor therapy imposes highly repetitive tasks that can translate to substantial improvement when patients remain cognitively engaged into the clinical procedure, a goal that most children find hard to pursue. Knowing that the child's brain is much more plastic than an adult's, it is reasonable to expect that the clinical gains observed in the adult population during the last two decades would be followed up by even greater gains in children. Nonetheless, and despite the multitude of adult studies, in children we are just getting started: There is scarcity of pediatric robotic rehabilitation devices that are currently available and the number of clinical studies that employ them is also very limited.

PURPOSE: We have recently developed the MIT's pedi-Anklebot, an adaptive habilitation robotic device that continuously motivates physically impaired children to do their best by tracking the child's performance and modifying their therapy accordingly. The robot's design is based on a multitude of studies we conducted focusing on the ankle sensorimotor control. In this paper, we briefly describe the device and the adaptive environment we built around the impaired children, present the initial clinical results and discuss how they could steer future trends in pediatric robotic therapy.

CONCLUSIONS: The results support the potential for future interventions to account for the differences in the sensorimotor control of the targeted limbs and their functional use (rhythmic vs. discrete movements and mechanical impedance training) and explore how the new technological advancements such as the augmented reality would employ new knowledge from neuroscience.

DOI: 10.3233/NRE-171458

PMID: 28505989

Stimulation transcrânienne

Brain stimulation and constraint for perinatal stroke hemiparesis: The PLASTIC CHAMPS Trial.

Kirton A, Andersen J, Herrero M, Nettel-Aguirre A, Carsolio L, Damji O, Keess J, Mineyko A, Hodge J, Hill MD.

Neurology. 2016 May 3;86(18):1659-67. doi: 10.1212/WNL.0000000000002646. Epub 2016 Mar 30.

OBJECTIVE: To determine whether the addition of repetitive transcranial magnetic stimulation (rTMS) and/or constraint-induced movement therapy (CIMT) to intensive therapy increases motor function in children with perinatal stroke and hemiparesis.

METHODS: A factorial-design, blinded, randomized controlled trial (clinicaltrials.gov/NCT01189058) assessed rTMS and CIMT effects in hemiparetic children (aged 6-19 years) with MRI-confirmed perinatal stroke. All completed a 2-week, goal-directed, peer-supported motor learning camp randomized to daily rTMS, CIMT, both, or neither. Primary outcomes were the Assisting Hand Assessment and the Canadian Occupational Performance Measure at baseline, and 1 week, 2 and 6 months postintervention. Outcome assessors were blinded to treatment. Interim safety analyses occurred after 12 and 24 participants. Intention-to-treat analysis examined treatment effects over time (linear mixed effects model). RESULTS: All 45 participants completed the trial. Addition of rTMS, CIMT, or both doubled the chances of clinically significant improvement. Assisting Hand Assessment gains at 6 months were additive and largest with rTMS + CIMT (β coefficient = 5.54 [2.57-8.51], $p = 0.0004$). The camp alone produced large improvements in Canadian Occupational Performance Measure scores, maximal at 6 months (Cohen $d = 1.6$, $p = 0.002$). Quality-of-life scores improved. Interventions were well tolerated and safe with no decrease in function of either hand.

Science Infos Paralysie Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

CONCLUSIONS: Hemiparetic children participating in intensive, psychosocial rehabilitation programs can achieve sustained functional gains. Addition of CIMT and rTMS increases the chances of improvement.

CLASSIFICATION OF EVIDENCE: This study provides Class II evidence that combined rTMS and CIMT enhance therapy-induced functional motor gains in children with stroke-induced hemiparetic cerebral palsy. © 2016 American Academy of Neurology.

[Free PMC Article](#)

DOI: 10.1212/WNL.0000000000002646

PMCID: PMC4854585

PMID: 27029628 [Indexed for MEDLINE]

Combined transcranial Direct Current Stimulation and robotic upper limb therapy improves upper limb function in an adult with cerebral palsy.

Friel KM, Lee P, Soles LV, Smorenburg ARP, Kuo HC, Edwards DJ.

NeuroRehabilitation. 2017 May 10. doi: 10.3233/NRE-171455. [Epub ahead of print]

BACKGROUND: Robotic therapy can improve upper limb function in hemiparesis. Excitatory transcranial direct current stimulation (tDCS) can prime brain motor circuits before therapy.

OBJECTIVE: We tested safety and efficacy of tDCS plus robotic therapy in an adult with unilateral spastic cerebral palsy (USCP).

METHODS: In each of 36 sessions, anodal tDCS (2 mA, 20 min) was applied over the motor map of the affected hand. Immediately after tDCS, the participant completed robotic therapy, using the shoulder, elbow, and wrist (MIT Manus). The participant sat in a padded chair with affected arm abducted, forearm supported, and hand grasping the robot handle. The participant controlled the robot arm with his affected arm to move a cursor from the center of a circle to each of eight targets (960 movements). Motor function was tested before, after, and six months after therapy with the Wolf Motor Function Test (WMFT) and Fugl-Meyer (FM). **RESULTS:** Reaching accuracy on the robot task improved significantly after therapy. The WMFT and FM improved clinically meaningful amounts after therapy. The motor map of the affected hand expanded after therapy. Improvements were maintained six months after therapy.

CONCLUSIONS: Combined tDCS and robotics safely improved upper limb function in an adult with USCP.

DOI: 10.3233/NRE-171455

PMID: 28505986

Transcranial direct current stimulation for children with perinatal stroke and hemiparesis.

Kirton A, Ciechanski P, Zewdie E, Andersen J, Nettel-Aguirre A, Carlson H, Carsolio L, Herrero M, Quigley J, Mineyko A, Hodge J, Hill M.

Neurology. 2017 Jan 17;88(3):259-267. doi: 10.1212/WNL.0000000000003518. Epub 2016 Dec 7.

OBJECTIVE: To determine whether the addition of transcranial direct current stimulation (tDCS) to intensive therapy increases motor function in children with perinatal stroke and hemiparetic cerebral palsy. **METHODS:** This was a randomized, controlled, double-blind clinical trial. Participants were recruited from a population-based cohort with MRI-classified unilateral perinatal stroke, age of 6 to 18 years, and disabling hemiparesis. All completed a goal-directed, peer-supported, 2-week after-school motor learning camp (32 hours of therapy). Participants were randomized 1:1 to 1 mA cathodal tDCS over the contralesional primary motor cortex (M1) for the initial 20 minutes of daily therapy or sham. Primary subjective (Canadian Occupational Performance Measure [COPM]), objective (Assisting Hand Assessment [AHA]), safety, and secondary outcomes were measured at 1 week and 2 months after intervention. Analysis was by intention to treat.

RESULTS: Twenty-four participants were randomized (median age 11.8 ± 2.7 years, range 6.7-17.8). COPM performance and satisfaction scores doubled at 1 week with sustained gains at 2 months (p < 0.001). COPM scores increased more with tDCS compared to sham control (p = 0.004). AHA scores demonstrated only mild increases at both time points with no tDCS effects. Procedures were safe and well tolerated with no decrease in either arm function or serious adverse events. **CONCLUSION:** tDCS trials appear feasible and safe in hemiparetic children. Lack

of change in objective motor function may reflect underdosing of therapy. Marked gains in subjective function with tDCS warrant further study.

CLINICALTRIALSGOV IDENTIFIER: NCT02170285.

CLASSIFICATION OF EVIDENCE: This study provides Class II evidence that for children with perinatal stroke and hemiparetic cerebral palsy, the addition of tDCS to moderate-dose motor learning therapy does not significantly improve motor function as measured by the AHA.

© 2016 American Academy of Neurology.

DOI: 10.1212/WNL.0000000000003518

PMID: 27927938 [Indexed for MEDLINE]

Douleur

Assessments of pain in children and adolescents with cerebral palsy: aretrospective population-based registry study.

Westbom L, Rimstedt A, Nordmark E.

Dev Med Child Neurol. 2017 May 16. doi: 10.1111/dmcn.13459. [Epub ahead of print]

AIM: To explore pain screening in CPUP, a follow-up surveillance programme for people with cerebral palsy (CP), specifically to describe reported pain prevalence, localizations, patterns of distribution; to compare with studies using psychometrically sound assessment instruments; and to assess agreement between pain documented in CPUP and medical records.

METHOD: Registry study of a population with CP, born 1993 to 2008, living in Skåne, Sweden in 2013. Descriptive data, cross-tabulations, and chi-square tests to characterize and compare the study groups. Kappa analysis to test the concordance between register and medical record reports on pain.

RESULTS: Pain was reported by 185 out of 497 children (37%; females 40%, males 35%). Level V in both Gross Motor Function Classification System (GMFCS) and Manual Ability Classification System (MACS) was associated with highest prevalence of pain (50% and 54%), and level I with lowest prevalence of pain (30% and 32%). Pain was most frequent in dyskinetic CP (46%) and least frequent in unilateral spastic CP (33%). Feet and knees were the dominant localizations. Fair-moderate agreement (kappa 0.37, prevalence-adjusted bias-adjusted kappa [PABAK] 0.44) was found between documented pain in CPUP and medical records, although more seldom recognized in medical records.

INTERPRETATION: The distribution of pain between CP subtypes, functional levels, sex, and age in CPUP is concordant with previous population-based studies, indicating the validity of the CPUP pain screening. Despite this, further clinical evaluation with extended pain assessments and pain management were largely neglected in children reporting chronic pain.

© 2017 Mac Keith Press.

DOI: 10.1111/dmcn.13459

PMID: 28509356

Change in pain status in children with cerebral palsy.

Christensen R, MacIntosh A, Switzer L, Fehlings D.

Dev Med Child Neurol. 2017 Apr;59:374-379. doi: 10.1111/dmcn.13328. Epub 2016 Nov 15.

AIM: To identify factors associated with a change in pain over time in children with cerebral palsy (CP).

METHOD: Pain was assessed at two time-points by physicians and caregiver-rated Health Utilities Index 3 (HUI3) pain scores.

RESULTS: One hundred and forty-eight children out of 179 approached from outpatient clinics (83% response; 104 males, 44 females mean age 8y 8mo, range 3y-16y) across all Gross Motor Function Classification System (GMFCS) levels were included. Fifty-five percent had changes in caregiver-reported HUI3 pain. A backward stepwise multiple linear regression retained HUI3 pain score at visit 1 and GMFCS level ($F[2,144] = 23.40$, $R(2) = 0.35$; $p < 0.001$) as variables associated with a change in pain status (HUI3 pain at visit 1: $\beta = 0.61$, $p < 0.001$; GMFCS level: $\beta = -0.17$, $p < 0.015$). The association between HUI3 pain at visit 1 and GMFCS level was significant ($\beta = -0.15$, $p < 0.036$). There

was an association between pain etiology and pain trajectory ($F[3,144] = 5.39, p = 0.002$). Post-hoc testing revealed musculoskeletal pain had the greatest improvements compared with the no pain group ($p = 0.006$).

INTERPRETATION: Children with CP with more severe initial pain and higher gross motor function have lower pain at follow-up indicating an improvement in pain status over time.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13328

PMID: 27861779 [Indexed for MEDLINE]

Pain management for children with cerebral palsy in school settings in two cultures: action and reaction approaches.

Adolfsson M, Johnson E, Nilsson S.

Disabil Rehabil. 2017 May 18:1-11. doi: 10.1080/09638288.2017.1327987. [Epub ahead of print]

BACKGROUND: Children with cerebral palsy (CP) face particular challenges, e.g. daily pain that threaten their participation in school activities. This study focuses on how teachers, personal assistants, and clinicians in two countries with different cultural prerequisites, Sweden and South Africa, manage the pain of children in school settings.

METHOD: Participants' statements collected in focus groups were analysed using a directed qualitative content analysis framed by a Frequency of attendance-Intensity of involvement model, which was modified into a Knowing-Doing model.

RESULTS: Findings indicated that pain management focused more on children's attendance in the classroom than on their involvement, and a difference between countries in terms of action-versus-reaction approaches. Swedish participants reported action strategies to prevent pain whereas South African participants primarily discussed interventions when observing a child in pain.

CONCLUSION: Differences might be due to school- and healthcare systems. To provide effective support when children with CP are in pain in school settings, an action-and-reaction approach would be optimal and the use of alternative and augmentative communication strategies would help to communicate children's pain. As prevention of pain is desired, structured surveillance and treatment programs are recommended along with trustful collaboration with parents and access to "hands-on" pain management when needed. Implications for rehabilitation

- When providing support, hands-on interventions should be supplemented by structured preventive programs and routines for parent collaboration (action-and-reaction approach).
- When regulating support, Sweden and South Africa can learn from each other;
- In Sweden, the implementation of a prevention program has been successful.
- In South Africa, the possibilities giving support directly when pain in children is observed have been beneficial.

DOI: 10.1080/09638288.2017.1327987

PMID: 28521563

Language -Communication

Alignment of classification paradigms for communication abilities in children with cerebral palsy.

Hustad KC, Oakes A, McFadd E, Allison KM.

Dev Med Child Neurol. 2016 Jun;58(6):597-604. doi: 10.1111/dmcn.12944. Epub 2015 Nov 2.

AIM: We examined three communication ability classification paradigms for children with cerebral palsy (CP): the Communication Function Classification System (CFCS), the Viking Speech Scale (VSS), and the Speech Language Profile Groups (SLPG). Questions addressed interjudge reliability, whether the VSS and the CFCS captured impairments in speech and language, and whether there were differences in speech intelligibility among levels within each classification paradigm.

METHOD: Eighty children (42 males, 38 females) with a range of types and severity levels of CP participated (mean age 60mo, range 50-72mo [SD 5mo]). Two speech-language pathologists classified each child via parent-child interaction samples and previous experience with the children for the CFCS and VSS, and using quantitative speech and language assessment data for the SLPG. Intelligibility scores were obtained using standard clinical intelligibility measurement.

RESULTS: Kappa values were 0.67 (95% confidence interval [CI] 0.55-0.79) for the CFCS, 0.82 (95% CI 0.72-0.92) for the VSS, and 0.95 (95% CI 0.72-0.92) for the SLPG. Descriptively, reliability within levels of each paradigm varied, with the lowest agreement occurring within the CFCS at levels II (42%), III (40%), and IV (61%). Neither the CFCS nor the VSS were sensitive to language impairments captured by the SLPG. Significant differences in speech intelligibility were found among levels for all classification paradigms.

INTERPRETATION: Multiple tools are necessary to understand speech, language, and communication profiles in children with CP. Characterization of abilities at all levels of the International Classification of Functioning, Disability and Health will advance our understanding of the ways that speech, language, and communication abilities present in children with CP.

© 2015 Mac Keith Press.

[Free PMC Article](#)

DOI: 10.1111/dmcn.12944

PMCID: PMC4853292

PMID: 26521844 [Indexed for MEDLINE]

Assessment With Children Who Need Augmentative and Alternative Communication (AAC): Clinical Decisions of AAC Specialists.

Lund SK, Quach W, Weissling K, McKelvey M, Dietz A.

Lang Speech Hear Serv Sch. 2017 Jan 1;48(1):56-68. doi: 10.1044/2016_LSHSS-15-0086.

Purpose: The purpose of this study was to explore how speech-language pathologists (SLPs) who are augmentative and alternative communication (AAC) specialists approach the assessment process for 2 case studies, 1 child with cerebral palsy and 1 with autism spectrum disorder. The aim of the study was to answer the following questions: (a) How do clinicians with expertise approach the AAC assessment process for children with developmental disabilities? (b) Can any initial hypothesis be drawn about how SLPs approach the assessment of children with motor versus social interactive deficits?

Method: This study used a phenomenological qualitative design. The researchers conducted 2 in-depth, semistructured interviews with 8 SLPs who specialized in AAC and self-identified as primarily working with children.

Results: Four major themes emerged from the data: area of assessment, method of assessment, evaluation preparation, and parent education. Each major theme contained multiple subthemes and categories within those subthemes.

Conclusions: Participants discussed similar areas of assessment for both cases, indicating that some aspects of AAC assessment are universal. However, the specific aspects of what they were assessing and how they went about assessing them differed between the 2 cases. The results of the current study provide an outline of an assessment protocol for children with complex communication needs.

DOI: 10.1044/2016_LSHSS-15-0086

PMID: 28114681 [Indexed for MEDLINE]

Babbling in children with neurodevelopmental disability and validity of a simplified way of measuring canonical babbling ratio.

Nyman A, Lohmander A.

Clin Linguist Phon. 2017 May 19:1-14. doi: 10.1080/02699206.2017.1320588. [Epub ahead of print]

Babbling is an important precursor to speech, but has not yet been thoroughly investigated in children with neurodevelopmental disabilities. Canonical babbling ratio (CBR) is a commonly used but time-consuming measure for quantifying babbling. The aim of this study was twofold: to validate a simplified version of the CBR (CBR(UTTER)), and to use this measure to determine if early precursors to speech and language development could be detected in children with different neurodevelopmental disabilities. Two different data sets were used. In Part I, CBR(UTTER) was compared to two other CBR measures using previously obtained phonetic transcriptions of 3571 utterances from 38 audio recordings of 12-18 month old children with and without cleft palate. In CBR(UTTER), number of canonical utterances was divided by total number of utterances. In CBR(syl), number of canonical syllables was divided by total number of syllables. In CBR(utt), number of canonical syllables was divided by total number of utterances. High agreement was seen between CBR(UTTER) and CBR(syl), suggesting CBR(UTTER) as an alternative. In Part II, babbling in children with neurodevelopmental disability was examined. Eighteen children aged

Science Infos Paralysie Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud 45
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

12-22 months with Down syndrome, cerebral palsy or developmental delay were audio-video recorded during interaction with a parent. Recordings were analysed by observation of babbling, consonant production, calculation of CBR(UTTER), and compared to data from controls. The study group showed significantly lower occurrence of all variables, except for of plosives. The long-term relevance of the findings for the speech and language development of the children needs to be investigated.

DOI: 10.1080/02699206.2017.1320588

PMID: 28521525

Language outcomes of children with cerebral palsy aged 5 years and 6 years: a population-based study.

Mei C, Reilly S, Reddihough D, Mensah F, Pennington L, Morgan A.

Dev Med Child Neurol. 2016 Jun;58(6):605-11. doi: 10.1111/dmcn.12957. Epub 2015 Nov 14.

AIM: To examine the frequency, range, and features of language impairment in a community sample of children with cerebral palsy (CP) aged 5 to 6 years. METHOD: Children with CP born between 2005 and 2007 were identified through the Victorian Cerebral Palsy Register. Eighty-four participants were recruited, representing 48% of the contacted families. The recruited sample was representative of non-participants. Participants completed standardized measures of receptive and expressive language, and non-verbal cognition.

RESULTS: Language impairment was identified in 61% (51/84) of participants. Twenty-four per cent (20/84) were non-verbal. Co-occurring receptive and expressive language impairment was common (37/84, 44%). Isolated receptive (6/84, 7%) and expressive (4/84, 5%) impairments occurred relatively infrequently. At a group level, verbal and non-verbal participants demonstrated deficits across language subdomains (i.e. semantics, syntax, morphology), rather than in single domains. Cognitive impairment and Gross Motor Function Classification System levels IV and V were associated with higher rates of language impairment (odds ratio [OR] 15.2, 95% confidence interval [CI] 3.2-71.8 and OR 8.5, 95% CI 1.8-40.3 respectively). Only cognition was independently associated with language impairment when both of these factors were considered within a multivariable model.

INTERPRETATION: Language impairment was common in 5-year-old and 6-year-old children with CP, affecting three out of five children. Participants were impaired across linguistic subdomains indicating a generalized language deficit. Findings suggest most children would benefit from a clinical language assessment. To target services effectively, subgroups of individuals with CP at greatest risk for language impairment need to be identified.

© 2015 Mac Keith Press.

[Free Article](#)

DOI: 10.1111/dmcn.12957

PMID: 26566585 [Indexed for MEDLINE]

Speech and language interventions for infants aged 0 to 2 years at high risk for cerebral palsy: a systematic review.

Chorna O, Hamm E, Cummings C, Fethers A, Maitre NL.

Dev Med Child Neurol. 2017 Apr;59:355-360. doi: 10.1111/dmcn.13342. Epub 2016 Nov 29.

AIM: We evaluated the level of evidence of speech, language, and communication interventions for infants at high-risk for, or with a diagnosis of, cerebral palsy (CP) from 0 to 2 years old.

METHOD: We performed a systematic review of relevant terms. Articles were evaluated based on the level of methodological quality and evidence according to A Measurement Tool to Assess Systematic Reviews (AMSTAR) and Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines.

RESULTS: The search terms provided 17 publications consisting of speech or language interventions. There were no interventions in the high level of evidence category. The overall level of evidence was very low. Promising interventions included Responsivity and Prelinguistic Milieu Teaching and other parent-infant transaction frameworks.

INTERPRETATION: There are few evidence-based interventions addressing speech, language, and communication needs of infants and toddlers at high risk for CP, and none for infants diagnosed with CP. Recommendation guidelines include parent-infant transaction programs.

© 2016 Mac Keith Press.

[Free PMC Article](#)

DOI: 10.1111/dmcn.13342

Science Infos Paralyse Cérébrale, Mai 2017, FONDATION PARALYSIE CEREBRALE 67 rue Vergniaud 75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

PMCID: PMC5395422

PMID: 27897320 [Indexed for MEDLINE]

Autres Troubles / Troubles concomitants

Informing evidence-based clinical practice guidelines for children with cerebral palsy at risk of osteoporosis: an update.

Ozel S, Switzer L, Macintosh A, Fehlings D.

Dev Med Child Neurol. 2016 Sep;58(9):918-23. doi: 10.1111/dmcn.13196. Epub 2016 Jul 20.

AIM: To investigate the impact of new evidence for weight-bearing, bisphosphonates, and vitamin D and calcium interventions, towards updating the systematic review and clinical practice guidelines for osteoporosis in children with cerebral palsy (CP) published in 2011.

METHOD: Computer-assisted literature searches were conducted for articles published from 2010 to 2016. Searches focused on children with CP functioning at Gross Motor Function Classification System levels III to V and limited to weight-bearing activities, bisphosphonates, and vitamin D and/or calcium supplementation. Articles were classified according to the American Academy of Neurology guidelines to update the grading of the evidence for improving bone mineral density (BMD) and decreasing fragility fractures.

RESULTS: Six new articles underwent full-text review and data abstraction. These included one weight-bearing, three bisphosphonate, and two mixed intervention studies (bisphosphonate and vitamin D/calcium supplementation). Overall, there continues to be 'probable' evidence for bisphosphonates, 'possible' evidence for vitamin D/calcium, and 'insufficient' evidence for weight-bearing activities as effective interventions to improve low BMD in children with CP. There is 'possible' evidence for bisphosphonates in reducing fragility fractures.

INTERPRETATION: The grading of evidence to support the use of weight-bearing activities, bisphosphonates, and vitamin D and calcium supplementation in pediatric CP osteoporosis clinical practice guidelines remained the same.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13196

PMID: 27435427 [Indexed for MEDLINE]

Muscle growth is reduced in 15-month-old children with cerebral palsy.

Herskind A, Ritterband-Rosenbaum A, Willerslev-Olsen M, Lorentzen J, Hanson L, Lichtwark G, Nielsen JB.

Dev Med Child Neurol. 2016 May;58(5):485-91. doi: 10.1111/dmcn.12950. Epub 2015 Oct 28.

AIM: Lack of muscle growth relative to bone growth may be responsible for development of contractures in children with cerebral palsy (CP). Here, we used ultrasonography to compare growth of the medial gastrocnemius muscle in children with and without CP.

METHOD: Twenty-six children with spastic CP (15 males, 11 females; mean age 35mo, range 8-65mo) and 101 typically developing children (47 males, 54 females; mean age 29mo, range 1-69mo) were included. Functional abilities of children with CP equalled levels I to III in the Gross Motor Function Classification System. Medial gastrocnemius muscle volume was constructed from serial, transverse, two-dimensional ultrasonography images.

RESULTS: In typically developing children, medial gastrocnemius volume increased linearly with age. Among children with CP, medial gastrocnemius volume increased less with age and deviated significantly from typically developing children at 15 months of age ($p < 0.05$). Bone length increased with age without significant difference ($p = 0.49$). **INTERPRETATION:** Muscle growth in children with CP initially follows that of typically developing children, but decreases at 15 months of age. This may be related to reduced physical activity and neural activation of the muscle. Interventions stimulating muscle growth in young children with CP may be important to prevent contractures.

[Free Article](#)

© 2015 Mac Keith Press.

DOI: 10.1111/dmcn.12950

PMID: 26510820 [Indexed for MEDLINE]

Relations between muscle endurance and subjectively reported fatigue, walking capacity, and participation in mildly affected adolescents with cerebral palsy.

Eken MM, Houdijk H, Doorenbosch CA, Kiezebrink FE, van Bennekom CA, Harlaar J, Dallmeijer AJ.

Dev Med Child Neurol. 2016 Aug;58(8):814-21. doi: 10.1111/dmcn.13083. Epub 2016 Feb 24.

AIM: To investigate the relation between muscle endurance and subjectively reported fatigue, walking capacity, and participation in mildly affected adolescents with cerebral palsy (CP) and peers with typical development.

METHOD: In this case-control study, knee extensor muscle endurance was estimated from individual load-endurance curves as the load corresponding to a 15-repetition maximum in 17 adolescents with spastic CP (six males, 11 females; age 12-19y) and 18 adolescents with typical development (eight males, 10 females; age 13-19y). Questionnaires were used to assess subjectively reported fatigue (Pediatric Quality of Life Inventory Multidimensional Fatigue Scale) and participation (Life-Habits questionnaire). Walking capacity was assessed using the 6-minute walk test. Relations were determined using multiple regression analyses.

RESULTS: Muscle endurance related significantly to subjectively reported fatigue and walking capacity in adolescents with CP, while no relations were found for adolescents with typical development (subjectively reported fatigue: regression coefficient β [95% confidence intervals] for CP=23.72 [6.26 to 41.18], for controls=2.72 [-10.26 to 15.69]; walking capacity β for CP=125m [-87 to 337], for controls=2m [-86 to 89]). The 15-repetition maximum did not relate to participation in adolescents with CP. INTERPRETATION: Subjectively reported fatigue and reduced walking capacity in adolescents with CP are partly caused by lower muscle endurance of knee extensors. Training of muscle endurance might contribute to reducing the experience of fatigue and improving walking capacity. Reduced muscle endurance seems to have no effect on participation.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13083

PMID: 26915305 [Indexed for MEDLINE]

✚ Troubles de la croissance

Growth characteristics in cerebral palsy subtypes: a comparative assessment.

Stanek JL, Emerson JA, Murdock FA, Petroski GF.

Dev Med Child Neurol. 2016 Sep;58(9):931-5. doi: 10.1111/dmcn.13116. Epub 2016 Apr 5.

AIM: Children with quadriplegic cerebral palsy (CP) have been found to have growth rates that differ from those of children with typical development. Little research has been performed to distinguish whether growth patterns in hemiplegic, diplegic, and quadriplegic CP differ from one another. The purpose of this study was to compare growth of children with quadriplegic, hemiplegic, and diplegic CP. METHOD: Retrospective data were collected from the electronic medical record of patients with CP at an outpatient center. Linear mixed models were used to examine growth by diagnosis, using International Classification of Diseases, Ninth Revision (ICD-9) diagnosis codes 343.0 (diplegia), 343.1 (hemiplegia), and 343.2 (quadriplegia).

RESULTS: Heights and weights of children with quadriplegic CP were consistently lower than those with hemiplegic or diplegic CP. Children with hemiplegic CP had greater heights and weights than other CP subtypes. There were statistically significant differences in weight gain curves among the three diagnoses for males ($p < 0.05$).

INTERPRETATION: Our study reveals differences in growth rates between hemiplegic, diplegic, and quadriplegic CP subtypes.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13116

PMID: 27059686 [Indexed for MEDLINE]

Growth during infancy and early childhood in children with cerebral palsy: a population-based study.

Strand KM, Dahlseng MO, Lydersen S, Rø TB, Finbråten AK, Jahnsen RB, Andersen GL, Vik T.

Dev Med Child Neurol. 2016 Sep;58(9):924-30. doi: 10.1111/dmcn.13098. Epub 2016 Mar 15.

AIM: To describe growth in infancy and early childhood in children with cerebral palsy (CP).

METHOD: One hundred and four children with CP born at minimum 36 weeks' gestation in 2002 to 2010 were included. Prospectively collected growth data were requested from public health clinics. We calculated standard deviation (SD) scores (z-scores) for weight and height for 12 set age points for each child from birth to 5 years, and for head circumference from birth to 12 months.

RESULTS: Children with CP had normal growth in weight and height if they were born non-small for gestational age (non-SGA) or had mild motor impairments (i.e. Gross Motor Function Classification System [GMFCS] I-II), whereas children born SGA or with severe motor impairments (GMFCS III-V) had reduced growth ($p < 0.001$). Children with feeding difficulties in infancy had reduced growth in weight and height throughout early childhood, while children without feeding difficulties had normal growth. Head circumference growth decreased most severely among children born SGA, who had mean z-scores of -3.0 (95% confidence interval [CI] -3.7 to -2.2) at 1 year.

INTERPRETATION: Children with mild CP had normal growth in weight and height until 5 years, and in head circumference during infancy. Feeding difficulties in infancy and being born SGA were strongly associated with reduced growth.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13098

PMID: 26992128 [Indexed for MEDLINE]

✚ Sphère bucco-dentaire – Troubles de la déglutition

Risk factors for dental caries among children with cerebral palsy in a low-resource setting.

Akhter R, Hassan NM, Martin EF, Muhit M, Haque MR, Smithers-Sheedy H, Jones C, Badawi N, Khandaker G.

Dev Med Child Neurol. 2017 May;59(5):538-543. doi: 10.1111/dmnc.13359. Epub 2016 Dec 9.

AIM: To describe the oral health status and investigate factors affecting dental caries experience among children with cerebral palsy (CP) in rural Bangladesh.

METHOD: A cross-sectional study was conducted among children with CP who are part of the Bangladesh Cerebral Palsy Register (BCPR) study. Caries experience was measured by identifying decayed, missing, and filled teeth for deciduous and permanent teeth (dmft/DMFT). Clinical periodontal index, body mass index, oral hygiene behaviour, masticatory ability, and dietary habits were recorded. CP motor types and severity of functional mobility (Gross Motor Function Classification System [GMFCS]) were assessed.

RESULTS: Of 90 children with CP (mean age 9y 7mo, range 2-17y, 37.8% female and 62.2% male), 35% of 2 to 6 year olds, and 70% of 7 to 11 year olds ($p = 0.014$) experienced caries (dmft+DMFT>0). The mean values (standard deviation [SD]) of dmft and DMFT were 2.46 (3.75) and 0.72 (1.79) respectively. After adjusting for age and sex, binary logistic regression analysis showed a significant relationship with dental caries for children who had quadriplegia (odds ratio [OR] 5.56, $p = 0.035$), tooth cleaning less than one time/day (OR 0.08, $p = 0.016$), using toothpowder or charcoal for cleaning (OR 7.63, $p = 0.015$), and snacking between meals more than one time/day (OR 6.93, $p = 0.012$).

INTERPRETATION: Early oral health preventive care is required for children with CP because dental caries is highly prevalent in these children.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13359

PMID: 27935024 [Indexed for MEDLINE]

✚ Nutrition - Metabolisme

Association between gross motor function and nutritional status in children with cerebral palsy: a cross-sectional study from Colombia.

Herrera-Anaya E, Angarita-Fonseca A, Herrera-Galindo VM, Martínez-Marín RD, Rodríguez-Bayona CN.

Dev Med Child Neurol. 2016 Sep;58(9):936-41. doi: 10.1111/dmnc.13108. Epub 2016 Mar 31. PubMed PMID: 27038060.

AIM: To determine the association between gross motor function and nutritional status in children with cerebral palsy (CP) residing in an urban area in a developing country.

METHOD: We conducted a cross-sectional study in 177 children (ages 2-12y, 59.3% male) with a diagnosis of CP who were attending rehabilitation centres in Bucaramanga, Colombia (2012-2013). A physiotherapist evaluated patients using the Gross Motor Function Classification System (GMFCS, levels I to V). Nutritional status was evaluated by nutritionists and classified according to the World Health Organization growth charts. We used linear and multinomial logistic regression methods to determine the associations.

RESULTS: There were 39.5%, 6.8%, 5.6%, 16.4%, and 31.6% patients classified in levels I to V respectively. The mean adjusted differences for weight-for-age, height-for-age, BMI-for-age, and height-for-weight z-scores were significantly larger for children classified in levels II to V compared with those in level I. The children classified in levels IV and V were more likely to have malnutrition (adjusted odds ratio [OR] 5.64; 95% confidence interval [CI] 2.27-14.0) and stunting (OR 8.42; 95% CI 2.90-24.4) than those classified in GMFCS levels I to III.

INTERPRETATION: Stunting and malnutrition are prevalent conditions among paediatric patients with CP, and both are directly associated with higher levels of gross motor dysfunction.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13108

PMID: 27038060 [Indexed for MEDLINE]

Differences in body composition according to gross motor function in children with cerebral palsy.

Sung KH, Chung CY, Lee KM, Cho BC, Moon SJ, Kim J, Park MS.

Arch Phys Med Rehabil. 2017 Apr 29. pii: S0003-9993(17)30267-8. doi: 10.1016/j.apmr.2017.04.005. [Epub ahead of print]

OBJECTIVES: To assess differences in body composition according to gross motor function in children with cerebral palsy (CP) compared to healthy controls. **DESIGN:** Retrospective case control study.

SETTING: Tertiary referral center for CP **PARTICIPANTS:** One hundred consecutive patients (mean age, 11.5 ± 4.2 years) with CP who were admitted for orthopedic surgery between May 2014 and March 2016 and 46 typically developing children (TDC, control group) were included.

INTERVENTION: Not applicable **MAIN OUTCOME MEASURES:** Bioelectrical impedance analysis (BIA) was used to assess body composition, including body fat, soft lean mass (SLM), fat free mass (FFM), skeletal muscle mass (SMM), body cell mass (BCM), bone mineral content (BMC), and basal metabolic rate (BMR). Body composition measures were compared according to gross motor function classification system (GMFCS) level, as well as between children with CP and TDC.

RESULTS: Children with CP with GMFCS levels IV and V had a lower height, weight, and body mass index than those with GMFCS levels I, II, and III. Children with CP with GMFCS levels IV and V had a significantly lower SLM, SLM index, FFM, FFM index, SMM, SMM index, BCM, BCM index, BMC, and BMC index than those with GMFCS levels I to III and TDC. GMFCS level significantly affected SLM and BMC. **CONCLUSIONS:** Body composition analysis using BIA showed that non-ambulatory children with CP had significantly lower FFM, SLM, SMM, BCM, and BMC than ambulatory children with CP and TDC. However, further study is required to allow the use of BIA as a valid nutritional assessment tool in patients with CP.

Copyright © 2016 American Congress of Rehabilitation Medicine. Published by Elsevier Inc. All rights reserved.

DOI: 10.1016/j.apmr.2017.04.005

PMID: 28465219

The Pediatric Version of the Eating Assessment Tool: a caregiver administered dysphagia-specific outcome instrument for children.

Serel Arslan S, Demir N, Karaduman AA, Belafsky PC.

Disabil Rehabil. 2017 May 5:1-5. doi: 10.1080/09638288.2017.1323235. [Epub ahead of print]

PURPOSE: To develop and evaluate the psychometric properties of the Pediatric version of the caregiver administered Eating Assessment Tool. **METHODS:** The study included developmental phase and reported content, criterion validity, internal consistency and test-retest reliability of the Pediatric Eating Assessment Tool. Literature review and the original Eating Assessment Tool were used for line-item generation. Expert consensus assessed the items for content validity over two Delphi rounds. Fifty-one healthy children to obtain normative data and 138

children with cerebral palsy to evaluate test-retest reliability, internal consistency, and criterion validity were included. The Penetration-Aspiration Scale was used to assess criterion validity.

RESULTS: All items were found to be necessary. Content validity index was 0.91. The mean score of Pediatric Eating Assessment Tool for healthy children and children with cerebral palsy was 0.26 ± 1.83 and 19.5 ± 11 , respectively. The internal consistency was high with Cronbach's alpha =0.87 for test and retest. An excellent correlation between the Pediatric Eating Assessment Tool and Penetration-Aspiration score for liquid and pudding swallowing was found ($p < 0.001$, $r = 0.77$; $p < 0.001$, $r = 0.83$, respectively). A score >4 demonstrated a sensitivity of 91.3% and specificity of 98.8% to predict penetration/aspiration.

CONCLUSIONS: The Pediatric Eating Assessment Tool was shown to be a valid and reliable tool to determine penetration/aspiration risk in children. Implications for rehabilitation The pediatric eating assessment tool: a new dysphagia-specific outcome survey for children. The Pediatric Version of the Eating Assessment Tool is a dysphagia specific, parent report outcome instrument to determine penetration/aspiration risk in children. The Pediatric Version of the Eating Assessment Tool has good internal consistency, test-retest reliability and criterion-based validity. The Pediatric Version of the Eating Assessment Tool may be utilized as a clinical instrument to assess the need for further instrumental evaluation of swallowing function in children.

DOI: 10.1080/09638288.2017.1323235

PMID: 28475381

Troubles visuels

Optic nerve morphology as marker for disease severity in cerebral palsy of perinatal origin.

Ghate D, Vedanarayanan V, Kamour A, Corbett JJ, Kedar S.

J Neurol Sci. 2016 Sep 15;368:25-31. doi: 10.1016/j.jns.2016.06.029. Epub 2016 Jun 14.

BACKGROUND: It is difficult to predict the neurologic outcome and ambulatory status in children with perinatal neurologic insult until 2-5years age. This study aims to correlate clinical optic nerve head (ONH) findings-cupping, pallor and hypoplasia, with gestational period and neurologic (motor) outcomes in patients with cerebral palsy (CP) from perinatal insults.

METHODS: 54 consecutive patients with CP from perinatal insults were enrolled. Patients with intraocular disease, retinopathy of prematurity and hydrocephalus were excluded. ONH was labeled as pale, hypoplastic or large cup (cup/disc ratio ≥ 0.5) if 2 ophthalmologists independently agreed after an ophthalmoscopic examination. Inter-rater reliability was excellent.

RESULTS: Mean age at examination was 10.98 ± 6.49 years; mean gestational period was 33.26 ± 4.78 weeks. Abnormal ONH (pallor, cupping or hypoplasia) was seen in 38/54 (70%) patients. Of patients with pallor ($n=17$), 88% were quadriplegic and 82% non-ambulatory. Mean cup/disc ratio was 0.45 ± 0.22 ; 50% patients had large cup. Multivariate logistic regression models showed that disc pallor was associated with non-ambulatory status (OR: 21.7; $p=0.003$) and quadriplegia (OR: 12.8; $p=0.03$). Large cup was associated with age at examination (OR 1.15; $p=0.03$). Cup/disc ratio showed positive correlation with age at examination (Pearson's $r=0.39$; $p=0.003$). There was no significant association of ONH parameters with gestational age.

CONCLUSION: Clinically observed ONH changes (pallor, cupping and hypoplasia) are common in CP. Presence of ONH pallor serves as an indicator for poor motor outcome in patients who develop CP from perinatal causes and should prompt early referral for rehabilitation.

Copyright © 2016 Elsevier B.V. All rights reserved.

DOI: 10.1016/j.jns.2016.06.029

PMID: 27538596 [Indexed for MEDLINE]

Troubles neurologiques

Risk of stroke among patients with cerebral palsy: a population-based cohort study.

Wu CW, Huang SW, Lin JW, Liou TH, Chou LC, Lin HW.

Dev Med Child Neurol. 2017 Jan;59(1):52-56. doi: 10.1111/dmcn.13180. Epub 2016 Jun 27.

AIM: The aim of the study was to investigate the risk of stroke in patients with cerebral palsy (CP), based on nationwide data in Taiwan.

METHOD: This prospective cohort study was comprised of patients recorded on the Taiwan Longitudinal Health Insurance Database 2005 (LHID2005) who had a diagnosis of CP (n=1975) in records between 1 January 2004 and 31 December 2007. A comparison group (1:5) drawn from the same database was matched for age and sex (n=9875). Each patient was tracked by data until the development of stroke or the end of 2008. Cox proportional-hazards regression analysis was used to evaluate the hazard ratios after adjusting for potential confounding factors.

RESULTS: Patients with CP were more likely to suffer stroke than the comparison population, after adjusting for potential confounding factors (adjusted hazard ratio: 2.17; 95% confidence interval [CI]: 1.74-2.69). The hazard ratio of stroke was 4.78 (95% CI: 3.18-7.17) and 1.57 (95% CI: 1.20-2.05) for patients with CP aged 50 years and under, and over 50 years respectively.

INTERPRETATION: Cerebral palsy is a risk factor or marker for stroke that is independent of traditional stroke risk factors. Further research in this area is warranted.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13180

PMID: 27346658 [Indexed for MEDLINE]

Fatigue

Fatigue and its relationship with physical activity, age, and body composition in adults with cerebral palsy.

McPhee PG, Brunton LK, Timmons BW, Bentley T, Gorter JW.

Dev Med Child Neurol. 2017 Apr;59:367-373. doi: 10.1111/dmcn.13306. Epub 2016 Nov 14.

AIM: The objectives of this exploratory study were (1) to describe the experience of fatigue in adults with cerebral palsy (CP) inclusive of all levels of the Gross Motor Function Classification System (GMFCS); and (2) to determine if physical activity level, sedentary time, age, or body composition can predict fatigue in adults with CP.

METHOD: An observational study was conducted in an outpatient setting in Ontario, Canada. Participants included adults with CP (n=41; GMFCS levels I-V; mean age 33.7y, standard deviation [SD] 12.3y). Fatigue was measured using the Fatigue Impact and Severity Self-Assessment (FISSA) questionnaire. Habitual physical activity and sedentary time were measured using accelerometry. Body mass index (BMI) and waist circumference were reported as measures of body composition.

RESULTS: The mean (SD) FISSA score for all participants was 84.5 (30.6), ranging from 54.0 (18.3) (GMFCS level I) to 93.6 (21.9) (GMFCS level V). Significant positive relationships (regression coefficient β [95% confidence intervals]) were observed between BMI and FISSA scores (1.9 [0.73-3.1]), waist circumference and FISSA scores (0.71 [0.19-1.2]), and age and FISSA scores (0.99 [0.26-1.7]). A significant negative relationship was observed between moderate-to-vigorous physical activity (MVPA) per hour and FISSA scores (-6.4 [-12 to -0.83]). Backwards stepwise regression analysis revealed BMI (1.8 [0.61-2.9]) and MVPA per hour (-5.4 [-10 to -0.30]) were significant predictors of FISSA scores.

INTERPRETATION: Health care providers should consider the importance of weight management and physical activity to prevent and treat fatigue in this population.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13306

PMID: 27861776 [Indexed for MEDLINE]

Sommeil

Co-sleeping in school-aged children with a motor disability: a comparative population-based study.

Jacquier D, Newman CJ.

Dev Med Child Neurol. 2017 Apr;59:420-426. doi: 10.1111/dmcn.13300. Epub 2016 Oct 25.

AIM: To determine the prevalence and determinants of co-sleeping in school-aged children with a motor disability compared with the school-aged general population.

METHOD: A questionnaire on demographic characteristics and co-sleeping habits, along with the Sleep Disturbance Scale for Children (SDSC), was sent to parents of children aged between 4 years and 18 years followed in our tertiary paediatric neurorehabilitation clinic, and to school-aged children in a representative sample of state schools.

RESULT: We analysed responses for 245 children with motor disability (142 males, 103 females; mean age 10y 6mo, standard deviation [SD] 3y 10mo, range 4-18y) and 2891 of the general population (1484 males, 1497 females; mean age [SD] 9y 6mo [3y 5mo], range 4-18y) (response rates 37% and 26% respectively). Cerebral palsy was the most common diagnosis among children with motor disability. Weekly co-sleeping was significantly more common in children with motor disability than in the general population (11.8% vs 7.9% respectively, $p=0.032$). Special care of the child with motor disability at night, mainly addressing epilepsy, was reported as a cause of co-sleeping by two-thirds of parents. Factors associated with co-sleeping in the motor disability group were age, housing crowding, severe visual impairment, and pathological sleep according to the SDSC.

INTERPRETATION: Co-sleeping is common among children with motor disability. It is influenced by personal and medical factors, as well as the requirements for special care at night. Therefore, health professionals should explore sleeping arrangements in families of children with motor disability.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13300

PMID: 27779314 [Indexed for MEDLINE]

Qualité de vie et rapport au monde

+Qualité de vie – Retentissement dans la vie quotidienne

Leisure participation-preference congruence of children with cerebral palsy: a Children's Assessment of Participation and Enjoyment International Network descriptive study.

Imms C, King G, Majnemer A, Avery L, Chiarello L, Palisano R, Orlin M, Law M.

Dev Med Child Neurol. 2017 Apr;59:380-387. doi: 10.1111/dmcn.13302. Epub 2016 Nov 5.

AIM: To examine participation-preference congruence, regional differences in participation-preference congruence, and predictors of whether children with cerebral palsy participate in preferred activities.

METHOD: The sample ($n=236$) included 148 males and 88 females aged 10 to 13 years, living in Victoria, Australia ($n=110$), Ontario ($n=80$), or Quebec ($n=46$), Canada. Ninety-nine (41.9%) were classed at Gross Motor Function Classification System (GMFCS) level I; 89 (37.7%) at GMFCS level II/III; and 48 (20.3%) at GMFCS level IV/V. Participants completed the Children's Assessment of Participation and Enjoyment and Preferences for Activity of Children questionnaires. Regional comparisons were performed using one-way analyses of variance and factors influencing participation-preference congruence were explored using multiple linear regression.

RESULTS: The proportion of children doing non-preferred activities in each activity type was generally low (2-17%), with only one regional difference. Higher proportions were not doing preferred active physical (range 23.2-29.1% across regions), skill-based (range 21.7-27.9% across regions), and social activities (range 12.8-14.5% across regions). GMFCS level was the most important predictor associated with not doing preferred activities.

INTERPRETATION: Children with cerebral palsy did not always participate in preferred active physical and skill-based activities. Understanding discrepancies between preferences and actual involvement may allow families and rehabilitation professionals to address participation barriers.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13302

PMID: 28252187 [Indexed for MEDLINE]

Relationship between activity limitation and health-related quality of life in school-aged children with cerebral palsy: a cross-sectional study.

Park EY.

Health Qual Life Outcomes. 2017 Apr 28;15:87. doi: 10.1186/s12955-017-0650-8.

BACKGROUND: Information on health-related quality of life is becoming increasingly important in children with cerebral palsy. This study investigated the relationship between activity limitation and health-related quality of life in school-aged children with cerebral palsy.

METHODS: Data were collected from 71 children aged 6-15 years with cerebral palsy. Activity limitations were assessed using functional classification systems, including the Korean-Gross Motor Function Classification System (K-

GMFCS) and the Korean-Manual Ability Classification System (K-MACS). Health-related quality of life was assessed using the Korean version of the Childhood Health Assessment Questionnaire. Physical therapists collected the data by interviewing the parents of the subjects.

RESULTS: Both the K-GMFCS and the K-MACS were significantly positively correlated with the Childhood Health Assessment Questionnaire. The Childhood Health Assessment Questionnaire score differed significantly with respect to the functional classification systems. The differences in the ratings according to the K-GMFCS levels were significant, except those between levels I and II, levels II and III, levels III and IV, and levels IV and V. In the K-MACS, there were no significant differences between levels I and II, levels III and IV, and levels IV and V. The K-GMFCS and the K-MACS were significant predictors of health-related quality of life, demonstrating 75.5% of the variance ($p < 0.05$).

CONCLUSION: Comprehensive information on children with cerebral palsy should be gathered to provide professionals with a better understanding of health-related quality of life.

[Free PMC Article](#)

DOI: 10.1186/s12955-017-0650-8

PMCID: PMC5408405

PMID: 28454541

School success and participation for students with cerebral palsy: a qualitative study exploring multiple perspectives.

Bourke-Taylor HM, Cotter C, Lalor A, Johnson L.

Disabil Rehabil. 2017 May 19;1-9. doi: 10.1080/09638288.2017.1327988. [Epub ahead of print]

PURPOSE: This qualitative study investigated perceived successful school experiences for students with cerebral palsy in Australia. Participation and appropriate support in school are complex concepts, although few studies have investigated all stakeholders' perspectives.

METHODS: Phenomenology informed the study that centered on the concept of a successful school experience. In-depth interviews occurred with students ($n = 7$), parents ($n = 11$), teachers ($n = 10$), school principals ($n = 9$) and allied health practitioners ($n = 10$) to gain the perspective from multiple vantage points. Specific research questions, interview guides and demographic questionnaires were configured for each group. Interviews were analyzed thematically within and between groups.

RESULTS: Three key themes emerged: Collaborative partnerships between families, schools and outside organizations; School culture and attitude is key; and, allied health practitioners are part of home and school teams.

CONCLUSIONS: Student and school success was impacted substantially by the capacity of adults in the student's life to collaborate - family, school professionals and allied health practitioners. An inclusive school culture was crucial to students with cerebral palsy. All parties needed to prioritize promotion of an open and positive school culture built around problem-solving inclusive practices. Involved people, such as allied health practitioners, bring knowledge and skills that are not otherwise readily available in school environments. Implications for rehabilitation Students with cerebral palsy have high needs at school and allied health practitioners have a role advocating for, educating and providing support to students within the school. Teachers of students with cerebral palsy need education, training and support from allied health practitioners. The need for allied health and rehabilitation services continues for children and youth with cerebral palsy outside of school and across the schooling years. School professionals; allied health practitioners; families and students can work together to improve the student experience.

DOI: 10.1080/09638288.2017.1327988

PMID: 28524702

Passage à l'âge adulte – Vieillesse

Participation trajectories: impact of school transitions on children and adolescents with cerebral palsy.

Imms C, Adair B.

Dev Med Child Neurol. 2017 Feb;59(2):174-182. doi: 10.1111/dmcn.13229. Epub 2016 Aug 13.

AIM: To describe participation trajectories, and impact of school transitions on those trajectories, of children with cerebral palsy (CP).

METHOD: This population-based longitudinal study assessed participation in activities outside school of children with CP born in 1994/1995. Eligible children contributed data between two and five occasions over 9 years, and had parents with sufficient English proficiency to complete the measures: the Children's Assessment of Participation and Enjoyment, and the Preferences for Activities of Children. Linear mixed models were used to assess the relationships between participation and age and the impact of transition.

RESULTS: At study commencement (2006), 233 children with CP born in 1994/1995 were registered in Victoria; 93 (51 males, 42 females; mean age 11y 2mo, age range 10-12y) contributed longitudinal data. Participation diversity and intensity decreased over time for recreational, active physical, and self-improvement activities ($p < 0.009$). Social participation increased over time: diversity, intensity, and frequency ($p < 0.007$). All of the identified slopes were generally small ($\beta \leq 0.11$, 1-point change every 9y) except for recreational diversity scores ($\beta = -0.29$). Transition from primary and secondary school had little impact on participation.

INTERPRETATION: Findings of increased social participation over time are encouraging. Declining participation in other activity types suggests that action is needed to ensure that meaningful recreation and leisure activities are maintained as adolescents with CP transition to adulthood.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13229

PMID: 27521188 [Indexed for MEDLINE]

Activité physique -Sport

Ability of independently ambulant children with cerebral palsy to ride a two-wheel bicycle: a case-control study.

Toovey R, Reid SM, Rawicki B, Harvey AR, Watt K.

Dev Med Child Neurol. 2017 Apr;59:395-401. doi: 10.1111/dmcn.13340. Epub 2016 Nov 30.

AIM: Limited information exists on the ability of children with cerebral palsy (CP) to ride a two-wheel bicycle, an activity that may improve health and participation. We aimed to describe bicycle-riding ability and variables associated with ability to ride in children with CP (Gross Motor Functional Classification System [GMFCS] levels I-II) compared with children with typical development.

METHOD: This case-control study surveyed parents of 114 children with CP and 87 children with typical development aged 6 to 15 years (115 males, mean age 9y 11mo, standard deviation [SD] 2y 10mo). Kaplan-Meier methods were used to compare proportions able to ride at any given age between the two groups. Logistic regression was used to assess variables associated with ability to ride for children with CP and typical development separately.

RESULTS: The proportion of children with CP able to ride at each level of bicycle-riding ability was substantially lower at each age than peers with typical development ($p < 0.001$). While most children with typical development were able to ride independently by 10 years of age, 51% of children with CP classified as GMFCS level I and 3% of those classified as GMFCS level II had obtained independent riding in the community by 15 years of age. Variables associated with ability to ride for children classified as GMFCS level I were age and parent-rated importance of their child being able to ride.

INTERPRETATION: Some independently ambulant children with CP can learn to ride a bicycle, in particular if they are classified as GMFCS level I. Variables associated with ability to ride deserve consideration in shaping future efforts for the majority of this population who are not yet able to ride.

© 2016 Mac Keith Press.

DOI: 10.1111/dmcn.13340

PMID: 27901269 [Indexed for MEDLINE]

Exercise and physical activity recommendations for people with cerebral palsy.

Verschuren O, Peterson MD, Balemans AC, Hurvitz EA.

Dev Med Child Neurol. 2016 Aug;58(8):798-808. doi: 10.1111/dmcn.13053. Epub 2016 Feb 7.

Physical activity and its promotion, as well as the avoidance of sedentary behaviour, play important roles in health promotion and prevention of lifestyle-related diseases. Guidelines for young people and adults with typical development are available from the World Health Organisation and American College of Sports Medicine. However, detailed recommendations for physical activity and sedentary behaviour have not been established for children, adolescents, and adults with cerebral palsy (CP). This paper presents the first CP-specific physical activity and

exercise recommendations. The recommendations are based on (1) a comprehensive review and analysis of the literature, (2) expert opinion, and (3) extensive clinical experience. The evidence supporting these recommendations is based on randomized controlled trials and observational studies involving children, adolescents, and adults with CP, and buttressed by the previous guidelines for the general population. These recommendations may be used to guide healthcare providers on exercise and daily physical activity prescription for individuals with CP.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13053

[Free PMC Article](#)

PMCID: PMC4942358

PMID: 26853808 [Indexed for MEDLINE]

Psychosocial effects of competitive Boccia program in persons with severe chronic disability.

Barak S, Mendoza-Laiz N, Fuentes MTG, Rubiera M, Huyzler Y.

J Rehabil Res Dev. 2016;53(6):973-988. doi: 10.1682/JRRD.2015.08.0156.

People with severe physical disabilities may experience psychosocial problems. Boccia is one sport that athletes with severe disability can engage in, but no information on the effects of Boccia on psychosocial outcomes for participants with severe disability is available. Therefore, we analyzed the effects of Boccia on psychosocial outcomes in persons with severe disabilities. The study included two competitive Boccia groups: independent competitive (IC) (n = 9) and nonindependent competitive (NIC) (n = 7), as well as a recreational Boccia group (n = 14) and control subjects (n = 13) (mean age = 46.46 +/- 10.75). All participants underwent a rehabilitation program. Between-group differences in change scores were assessed using analysis of variance/multivariate analysis of variance. Within-group differences were compared using t-tests and effect sizes (ESs). Change in psychosocial parameters was not significantly influenced by study group (p > 0.05). All groups presented moderate-to-large ESs in physical and psychological quality of life (ES > 0.51). In comparison to the control group, who presented small-to-trivial ESs in General Health Questionnaire-28 (GHQ-28), State-Trait Anxiety Inventory, and Profile of Mood States-Tension, the IC and recreational group presented moderate ESs in GHQ-28, whereas the NIC group presented moderate ESs in anxiety and tension. In conclusion, the rehabilitation program had a general positive effect on the psychosocial status of individuals with severe physical disabilities. However, the competitive Boccia groups demonstrated a greater number of favorable changes, suggesting an added value of participation in Boccia.

[Free Article](#)

DOI: 10.1682/JRRD.2015.08.0156

PMID: 28475199

Prise en charge et Accompagnant/Accompagnement

Hospital admissions in children with cerebral palsy: a data linkage study.

Meehan E, Reid SM, Williams K, Freed GL, Sewell JR, Vidmar S, Donath S, Reddihough DS.

Dev Med Child Neurol. 2017 May;59(5):512-519. doi: 10.1111/dmnc.13350. Epub 2016 Nov 30.

AIM: The overall aim was to investigate the feasibility and utility of linking a cerebral palsy (CP) register to an administrative data set for health services research purposes. We sought to compare CP hospital admissions to general childhood population admissions, and identify factors associated with type and frequency of admissions in a CP cohort.

METHOD: The CP register for Victoria, Australia was linked to the state's hospital admissions database. Data pertaining to the admissions of a CP cohort (n=1748) that took place between 2007 and 2014 were extracted. Population data were also obtained.

RESULTS: Overall, 80% of the CP cohort (n=1401) had at least admission between 2007 and 2014, accounting for 11 012 admissions or 1.5% of all admissions in their age group. Compared to general population admissions, CP admissions were more costly and more likely to be elective (66% vs 57%; p<0.001), medical (71% vs 57%; p<0.001), and to take place in metropolitan hospitals (92% vs 78%; p<0.001). Increased CP severity and complexity were associated with having more admissions and a higher proportion of admissions attributable to respiratory illness.

INTERPRETATION: By linking with administrative data sets, CP registers may be useful for health services research and inform health service delivery.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13350

PMID: 27900776 [Indexed for MEDLINE]

Learn From Every Patient': implementation and early results of a learning health system.

Lowes LP, Noritz GH, Newmeyer A, Embi PJ, Yin H, SmoyerWE; 'Learn from Every Patient' Study Group.

Collaborators: Tidball A, Love L, Schmidt J, Golias J, Miller M.

Dev Med Child Neurol. 2017 Feb;59(2):183-191. doi: 10.1111/dmnc.13227. Epub 2016 Aug 22.

AIM: The convergence of three major trends in medicine, namely conversion to electronic health records (EHRs), prioritization of translational research, and the need to control healthcare expenditures, has created unprecedented interest and opportunities to develop systems that improve care while reducing costs. However, operationalizing a 'learning health system' requires systematic changes that have not yet been widely demonstrated in clinical practice.

METHOD: We developed, implemented, and evaluated a model of EHR-supported care in a cohort of 131 children with cerebral palsy that integrated clinical care, quality improvement, and research, entitled 'Learn From Every Patient' (LFEP). **RESULTS:** Children treated in the LFEP Program for a 12-month period experienced a 43% reduction in total inpatient days ($p=0.030$ vs prior 12mo period), a 27% reduction in inpatient admissions, a 30% reduction in emergency department visits ($p=0.001$), and a 29% reduction in urgent care visits ($p=0.046$). LFEP Program implementation also resulted in reductions in healthcare costs of 210% (US\$7014/child) versus a Time control group, and reductions of 176% (\$6596/child) versus a Program Activities control group. Importantly, clinical implementation of the LFEP Program has also driven the continuous accumulation of robust research-quality data for both publication and implementation of evidence-based improvements in clinical care.

INTERPRETATION: These results demonstrate that a learning health system can be developed and implemented in a cost-effective manner, and can integrate clinical care and research to systematically drive simultaneous clinical quality improvement and reduced healthcare costs.

© 2016 Mac Keith Press.

DOI: 10.1111/dmnc.13227

PMID: 27545839 [Indexed for MEDLINE]

Predictors of parents' adherence to home exercise programs for children with developmental disabilities, regarding both exercise frequency and duration: a survey design.

Medina-Mirapeix F, Lillo-Navarro C, Montilla-Herrador J, Gacto-Sanchez M, Franco-Sierra MÁ, Escolar-Reina P.

Eur J Phys Rehabil Med. 2017 May 2. doi: 10.23736/S1973-9087.17.04464-1. [Epub ahead of print]

BACKGROUND: Many families have problems adhering to home exercise programs (HEP) for children with developmental disabilities. However, parental participation in HEP is known to have a positive effect on child-related outcome variables, as well as on parental functioning.

AIM: This study examined whether the different behaviours of health professionals, and the behaviour and social characteristics of parents determine rates of parental adherence to both the frequency per week, and duration per session, of HEP for children with developmental disabilities attending paediatric services in early intervention centres. In this study, developmental disabilities include those caused by developmental delay or specific health conditions such as cerebral palsy, congenital illness, or others.

DESIGN: Survey.

SETTING: 18 early intervention centres.

POPULATION: Parents of children with developmental disabilities receiving HEP.

METHODS: A self-reported questionnaire was used to examine: whether frequency and duration of weekly exercise sessions was prescribed by physiotherapists; whether the child had received the HEP according to what was prescribed; and items related to the individual, social support, illnesses and the involvement of the health professional. Multiple logistic regression analyses examined their relative relevance.

RESULTS: 219 parents participated. The rate of adherence to the prescribed frequency and duration of the HEP was similar (61.4-57.2%). The probability of adherence to both components increased for parents who had a low perception of the existence of barriers for integrating the exercises into their daily routine (OR=2.62 and 4.83).

Furthermore, other cognitive factors of parents had a variable influence. The involvement of the professional had a significant impact regarding the frequency of the HEP. Professional involvement increased the probability of exercises being followed accurately by adopting strategies such as: providing information about the progress and evolution of the exercises (OR=3.75); justifying their usefulness (OR=2.17); giving advice on how to include them into the daily routine (OR=2.54); checking skills during follow-up (OR=2.21) and asking about home adherence (OR=2.20). CONCLUSIONS: Providing information during clinical encounters, advising how to include exercises into the daily routine, and checking skills and adherence during follow-up represent practical targets for clinicians aiming to improve the frequency of HEP for children with developmental disabilities. CLINICAL REHABILITATION IMPACT: This study contributes to the knowledge of physicians and therapists regarding how their interventions (in particular, information, instructions for HEP and follow-up) influence parents regarding their adherence to HEP.

Free Article

DOI: 10.23736/S1973-9087.17.04464-1

PMID: 28466627

Quality of life of primary caregivers of children with cerebral palsy: a comparison between mother and grandmother caregivers in Anhui province of China.

Wu J, Zhang J, Hong Y.

Child Care Health Dev. 2017 May 11. doi: 10.1111/cch.12464. [Epub ahead of print]

BACKGROUND: The aims of the study are to evaluate the quality of life of mother and grandmother primary caregivers of children with cerebral palsy (CP) and to compare the difference between these two groups of caregivers.

METHODS: We recruited 125 mother and 52 grandmother primary caregivers of children with CP. All the primary caregivers were interviewed with the short-form 36 (SF-36) health survey version 2.0 and with researcher-designed questionnaires for family background. As for the children, social-demographic characteristics, medical history and the result of a physical examination performed by a paediatric specialist in neurological rehabilitation were also collected.

RESULTS: Mother and grandmother caregivers scored lower than their counterparts in the general population in both summary scores. Grandmother caregivers had lower scores than mother caregivers in all eight domains and in the two summary scores, with all differences being statistically significant ($P < 0.05$), except for the domain of the mental component summary score ($P = 0.618$). The differences were found particularly remarkable in the domains of physical functioning, role physical, bodily pain and also the physical component summary score ($P < 0.001$).

CONCLUSIONS: The quality of life is significantly unsatisfactory in both mother and grandmother primary caregivers of children with CP; this research provides evidence for the need of the monitoring of these caregivers.

© 2017 John Wiley & Sons Ltd.

DOI: 10.1111/cch.12464

PMID: 28497475



LA FONDATION MOTRICE . LA FONDATION PARALYSIE CEREBRALE

67 rue Vergniaud 75013 Paris

Tel.: + 33 1 45 54 063 03

secretariat@lafondationmotrice.org

<http://www.fondationparalysiecerebrale.org/>