

Science Infos

Paralysie Cérébrale

N°26 - AOUT 2016



Focus



La Fondation Motrice a lancé l'enquête nationale (ESPACE*) pour évaluer les soins reçus, besoins perçus, les priorités et améliorations attendues en Rééducation Motrice par les personnes atteintes de Paralysie Cérébrale et leur famille.

**Cette enquête a été initiée en Mai 2016
sous l'égide des sociétés savantes :**



et se terminera fin Décembre 2016

Nous avons besoin du soutien de tous pour stimuler la participation à cette enquête, n'hésitez pas à en parler autour de vous ...

Pour plus d'information

<http://www.fondationparalysiecerebrale.org>

*ESPACE : Enquête Satisfaction PARalysie CERébrale

1^{ÈRE} ENQUÊTE NATIONALE SUR LES SOINS REÇUS, BESOINS PERÇUS,
LES PRIORITÉS ET AMÉLIORATIONS ATTENDUES EN RÉÉDUCATION MOTRICE,
RAPPORTÉS PAR LES PERSONNES ATTEINTES DE PARALYSIE CÉRÉBRALE*
ET LEUR FAMILLE EN FRANCE



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sur la rééducation
motrice en
Paralysie
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*on utilise aussi les termes de PC et Infirmité Motrice Cérébrale (IMC).

Pour plus d'informations, consulter la brochure
ou le site de la Fondation Motrice.

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Manifestations et congrès

Septembre 2016

AACPDM 70th Annual Meeting

20-24 Septembre 2016
Hollywood, Florida, USA
<http://www.aacpdm.org/meetings/2016>

European paediatric stroke symposium

Neonatal Arteriel Ischemic Stroke (NAIS from birth to childhood)
21-22 septembre 2016
Saint Etienne, France
<http://www.chu-st-etienne.fr/avcpediatric/>
http://www.swiss-paediatrics.org/sites/default/files/2016.09.21_proamme_congres_avc_enfantv2.pdf

6th International Conference on Clinical Neonatology

22-24 Septembre 2016
Turin, Italie
<https://www.eiseverywhere.com/ehome/105597/234360/>

Octobre 2016

31ème Congrès de la Société française de Médecine Physique et de réadaptation (SOFMER)

13-15 Octobre 2016
Saint Etienne, France
<http://saint-etienne.sofmer2016.com/>

Novembre 2016

Journées d'études, Polyhandicap 2016

21-22 novembre 2016
Paris, France
<http://www.institutmc.org/index.php/journees-d-etudes-polyhandicap-2016-21-et-22-novembre-2016>

Décembre 2016

Innovation, Robotique et Santé : Assistance à la conduite de fauteuil roulant

Réseau Breizh Paralyse Cérébrale
9 décembre 2016
Rennes, France
<https://sites.google.com/site/innorobosante/>

Journées d'Etude annuelles du CDI

12-13 décembre 2016
Paris, France
<http://www.institutmc.org/index.php/journee-d-etude-annuelles-du-cdi-12-et-13-decembre-2016>

Mai 2017

29th Annual EACD Meeting,

17-20 mai 2017
Amsterdam, pays bas
<http://www.eacd2017.org/>

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

Epidémiologie

+Prévalence- Incidence

Decreasing prevalence in cerebral palsy: a multi-site European population-based study, 1980 to 2003.

Sellier E, Platt MJ, Andersen GL, Krägeloh-Mann I, De La Cruz J, Cans C; Surveillance of Cerebral Palsy Network. Collaborators: Van Bakel M, Arnaud C, Delobel M, Chalmers J, McManus V, Lyons A, Parkes J, Dolk H, Himmelmann K, Pahlman M, Dowding V, Colver A, Pennington L, Horridge K, Kurinczuk J, Surman G, Udall P, Rackauskaite G, Torrioli M, Marcelli M, Julsen Hollung S, Bottos M, Gaffney G, Pallas C, Neubauer D, Jekovec-Vrhovšek M, Virella D, Andrada M, Greitane A, Hollody K, Sigurdardottir S, Einarsson I, Honold M, Rostasy K, Mejaski-Bosnjak V. *Dev Med Child Neurol.* 2016 Jan;58(1):85-92. doi: 10.1111/dmcn.12865. Epub 2015 Aug 28. Comment in *Dev Med Child Neurol.* 2016 Jan;58(1):14.

AIM: To monitor the trends in prevalence of cerebral palsy (CP) by birthweight in Europe, 1980 to 2003.

METHOD: Data were collated from 20 population-based registers contributing to the Surveillance of Cerebral Palsy in Europe database. Trend analyses were conducted in four birthweight groups: <1000g (extremely low birthweight [ELBW]); 1000 to 1499g (very low birthweight [VLBW]); 1500 to 2499g (moderately low birthweight [MLBW]); and >2499g (normal birthweight [NBW]).

RESULTS: The overall prevalence of CP decreased from 1.90 to 1.77 per 1000 live births, $p < 0.001$, with a mean annual fall of 0.7% (95% confidence interval [CI] -0.3% to -1.0%). Prevalence in NBW children showed a non-significant trend from 1.17 to 0.89 per 1000 live births ($p = 0.22$). Prevalence in MLBW children decreased from 8.5 to 6.2 per 1000 live births ($p < 0.001$), but not linearly. Prevalence in VLBW children also declined from 70.9 to 35.9 per 1000 live births ($p < 0.001$) with a mean annual fall of 3.4% (95% CI -2.4% to -4.3%). Prevalence in ELBW children remained stable, at a mean rate of 42.4 per 1000 live births.

INTERPRETATION: The decline in prevalence of CP in children of VLBW continues, and confirms that previously reported. For the first time, there is also a significant decline among those of MLBW, resulting in a significant overall decrease in the prevalence of CP.

© 2015 Mac Keith Press.

DOI: 10.1111/dmcn.12865

PMID: 26330098 [PubMed - 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 Aug 1. doi: 10.1001/jamapediatrics.2016.1210. [Epub ahead of print]

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 [PubMed - as supplied by publisher]

Prevalence and Causes of Paralysis-United States, 2013.

Armour BS, Courtney-Long EA, Fox MH, Fredine H, Cahill A.

Am J Public Health. 2016 Aug 23:e1-e3. [Epub ahead of print]

OBJECTIVES: To estimate the prevalence and causes of functional paralysis in the United States.

METHODS: We used the 2013 US Paralysis Prevalence & Health Disparities Survey to estimate the prevalence of paralysis, its causes, associated sociodemographic characteristics, and health effects among this population.

RESULTS: Nearly 5.4 million persons live with paralysis. Most persons with paralysis were younger than 65 years (72.1%), female (51.7%), White (71.4%), high school graduates (64.8%), married or living with a partner (47.4%), and unable to work (41.8%). Stroke is the leading cause of paralysis, affecting 33.7% of the population with paralysis, followed by spinal cord injury (27.3%), multiple sclerosis (18.6%), and cerebral palsy (8.3%).

CONCLUSIONS: According to the functional definition, persons living with paralysis represent a large segment of the US population, and two thirds of them are between ages 18 and 64 years. Targeted health promotion that uses inclusion strategies to account for functional limitations related to paralysis can be undertaken in partnership with state and local health departments. (*Am J Public Health.* Published online ahead of print August 23, 2016: e1-e3.

doi:10.2105/AJPH.2016.303270).

Science Infos Paralyse Cérébrale, Août 2016, FONDATION PARALYSIE CEREBRALE, 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

Facteurs de risque – Causes

Intake of Caffeinated Soft Drinks before and during Pregnancy, but Not Total Caffeine Intake, Is Associated with Increased Cerebral Palsy Risk in the Norwegian Mother and Child Cohort Study.

Tollånes MC, Strandberg-Larsen K, Eichelberger KY, Moster D, Lie RT, Brantsæter AL, Meltzer HM, Stoltenberg C, Wilcox AJ

J Nutr. 2016 Aug 3. pii: jn232272. [Epub ahead of print]

BACKGROUND: Postnatal administration of caffeine may reduce the risk of cerebral palsy (CP) in vulnerable low-birth-weight neonates. The effect of antenatal caffeine exposure remains unknown.

OBJECTIVE: We investigated the association of intake of caffeine by pregnant women and risk of CP in their children.

METHODS: The study was based on The Norwegian Mother and Child Cohort Study, comprising >100,000 live-born children, of whom 222 were subsequently diagnosed with CP. Mothers reported their caffeine consumption in questionnaires completed around pregnancy week 17 (102,986 mother-child pairs), week 22 (87,987 mother-child pairs), and week 30 (94,372 mother-child pairs). At week 17, participants were asked about present and prepregnancy consumption. We used Cox regression models to estimate associations between exposure [daily servings (1 serving = 125 mL) of caffeinated coffee, tea, and soft drinks and total caffeine consumption] and CP in children, with nonconsumers as the reference group. Models included adjustment for maternal age and education, medically assisted reproduction, and smoking, and for each source of caffeine, adjustments were made for the other sources.

RESULTS: Total daily caffeine intake before and during pregnancy was not associated with CP risk. High consumption (≥ 6 servings/d) of caffeinated soft drinks before pregnancy was associated with an increased CP risk (HR: 1.9; 95% CI: 1.2, 3.1), and children of women consuming 3-5 daily servings of caffeinated soft drinks during pregnancy weeks 13-30 also had an increased CP risk (HR: 1.7; 95% CI: 1.1, 2.8). A mean daily consumption of 51-100 mg caffeine from soft drinks during the first half of pregnancy was associated with a 1.9-fold increased risk of CP in children (HR: 1.9; 95% CI: 1.1, 3.6).

CONCLUSIONS: Maternal total daily caffeine consumption before and during pregnancy was not associated with CP risk in children. The observed increased risk with caffeinated soft drinks warrants further investigation.

© 2016 American Society for Nutrition.

DOI: 10.3945/jn.116.232272

PMID: 27489007 [PubMed - as supplied by publisher]

Long-Term Cognitive Outcomes of Birth Asphyxia and the Contribution of Identified Perinatal Asphyxia to Cerebral Palsy.

Pappas A, Korzeniewski SJ.

Clin Perinatol. 2016 Sep;43(3):559-72. doi: 10.1016/j.clp.2016.04.012.

Neonatal encephalopathy among survivors of presumed perinatal asphyxia is recognized as an important cause of cerebral palsy (CP) and neuromotor impairment. Recent studies suggest that moderate to severe neonatal encephalopathy contributes to a wide range of neurodevelopmental and cognitive impairments among survivors with and without CP. Nearly 1 of every 4 to 5 neonates treated with hypothermia has or develops CP. Neonatal encephalopathy is diagnosed in only approximately 10% of all cases. This article reviews the long-term cognitive outcomes of children with presumed birth asphyxia and describes what is known about its contribution to CP.

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DOI: 10.1016/j.clp.2016.04.012

PMID: 27524454 [PubMed - in process]

Neurodevelopmental outcomes of premature infants with severe intraventricular hemorrhage.

Calisici E, Eras Z, Oncel MY, Oguz SS, Gokce İK, Dilmen U.

J Matern Fetal Neonatal Med. 2015;28(17):2115-20. doi:10.3109/14767058.2014.979783. Epub 2014 Nov 14.

OBJECTIVE: Our objective was to determine the neurodevelopmental outcome at 18-24 months' of corrected age (CA) in preterm infants with severe intraventricular hemorrhage (IVH).

METHODS: This was a retrospective cohort study of all preterm infants who were <37 weeks' gestation, had Grade 3-4 IVH, were admitted between January 2009 and December 2010 and discharged. The cohort was divided into three groups. Group 1 was defined as infants born with a birth weight (BW) less than 1000 g, group 2 was defined as infants born with a BW between 1000 and 1500 g and group 3 was defined as infants born with a BW between 1501 and 2500 g. Severe IVH was defined as the presence of grade 3-4 IVH on cranial ultrasound. Cranial ultrasound was performed in the first week of life and subsequently at weekly intervals by a radiologist. A comprehensive assessment including hearing, vision, neurological and developmental evaluation with Bayley Scales of Infant Development, Second edition was performed by the experienced researchers at 18-24 months' CA. Neurodevelopmental impairment (NDI) was defined as at the presence of one or more of the following: cerebral palsy; Mental Developmental Index score lower than 70; Psychomotor Developmental Index score lower than 70; bilateral hearing impairment; or bilateral blindness.

RESULTS: From January 2009 to December 2010, a total of 138 infants were diagnosed as severe IVH (grade 3-4). Of them, 74 (71.1%) infants (group 1 = 31, group 2 = 29 and group 3 = 14 infants) completed the follow-up visit and evaluated at 18-24 months' CA. Median Apgar score ($p < 0.01$) and resuscitation at birth ($p < 0.01$) were significantly different for groups 1-3. The use of catheterization, need for mechanical ventilation, need for phototherapy, retinopathy of premature and bronchopulmonary dysplasia were significantly higher in group 1 compared to groups 2 and 3 ($p < 0.001$, $p < 0.001$, $p < 0.01$, $p < 0.01$ and $p = 0.014$, respectively). The duration of hospitalization and mortality rates consistent with the degree of prematurity were significantly higher in group 1 compared to groups 2 and 3 ($p = 0.03$ and $p = 0.01$). Among the long-term outcomes, the rates of CP and NDI did not differ between the groups ($p = 0.68$ and $p = 0.068$).

CONCLUSION: Our results demonstrated that long-term outcomes of preterm infants did not differ between the groups classified according to the BW at two years of age. This has led to the conclusion that severe IVH is alone represents a significant risk factor for poor neurodevelopmental outcome in this already high-risk population.

DOI: 10.3109/14767058.2014.979783

PMID: 25354288 [PubMed - indexed for MEDLINE]

Neurological sequelae of healthcare-associated sepsis in very-low-birthweight infants: Umbrella review and evidence-based outcome tree.

Haller S, Deindl P, Cassini A, Suetens C, Zingg W, Abu Sin M, Velasco E, Weiss B, Ducomble T, Sixtensson M, Eckmanns T, Harder T.

Euro Surveill. 2016;21(8). doi: 10.2807/1560-7917.ES.2016.21.8.30143.

Sepsis is a frequent cause of death in very-low-birthweight infants and often results in neurological impairment. Its attributable risk of sequelae has not been systematically assessed. To establish an outcome tree for mapping the burden of neonatal sepsis, we performed systematic literature searches to identify systematic reviews addressing sequelae of neonatal sepsis. We included cohort studies and performed meta-analyses of attributable risks. Evidence quality was assessed using GRADE. Two systematic reviews met inclusion criteria. The first included nine cohort studies with 5,620 participants and five outcomes (neurodevelopmental impairment, cerebral palsy, vision impairment, hearing impairment, death). Pooled risk differences varied between 4% (95% confidence interval (CI):2-10) and 13% (95% CI:5-20). From the second review we analysed four studies with 472 infants. Positive predictive value of neurodevelopmental impairment for later cognitive impairment ranged between 67% (95% CI:22-96) and 83% (95% CI:36-100). Neonatal sepsis increases risk of permanent neurological impairment. Effect size varies by outcome, with evidence quality being low to very low. Data were used to construct an outcome tree for neonatal sepsis. Attributable risk estimates for sequelae following neonatal sepsis are suitable for burden estimation and may serve as outcome parameters in interventional studies.

DOI: 10.2807/1560-7917.ES.2016.21.8.30143

PMID: 26940884 [PubMed - indexed for MEDLINE]

+Données fondamentales

Concurrent decrease of brain white matter tracts' thicknesses and fractional anisotropy after antenatal hypoxia-ischemia detected with tract-based spatial statistics analysis.

Drobyshevsky A

J Magn Reson Imaging. 2016 Aug 9. doi: 10.1002/jmri.25407. [Epub ahead of print] PubMed PMID: 27505718.

PURPOSE: To examine the extent of gray and white matter (WM) injury following global antenatal hypoxia-ischemia (H-I) and resulting in muscle hypertonia in newborns in a rabbit cerebral palsy model.

MATERIALS AND METHODS: Rabbit dams (n = 15) underwent uterine ischemia procedure resulting in a global fetal H-I at embryonic day 22 (embryonic 22 days gestation). Newborn's brains underwent high resolution diffusion tensor imaging on a 14 Tesla magnet ex vivo. Fractional anisotropy (FA) in brains of hypertonic (n = 9), nonhypertonic (n = 6), and sham control (n = 5) kits were compared voxel-wise using Tract-Based Spatial Statistics (TBSS) approach. Herein, we used a novel method to assess local WM tracts' thicknesses in TBSS analysis and compare between the groups.

RESULTS: Significant (corrected P < 0.05) reduction of WM FA was found in corpus callosum splenium (91.2%), periventricular WM (83.5%), fimbria hippocampi (78.8%), cingulum (81.4%), anterior commissure (95%), internal capsule (83.2%), and optic tract (82.9%) in the hypertonic group. Significant (corrected P < 0.05) reduction in WM tracts' thicknesses was found in corpus callosum (73.3%), periventricular WM (82.5%), cingulum (73.4%), bilaterally in the hypertonic group.

CONCLUSION: WM injury in newborn hypertonic kits 10 days after global fetal H-I is widespread and involves not only motor but also limbic and commissural fibers in multiple regions. WM injury in newborn hypertonic kits is manifested by changes in microstructural properties and decreased FA, as well as reduction of WM volumes, relative to nonhypertonic kits. *J. Magn. Reson. Imaging* 2016.

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DOI: 10.1002/jmri.25407

PMID: 27505718 [PubMed - as supplied by publisher]

Neuronal self-injury mediated by IL-1 β and MMP-9 in a cerebral palsy model of severe neonatal encephalopathy induced by immune activation plus hypoxia-ischemia.

Savard A, Brochu ME, Chevin M, Guiraut C, Grbic D, Sébire G

J Neuroinflammation. 2015 May 30;12:111. doi: 10.1186/s12974-015-0330-8.

BACKGROUND: Inflammation due to remote pathogen exposure combined to hypoxia/ischemia (HI) is one of the most common causes of neonatal encephalopathy affecting at-term or near-term human newborn, which will consequently develop cerebral palsy. Within term-equivalent rat brains exposed to systemic lipopolysaccharide (LPS) plus HI, it was previously showed that neurons produce IL-1 β earlier than do glial cells, and that blocking IL-1 was neuroprotective. To further define the mechanisms whereby IL-1 exerts its neurotoxic effect, we hypothesize that IL-1 β plays a pivotal role in a direct and/or indirect mechanistic loop of neuronal self-injury through matrix metalloproteinase (MMP)-9.

METHODS: An established preclinical rat model of LPS+HI-induced neonatal encephalopathy was used. In situ hybridization, ELISA, and immunolabeling techniques were employed. Selective blocking compounds allowed addressing the respective roles of IL-1 and MMP-9.

RESULTS: In LPS+HI-exposed forebrains, neuronal IL-1 β was first detected in infarcted neocortical and striatal areas and later in glial cells of the adjacent white matter. Neuronal IL-1 β played a key role: (i) in the early post-HI exacerbation of neuroinflammation and (ii) in generating both core and penumbral infarcted cerebral areas. Systemically administered IL-1 receptor antagonist (IL-1Ra) reached the brain and bound to the neocortical and deep gray neuronal membranes. Then, IL-1Ra down-regulated IL-1 β mRNA and MMP-9 neuronal synthesis. Immediately post-HI, neuronal IL-1 β up-regulated cytokine-induced neutrophil chemoattractant (CINC-1), monocyte chemoattractant protein-1 (MCP-1), and inducible nitric oxide synthase. MMP-9 would disrupt the blood-brain barrier, which, combined to CINC-1 up-regulation, would play a role in polymorphonuclear cell (PMN) infiltration into

the LPS+HI-exposed brain. IL-1 β blockade prevented PMN infiltration and oriented the phenotype of macrophagic/microglial cells towards anti-inflammatory and neurotrophic M2 profile. IL-1 β increased the expression of activated caspase-3 and of receptor-interacting-protein (RIP)-3 within infarcted forebrain area. Such apoptotic and necroptotic pathway activations were prevented by IL-1Ra, as well as ensuing cerebral palsy-like brain damage and motor impairment.

CONCLUSIONS: This work uncovered a new paradigm of neuronal self-injury orchestrated by neuronal synthesis of IL-1 β and MMP-9. In addition, it reinforced the translational neuroprotective potential of IL-1 blockers to alleviate human perinatal brain injuries.

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DOI: 10.1186/s12974-015-0330-8

PMCID: PMC4449972

PMID: 26025257 [PubMed - indexed for MEDLINE]

Prenatal ischemia deteriorates white matter, brain organization, and function: implications for prematurity and cerebral palsy.

Coq Jo, Delcour M, Massicotte VS, Baud O, Barbe MF.

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:7-11. doi: 10.1111/dmcn.13040.

Cerebral palsy (CP) describes a group of neurodevelopmental disorders of posture and movement that are frequently associated with sensory, behavioral, and cognitive impairments. The clinical picture of CP has changed with improved neonatal care over the past few decades, resulting in higher survival rates of infants born very preterm. Children born preterm seem particularly vulnerable to perinatal hypoxia-ischemia insults at birth. Animal models of CP are crucial for elucidating underlying mechanisms and for development of strategies of neuroprotection and remediation. Most animal models of CP are based on hypoxia-ischemia around the time of birth. In this review, we focus on alterations of brain organization and functions, especially sensorimotor changes, induced by prenatal ischemia in rodents and rabbits, and relate these alterations to neurodevelopmental disorders found in preterm children. We also discuss recent literature that addresses the relationship between neural and myelin plasticity, as well as possible contributions of white matter injury to the emergence of brain dysfunctions induced by prenatal ischemia.

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DOI: 10.1111/dmcn.13040

PMCID: PMC4817365 [Available on 2017-03-01]

PMID: 27027601 [PubMed - indexed for MEDLINE]

Données cliniques

Implementation of an antenatal magnesium sulfate protocol for fetal neuroprotection in preterm infants.

Bouet PE, Brun S, Madar H, Baisson AL, Courtay V, Gascoin-Lachambre G, Lasocki S, Sentilhes L

Sci Rep. 2015 Sep 29;5:14732. doi: 10.1038/srep14732.

The aim of our study was to assess the feasibility of implementing a protocol for the use of magnesium sulfate to prevent cerebral palsy. This retrospective single-center study included all women with fetuses of gestational age <33 weeks of gestation whose birth was planned or expected within 24 hours from September 2011 to December 2012. They were to receive magnesium sulfate, administered intravenously as a 4-g bolus followed by a constant infusion of 1 g per hour. If delivery had not occurred after 12 hours and was no longer considered imminent, the infusion was to be discontinued. The study included 119 women, 81 (68.1%) of whom received magnesium sulfate. Among the latter, 71 (87.5%) gave birth within 24 hours. The reasons treatment was not given were: omission by medical team (19/38, 50%), urgent delivery (18/38, 47.4%), and contraindication to treatment (1/38, 2.6%). The mean gestational age at protocol implementation was 29.6 +/- 2.1 weeks. Maternal monitoring, especially at the onset of infusion, appeared suboptimal. No major maternal side effects were observed. Our study shows that implementing a protocol for prevention of cerebral palsy by magnesium sulfate is feasible in a tertiary obstetric center.

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DOI: 10.1038/srep14732

PMCID: PMC4586759

PMID: 26415713 [PubMed - indexed for MEDLINE]

Magnesium sulphate for fetal neuroprotection: benefits and challenges of a systematic knowledge translation project in Canada.

Teela KC, De Silva DA, Chapman K, Synnes AR, Sawchuck D, Basso M, Liston RM, von Dadelszen P, Magee LA; MAG-CP Collaborative Group.

BMC Pregnancy Childbirth. 2015 Dec 22;15:347. doi: 10.1186/s12884-015-0785-8.

BACKGROUND: Administration of magnesium sulphate (MgSO₄) to women with imminent preterm birth at <34 weeks is an evidence-based antenatal neuroprotective strategy to prevent cerebral palsy. Although a Society of Obstetricians and Gynaecologists of Canada (SOGC) national guideline with practice recommendations based on relevant clinical evidence exists, ongoing controversies about aspects of this treatment remain. Given this, we anticipated managed knowledge translation (KT) would be needed to facilitate uptake of the guidelines into practice. As part of the Canadian Institutes of Health Research (CIHR)-funded MAG-CP (MAGnesium sulphate to prevent Cerebral Palsy) project, we aimed to compare three KT methods designed to impact both individual health care providers and the organizational systems in which they work.

METHODS: The KT methods undertaken were an interactive online e-learning module available to all SOGC members, and at MAG-CP participating sites, on-site educational rounds and focus group discussions, and circulation of an anonymous 'Barriers and Facilitators' survey for the systematic identification of facilitators and barriers for uptake of practice change. We compared these strategies according to: (i) breadth of respondents reached; (ii) rates and richness of identified barriers, facilitators, and knowledge needed; and (iii) cost.

RESULTS: No individual KT method was superior to the others by all criteria, and in combination, they provided richer information than any individual method. The e-learning module reached the most diverse audience of health care providers, the site visits provided opportunity for iterative dialogue, and the survey was the least expensive. Although the site visits provided the most detailed information around individual and organizational barriers, the 'Barriers and Facilitators' survey provided more detail regarding social-level barriers. The facilitators identified varied by KT method. The type of knowledge needed was further defined by the e-learning module and surveys.

CONCLUSIONS: Our findings suggest that a multifaceted approach to KT is optimal for translating national obstetric guidelines into clinical practice. As audit and feedback are essential parts of the process by which evidence to practice gaps are closed, MAG-CP is continuing the iterative KT process described in this paper concurrent with tracking of MgSO₄ use for fetal neuroprotection and maternal and child outcomes until September 2015; results are anticipated in 2016.

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DOI: 10.1186/s12884-015-0785-8

PMCID: PMC4688933

PMID: 26694323 [PubMed - indexed for MEDLINE]

Motor and cognitive outcome after specific early lesions of the brain – a systematic review.

Hielkema T, Hadders-Algra M

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:46-52. doi: 10.1111/dmcn.13047.

The aim of this systematic review was to study motor and cognitive outcome in infants with severe early brain lesions and to evaluate effects of side of the lesion, sex, and social economic status on outcome. A literature search was performed using the databases Pubmed and Embase. Included studies involved infants with either cystic periventricular leukomalacia (cPVL), preterm, or term stroke (i.e. parenchymal lesion of the brain). Outcome was expressed as cerebral palsy (CP) and intellectual disability (mental retardation). Median prevalence rates of CP after cPVL, preterm, and term stroke were 86%, 71%, and 29% respectively; of intellectual disability 50%, 27%, and 33%. Most infants with cPVL developed bilateral CP, those with term stroke unilateral CP, whereas after preterm stroke bilateral and unilateral CP occurred equally often. Information on the effects of sex and social economic status on outcome after specific brain lesions was very limited. Our findings show that the risk for CP is high after cPVL, moderate after preterm stroke, and lowest after term stroke. The risk for intellectual disability after an early brain lesion is lower than that for CP. Predicting outcome at individual level remains difficult; new imaging techniques may improve predicting developmental trajectories.

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Science Infos Paralysie Cérébrale, Août 2016, FONDATION PARALYSIE CEREBRALE, 67 rue Vergniaud
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DOI: 10.1111/dmcn.13047

PMID: 27027607 [PubMed - indexed for MEDLINE]

Relationship between characteristics on magnetic resonance imaging and motor outcomes in children with cerebral palsy and white matter injury.

Reid SM, Ditchfield MR, Bracken J, Reddihough DS

Res Dev Disabil. 2015 Oct-Nov;45-46:178-87. doi: 10.1016/j.ridd.2015.07.030. Epub 2015 Aug 8.

In a population cohort of children with white matter injury (WMI) and cerebral palsy (CP), we aimed to describe the magnetic resonance imaging (MRI) characteristics, identify key structure-function relationships, and classify the severity of WMI in a clinically relevant way. Stratified on MRI laterality/symmetry, variables indicating the extent and location of cerebral abnormalities for 272 children with CP and WMI on chronic-phase MRI were related to gross motor function and motor topography using univariable and multivariable approaches. We found that symmetrical involvement, severe WM loss in the hemispheres and corpus callosum, and cerebellar involvement were the strongest predictors of poor gross motor function, but the final model explained only a small proportion of the variability. Bilateral, extensive WM loss was more likely to result in quadriplegia, whereas volume loss in the posterior-mid WM more frequently resulted in diplegia. The extent and location of MRI abnormalities differed according to laterality/symmetry; asymmetry was associated with less extensive hemispheric involvement than symmetrical WMI, and unilateral lesions were more focal and located more anteriorly. In summary, laterality/symmetry of WMI, possibly reflecting different pathogenic mechanisms, together with extent of WM loss and cerebellar abnormality predicted gross motor function in CP, but to a limited extent.

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DOI: 10.1016/j.ridd.2015.07.030

PMID: 26263404 [PubMed - indexed for MEDLINE]

The Neurological Outcome of Isolated PVL and Severe IVH in Preterm Infants: Is It Fair to Compare?

Al Rifai MT, Al Tawil KI

Pediatr Neurol. 2015 Nov;53(5):427-33. doi: 10.1016/j.pediatrneurol.2015.04.004. Epub 2015 May 22.

OBJECTIVE: We compared the neurological outcome of isolated periventricular leukomalacia and severe intraventricular hemorrhage in a cohort of very low birth weight infants born and managed at single tertiary-care center in Saudi Arabia.

METHODS: We undertook a descriptive retrospective chart review of the neurological status of very low birth weight infants who were born and managed over a 5-year period at King Abdulaziz Medical City, Riyadh. The neurological outcome of neonates with isolated periventricular leukomalacia and severe intraventricular hemorrhage (grades III and IV) was studied and compared in relation to developmental delay and cerebral palsy.

RESULTS: A total of 20 patients with isolated periventricular leukomalacia and 26 with severe intraventricular hemorrhage (grades III and IV) were identified for this study. Of 20 patients with isolated periventricular leukomalacia, 9 (45%) had good developmental outcome and 11 (55%) had bad developmental outcome. Of 26 patients of severe intraventricular hemorrhage, 14 (54%) had good developmental outcome and 12 (46%) had bad developmental outcome ($P = 0.55$). Significant motor neurological deficit affecting function is distributed as follows: 11/20 (55%) in the isolated periventricular leukomalacia group and 7/26 (27%) in the severe intraventricular hemorrhage group ($P = 0.05$). Cerebral palsy was diplegic in 7/11 (64%) and quadriplegic in 4/11 (36%) in the isolated periventricular leukomalacia group, and hemiplegic 3/7 (43%), diplegic in 1/7 (14%), and quadriplegic in 3/7 (43%) in the severe intraventricular hemorrhage group ($P = 0.03$). Distribution of the neurological outcome according to periventricular leukomalacia grade was as follows: for periventricular leukomalacia grade I ($n = 8$), 6/8 (75%) had good neurological outcome and 2/8 (25%) had bad neurological outcome. In periventricular leukomalacia grade II ($n = 4$), good neurological outcome was seen in three patients (75%) and bad neurological outcome was seen in one patient (25%). All patients ($n = 8$) with periventricular leukomalacia grade III had bad outcome ($P < 0.01$).

CONCLUSION: About half of patients with isolated periventricular leukomalacia and severe intraventricular hemorrhage had a poor developmental outcome. However, the severity of cerebral palsy was greater in the isolated periventricular leukomalacia patients and correlates highly with periventricular leukomalacia grade. Symmetrical

diplegic cerebral palsy is the most common motor deficit associated with isolated periventricular leukomalacia, whereas asymmetrical hemiplegic cerebral palsy is seen exclusively with severe intraventricular hemorrhage.

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DOI: 10.1016/j.pediatrneurol.2015.04.004

PMID: 26476149 [PubMed - indexed for MEDLINE]

Détection – Diagnostic

+Données fondamentales

Early Cord Metabolite Index and Outcome in Perinatal Asphyxia and Hypoxic-Ischaemic Encephalopathy.

Ahearne CE, Denihan NM, Walsh BH, Reinke SN, Kenny LC, Boylan GB, Broadhurst DI, Murray DM.

Neonatology. 2016 Aug 3;110(4):296-302. [Epub ahead of print]

BACKGROUND: A 1H-NMR-derived metabolomic index based on early umbilical cord blood alterations of succinate, glycerol, 3-hydroxybutyrate and O-phosphocholine has shown potential for the prediction of hypoxic-ischaemic encephalopathy (HIE) severity.

OBJECTIVE: To evaluate whether this metabolite score can predict 3-year neurodevelopmental outcome in infants with perinatal asphyxia and HIE, compared with current standard biochemical and clinical markers.

METHODS: From September 2009 to June 2011, infants at risk of perinatal asphyxia were recruited from a single maternity hospital. Cord blood was drawn and biobanked at delivery. Neonates were monitored for development of encephalopathy both clinically and electrographically. Neurodevelopmental outcome was assessed at 36-42 months using the Bayley Scales of Infant and Toddler Development, ed. III (BSID-III). Death and cerebral palsy were also considered as abnormal end points.

RESULTS: Thirty-one infants had both metabolomic analysis and neurodevelopmental outcome at 36-42 months. No child had a severely abnormal BSID-III result. The metabolite index significantly correlated with outcome ($\chi^2_{1,2} = 0.30, p < 0.01$), which is robust to predict both severe outcome (area under the receiver operating characteristic curve: 0.92, $p < 0.01$) and intact survival (0.80, $p = 0.01$). There was no correlation between the index score and performance in the individual BSID-III subscales (cognitive, language, motor).

CONCLUSIONS: The metabolite index outperformed other standard biochemical markers at birth for prediction of outcome at 3 years, but was not superior to EEG or the Sarnat score.

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DOI: 10.1159/000446556

PMID: 27486995 [PubMed - as supplied by publisher]

+Données cliniques

Does general movements quality in term infants predict cerebral palsy and milder forms of limited mobility at 6 years?

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

Dev Med Child Neurol. 2016 Aug 13. doi: 10.1111/dmcn.13228. [Epub ahead of print]

AIM: To evaluate in term infants associations between quality of general movements and developmental outcome in term infants at 6 years with either cerebral palsy (CP) or limited mobility without CP.

METHOD: Participants of this prospective study were 145 term infants (86 male, 59 female). Their general movements quality was assessed at 'writhing' and 'fidgety' general movements age (3wks and 13wks post term). The assessment at 6 years consisted of a neurological examination, including assessment of minor neurological dysfunction (MND), evaluation of mobility with the Movement Assessment Battery for Children, and of behaviour and learning problems with questionnaires.

RESULTS: Definitely abnormal general movements at writhing age were not associated with CP, whereas definitely abnormal general movements at fidgety age were (sensitivity 60%; specificity 91%; positive predictive value 19%,

negative predictive value 98%). In children without CP, general movements quality was not associated with limited mobility, but it was associated to a minor extent with MND.

INTERPRETATION: In term infants, definitely abnormal general movements at fidgety age do predict CP, but with lower accuracy than in preterm infants. General movements quality does not predict limited mobility in children without CP. The study supports suggestions that predictive value of general movements assessment in term infants is lower than that in preterm infants.

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DOI: 10.1111/dmnc.13228

PMID: 27521054 [PubMed - as supplied by publisher]

Early identification of motor delay: Family-centred screening tool.

Harris SR

Can Fam Physician. 2016 Aug;62(8):629-32.

OBJECTIVE: To describe the Harris Infant Neuromotor Test (HINT), an infant neuromotor test using Canadian norms published in 2010 that could be used to screen for motor delay during the first year of life.

QUALITY OF EVIDENCE: Extensive research has been published on the intrarater, interrater, and test-retest reliability and the content, concurrent, predictive, and known-groups validity of the HINT, as well as on the sensitivity, specificity, and positive and negative predictive values of parental concerns, as assessed by the HINT. Most evidence is level II.

MAIN MESSAGE: Diagnosing motor delays during the first year of life is important because these often indicate more generalized developmental delays or specific disabilities, such as cerebral palsy. Parental concerns about their children's motor development are strongly predictive of subsequent diagnoses involving motor delay.

CONCLUSION: Only through early identification of developmental motor delays, initially with screening tools such as the HINT, is it possible to provide referrals for early intervention that could benefit both the infant and the family.

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PMID: 27521388 [PubMed - in process]

Neurodevelopmental outcome after neonatal perforator stroke.

Ecury-Goossen GM, van der Haer M, Smit LS, Feijen-Roon M, Lequin M, de Jonge RC, Govaert P, Dudink J

Dev Med Child Neurol. 2016 Jan;58(1):49-56. doi: 10.1111/dmnc.12857. Epub 2015 Jul 26.

Comment in Dev Med Child Neurol. 2016 Jan;58(1):8-9.

AIM: To assess outcome after neonatal perforator stroke in the largest cohort to date.

METHOD: Survivors from a cohort of children diagnosed with neonatal perforator stroke using cranial ultrasound or magnetic resonance imaging were eligible for inclusion. Recovery and Recurrence Questionnaire score, presence of cerebral palsy (CP), and crude outcome were assessed, specifically (1) the ability to walk independently, (2) participation in regular education, and (3) the presence of epilepsy.

RESULTS: Thirty-seven patients (20 males, 17 females) aged 3 to 14 years (mean age 8y) were included in the study: 14 with isolated single perforator stroke, four with multiple isolated perforator strokes, and 19 with additional brain injury. Out of 18 children with isolated perforator stroke(s), four had CP, one could not walk independently, and one developed epilepsy. The posterior limb of the internal capsule was involved in four out of 18 patients; three of these patients had CP. Of 19 children with additional brain injury, 11 had CP and three were not able to walk independently. Three out of nine children with concomitant cortical middle cerebral artery stroke developed epilepsy.

INTERPRETATION: Perforator stroke patterns can be of use in predicting long-term outcome and for guiding counselling and surveillance. Motor outcome was favourable in children with isolated perforator stroke(s), except when the posterior limb of the internal capsule was involved.

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DOI: 10.1111/dmnc.12857

PMID: 26212612 [PubMed - indexed for MEDLINE]

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 \geq 0.5) if 2 ophthalmologists independently agreed after an ophthalmoscopic examination. Inter-rater reliability was excellent.

RESULTS: Mean age at examination was 10.98 \pm 6.49years; mean gestational period was 33.26 \pm 4.78weeks. 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 \pm 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.

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DOI: 10.1016/j.jns.2016.06.029

PMID: 27538596 [PubMed - in process]

Prognostic significance of neurological signs in high-risk infants - a systematic review.

Hamer EG, Hadders-Algra M

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:53-60. doi: 10.1111/dmcn.13051.

The aim of this paper was to systematically review the literature on the significance of specific neurological signs in infancy, in particular in infants at risk for developmental problems such as cerebral palsy (CP). A literature search was performed using the databases PubMed, Embase, Web of Science, and AMED. Papers on infantile reactions ('primitive reflexes') and postural reactions were included if data were available allowing for calculation of sensitivity, specificity, or positive and negative predictive value for CP or atypical developmental outcome. Our search identified 23 articles on 20 different neurological signs. Properties of six neurological signs were reported in at least three different papers. The data indicated that, in early infancy, an absent Moro or plantar grasp response may be predictive for adverse developmental outcome. After early infancy, persistence of the Moro response and asymmetric tonic neck reflex was clinically significant. Prediction of a delayed emergence of the parachute reaction increases with age. Abnormal performances on the pull-to-sit manoeuvre and vertical suspension test have predictive significance throughout infancy. The neurological signs reviewed have some predictive value in infants at risk. For most of the signs, criteria for abnormality and significance are age-dependent.

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DOI: 10.1111/dmcn.13051

Motricité - Mobilité – Posture

A systematic review of evidence-based assessment practices by allied health practitioners for children with cerebral palsy.

O'Connor B, Kerr C, Shields N, Imms C.

Dev Med Child Neurol. 2016 Apr;58(4):332-47. doi: 10.1111/dmcn.12973. Epub 2015 Dec 9.

Comment in *Dev Med Child Neurol.* 2016 Apr;58(4):321.

AIM: The routine use of psychometrically robust assessment tools is integral to best practice. This systematic review aims to determine the extent to which evidence-based assessment tools were used by allied health practitioners for children with cerebral palsy (CP).

METHOD: The Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocols 2015 was employed. A search strategy applied the free text terms: 'allied health practitioner', 'assessment', and 'cerebral palsy', and related subject headings to seven databases. Included articles reported assessment practices of occupational therapists, physiotherapists, or speech pathologists working with children with CP aged 0 to 18 years, published from the year 2000.

RESULTS: Fourteen articles met the inclusion criteria. Eighty-eight assessment tools were reported, of which 23 were in high use. Of these, three tools focused on gross motor function and had acceptable validity for use with children with CP: Gross Motor Function Measure, Gross Motor Function Classification System, and goniometry. Validated tools to assess other activity components, participation, quality of life, and pain were used infrequently or not at all.

INTERPRETATION: Allied health practitioners used only a few of the available evidence-based assessment tools. Assessment findings in many areas considered important by children and families were rarely documented using validated assessment tools.

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DOI: 10.1111/dmcn.12973

PMID: 26645152 [PubMed - indexed for MEDLINE]

A Nonlinear Model for Mouse Pointing Task Movement Time Analysis Based on Both System and Human Effects.

Almanji A, Payne AR, Amor R, Davies TC.

IEEE Trans Neural Syst Rehabil Eng. 2015 Nov;23(6):1003-11. doi: 10.1109/TNSRE.2014.2377692. Epub 2014 Dec 18.

This paper provides a detailed model for analyzing movement time performance during rapid goal-directed point-and-click motions with a computer mouse. Twelve typically developed individuals and eleven youths with cerebral palsy conducted point and click computer tasks from which the model was developed. The proposed model is nonlinear and based on both system (target width and movement amplitude) and human effects (erroneous clicks, number of submovements, number of slip-offs, curvature index, and average speed). To ensure successful targeting by youths with cerebral palsy, the index of difficulty was limited to a range of 1.58 - 3.0 bits. For consistency, the same range was used with both groups. The most significant contributing human effect to movement time was found to be the curvature index for both typically developed individuals and individuals with cerebral palsy. This model will assist in algorithm development to improve cursor speed and accuracy for youths with cerebral palsy.

DOI: 10.1109/TNSRE.2014.2377692

PMID: 25532208 [PubMed - indexed for MEDLINE]

Bimanual Capacity of Children With Cerebral Palsy: Intra- and Interrater Reliability of a Revised Edition of the Bimanual Fine Motor Function Classification.

Elvrum AG, Beckung E, Sæther R, Lydersen S, Vik T, Himmelmann K.

Phys Occup Ther Pediatr. 2016 Aug 26:1-12. [Epub ahead of print]

AIMS: To develop a revised edition of the Bimanual Fine Motor Function (BFMF 2), as a classification of fine motor capacity in children with cerebral palsy (CP), and establish intra- and interrater reliability of this edition.

METHODS: The content of the original BFMF was discussed by an expert panel, resulting in a revised edition comprising the original description of the classification levels, but in addition including figures with specific explanatory text. Four professionals classified fine motor function of 79 children (3-17 years; 45 boys) who represented all subtypes of CP and Manual Ability Classification levels (I-V). Intra- and inter-rater reliability was assessed using overall intra-class correlation coefficient (ICC), and Cohen's quadratic weighted kappa.

RESULTS: The overall ICC was 0.86. Cohen's weighted kappa indicated high intra-rater (κ_w : >0.90) and inter-rater (κ_w : >0.85) reliability.

CONCLUSIONS: The revised BFMF 2 had high intra- and interrater reliability. The classification levels could be determined from short video recordings (<5 minutes), using the figures and precise descriptions of the fine motor function levels included in the BFMF 2. Thus, the BFMF 2 may be a feasible and useful classification of fine motor capacity both in research and in clinical practice.

DOI: 10.1080/01942638.2016.1185507

PMID: 27563732 [PubMed - as supplied by publisher]

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Differentiation of hand posture to object shape in children with unilateral spastic cerebral palsy.

Wolff AL, Raghavan P, Kaminski T, Hillstrom HJ, Gordon AM

Res Dev Disabil. 2015 Oct-Nov;45-46:422-30. doi: 10.1016/j.ridd.2015.07.002. Epub 2015 Jul 18.

Quantifying hand-shaping in children with unilateral spastic cerebral palsy (USCP) is the first step in understanding hand posture differentiation. To quantify this ability and determine how hand posture evolves during reach toward various object shapes in children with unilateral spastic cerebral palsy (USCP), 2 groups of children (10 typically developing, and 10 USCP, ages 6-13) were studied in a single-session cross-sectional study. Subjects grasped rectangular, concave, and convex objects with each hand. Metacarpal and proximal interphalangeal joint finger flexion and finger abduction angles were calculated. The extent to which hand posture reflects object shape was calculated using a "visuomotor efficiency (VME) index" (a score of 100 reflects perfect discrimination between objects). A mixed design ANOVA with repeated measures on time was used to compare the VME between groups. Children with USCP demonstrated a lower VME than controls in the affected hand, indicating less effective hand-shaping; $p < .01$. There was also a difference between groups in the evolution of VME throughout reach; $p < .01$. No difference in hand-shaping in the less affected hand in USCP was observed. Analysis of joint angles at contact and VME throughout reach demonstrated that children with USCP differentiated their hand posture to objects of different shapes, but demonstrated deficits in the timing and magnitude of hand-shaping isolated to the affected side. The present study suggests it may be important to consider the quality of hand activity using quantitative approaches such as VME analyses. Rehabilitation approaches that target these deficits to improve joint mobility and motor control are worth testing.

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DOI: 10.1016/j.ridd.2015.07.002

PMID: 26198126 [PubMed - indexed for MEDLINE]

Does muscle coactivation influence joint excursions during gait in children with and without hemiplegic cerebral palsy? Relationship between muscle coactivation and joint kinematics.

Gross R, Leboeuf F, Hardouin JB, Perrouin-Verbe B, Brochard S, Rémy-Néris O.

Clin Biomech (Bristol, Avon). 2015 Dec;30(10):1088-93. doi: 10.1016/j.clinbiomech.2015.09.001. Epub 2015 Sep 8.

BACKGROUND: The theoretical role of muscle coactivation is to stiffen joints. The aim of this study was to assess the relationship between muscle coactivation and joint excursions during gait in children with and without hemiplegic cerebral palsy.

METHODS: Twelve children with hemiplegic cerebral palsy and twelve typically developing children underwent gait analysis at three different gait speeds. Sagittal hip, knee, and ankle kinematics were divided into their main components corresponding to joint excursions. A coactivation index was calculated for each excursion from the electromyographic envelopes of the rectus femoris/semiotendinosus, vastus medialis/semiotendinosus, or tibialis anterior/soleus muscles. Mixed linear analyses of covariance modeled joint excursions as a function of the coactivation index and limb.

FINDINGS: In typically developing children, increased coactivation was associated with reduced joint excursion for 8 of the 14 linear models (hip flexion, knee loading, knee extension in stance, knee flexion in swing, ankle plantarflexion from initial contact to foot-flat, ankle dorsiflexion in stance and in swing). Conversely, ankle plantarflexion excursion at push-off increased with increasing tibialis anterior/soleus coactivation. In the involved limbs of the children with cerebral palsy, knee loading, ankle plantarflexion at push off, and ankle dorsiflexion in swing decreased, while hip extension increased, with increasing muscle coactivation.

INTERPRETATION: The relationships between muscle coactivation and joint excursion were not equally distributed in both groups, and predominant in typically developing children. The results suggest that excessive muscle coactivation is not a cause of stiff-knee gait in children with hemiplegic cerebral palsy, but appears to be related to spastic drop foot.

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DOI: 10.1016/j.clinbiomech.2015.09.001

PMID: 26377949 [PubMed - indexed for MEDLINE]

Elbow Kinematics During Gait Improve With Age in Children With Hemiplegic Cerebral Palsy.

Gordon BL, Wolff AL, Daluiski A.
J Pediatr Orthop. 2016 Jul 29. [Epub ahead of print]

BACKGROUND: Children with hemiplegic cerebral palsy (hCP) exhibit a typical posture of elbow flexion during gait. However, the change in elbow kinematics and symmetry during gait across age span in both hCP and typically developing (TD) children is not well described. The aim of this study was to quantify the change in elbow kinematics and symmetry across age span in hCP children compared with TD children.

METHODS: Upper extremity kinematic data were extracted and analyzed from a database for gait studies performed between 2009 and 2015. A total of 35 hCP and 51 TD children between the ages of 4 and 18 (mean age: TD=11.2±0.6, hCP=9.8±0.5) met inclusionary criteria. The groups were further subdivided into 3 age categories: 4 to 7, 8 to 11, 12+ years old. Elbow angles were extracted and peak elbow flexion, overall range of motion during gait, and asymmetry indices were calculated. A 1-way analysis of variance was performed on each group with post hoc Tukey honestly significant difference pairwise comparisons.

RESULTS: Peak elbow flexion during gait increased with age in TD children ($P<0.05$) and decreased with age in hCP children on the affected side ($P<0.05$). There was no change on the less affected side of hCP children. TD children demonstrated significantly less elbow flexion (mean=51.9±2.1 deg.) compared with the affected side in hCP (mean=82.1±3.8 deg.) across all age categories ($P<0.05$). There was no change in elbow asymmetry index (0=perfect symmetry) across age in either controls or hCP children; however, there were differences between hCP and TD groups in younger age groups (TD=28, hCP=62, $P<0.05$) that resolved by adolescence (TD=32, hCP=40).

CONCLUSIONS: During gait, hCP children have greater peak elbow flexion on the affected side than do TD children. Peak elbow flexion angle converged between the 2 groups with age, decreasing in hCP children and increasing in TD children. Furthermore, elbow symmetry during gait improves with age in hCP children, approximating symmetry of TD children by adolescence. These findings have implications for both consideration and optimal timing of surgical intervention to improve elbow flexion in children with hCP.

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

DOI: 10.1097/BPO.0000000000000842

PMID: 27479191 [PubMed - as supplied by publisher]

Gastrocnemius muscle-tendon interaction during walking in typically-developing adults and children, and in children with spastic cerebral palsy.

Kalsi G, Fry NR, Shortland AP

J Biomech. 2016 Aug 8. pii: S0021-9290(16)30852-1. doi: 10.1016/j.jbiomech.2016.07.038. [Epub ahead of print]

BACKGROUND: Our understanding of the interaction of muscle bellies and their tendons in individuals with muscle pathology is limited. Knowledge of these interactions may inform us of the effects of musculoskeletal pathologies on muscle-tendon dynamics and the subsequent neurological control strategies used in gait. Here, we investigate gastrocnemius muscle-tendon interaction in typically-developing (TD) adults and children, and in children with spastic cerebral palsy (SCP).

METHODS: We recruited six TD adults (4 female; mean age: 34 yrs. (24-54)), eight TD children (5 female; mean age: 10 yrs. (6-12)) and eight independently ambulant children with SCP (5 female; mean age 9 yrs. (6-12); 3 unilaterally-affected). A combination of 3D motion capture and 2D real-time ultrasound imaging were used to compute the gastrocnemius musculo-tendinous unit (MTU) length and estimate muscle belly and tendon lengths during walking. For the TD subjects, the measurements were made for heel-toe walking and voluntary toe-walking.

RESULTS: The gastrocnemius muscle bellies of children with SCP lengthened during single support ($p = 0.003$). In contrast, the muscle bellies of TD subjects did not demonstrate an increase in length over the period of single support under heel-toe or toe-walking conditions.

CONCLUSION: We observed lengthening of the gastrocnemius muscle bellies in children with SCP during single support, a phase of the gait cycle in which the muscle is reported consistently to be active. Repeated lengthening of muscle bellies while they are active may lead to muscle damage and have implications for the natural history of gait in this group.

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DOI: 10.1016/j.jbiomech.2016.07.038

PMID: 27545082 [PubMed - as supplied by publisher]

Hand function assessment in the first years of life in unilateral cerebral palsy: Correlation with neuroimaging and cortico-spinal reorganization.

Baranello G, Rossi Sebastiano D, Pagliano E, Visani E, Ciano C, Fumarola A, Arnoldi MT, Corlatti A, Foscan M, Marchi A, Erbetta A, Riva D

Eur J Paediatr Neurol. 2016 Jan;20(1):114-24. doi: 10.1016/j.ejpn.2015.09.005. Epub 2015 Sep 25.

AIM: The purpose of the present study was to correlate early hand function assessment during the first years of life with neuroimaging findings and the different patterns of cortico-motor reorganization in children with unilateral cerebral palsy (UCP).

METHODS: We conducted a long prospective observational study, in which 17 children with UCP (8 left-sided hemiplegia; Manual Ability Classification System level 1-3) were first assessed at a mean age of 24 months (range 18-28), and followed up by means of the Besta Scale, a new standardized protocol assessing both unimanual and bimanual hand function. They also underwent Melbourne Assessment of Unilateral Upper Limb Function (MUUL) and single-pulse Transcranial Magnetic Stimulation (TMS) at a mean age of 10 years 5 months (range 9 y 1 m-12 y 8 m). Brain MRIs of all the 17 children were independently assessed and scored by two blinded observers, according to a defined protocol. Possible correlations between hand function at first assessment, neuroimaging and TMS data were analyzed.

RESULTS: Early hand function impairment significantly correlated with the extension of brain damage ($\rho = -0.531$, $p = 0.028$), number of involved areas ($\rho = -0.608$, $p = 0.010$), presence of radiological signs of cortico-spinal degeneration ($\rho = -0.628$, $p = 0.007$), and basal ganglia involvement ($\rho = -0.485$, $p = 0.049$). Additionally, higher hand function scores (i.e. better hand function) at first assessment significantly correlated with contralateral cortico-spinal projections, while lower scores significantly correlated with either mixed or ipsilateral cortico-spinal projections to the affected hand ($\chi^2(2) = 11.418$, $p = 0.003$; post-hoc tests: contralateral TMS group versus ipsilateral: $Z = -2.943$, $p = 0.002$ and contralateral TMS group versus mixed: $Z = -2.775$, $p = 0.006$).

CONCLUSIONS: To our knowledge, this is the first study correlating hand function assessment in the first years of life, and its evolution over time, with neuroimaging and cortico-spinal projection patterns in children with UCP. These findings could contribute to an improved prediction of prognosis and a better delineation of therapeutic interventions in young children with UCP.

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DOI: 10.1016/j.ejpn.2015.09.005

PMID: 26439103 [PubMed - indexed for MEDLINE]

Managing the maintenance of gait stability during dual walking task: effects of age and neurological disorders.

Tramontano M, Morone G, Curcio A, Temperoni G, Medici A, Morelli D, Caltagirone C, Paolucci S, Iosa M.

Eur J Phys Rehabil Med. 2016 Aug 30. [Epub ahead of print]

BACKGROUND: Dual task paradigm is common mechanism of daily life, it is often used for investigating the effect on cognitive processing of motor behavior.

AIM: In the present study we investigate the dual task interference during walking on upright gait stability.

DESIGN: cross-sectional study.

SETTING: Inpatient neurorehabilitation unit and children neurorehabilitation unit.

POPULATION: Eighty-five subjects were enrolled, divided into five groups: healthy young, healthy elderly, children with typical development, children with cerebral palsy and adults with stroke in subacute phase.

METHODS: All subjects had to walk through a pathway during which they had to hear a sound, turn the head to watch a number and verbalize it. Subjects wore an accelerometer on their lumbar spine to measure upright gait stability have been assessed by means of the Root Mean Square (RMS) of the trunk acceleration.

RESULTS: All subjects showed a reduced speed when performing a dual task with respect to single task. This reduction was significantly different among groups ($F(4,81)=12.253$, $p<0.001$, $ES=0.377$). The RMS resulted increased along LL-axis, and reduced along AP- and CC-axes during the dual task walking.

CONCLUSION: These accelerations were significantly related to the changes in speed that were managed in a different way in subjects affected by cerebral palsy and stroke.

CLINICAL REHABILITATION IMPACT: The information obtained in this study may be used to support specific rehabilitation techniques in subjects with poor balance ability.

PMID: 27575014 [PubMed - as supplied by publisher]

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Mechanical and material properties of the plantarflexor muscles and Achilles tendon in children with spastic cerebral palsy and typically developing children.

Theis N, Mohagheghi AA, Korff T.

J Biomech. 2016 Jul 26. pii: S0021-9290(16)30788-6. doi: 10.1016/j.jbiomech.2016.07.020. [Epub ahead of print]

BACKGROUND: Children with spastic cerebral palsy (CP) experience secondary musculoskeletal adaptations, affecting the mechanical and material properties of muscles and tendons. CP-related changes in the spastic muscle are well documented whilst less is known about the tendon. From a clinical perspective, it is important to understand alterations in tendon properties in order to tailor interventions or interpret clinical tests more appropriately. The main purpose of this study was to compare the mechanical and material properties of the Achilles tendon in children with cerebral palsy to those of typically developing children.

METHODS: Using a combination of ultrasonography and motion analysis, we determined tendon mechanical properties in ten children with spastic cerebral palsy and ten aged-matched typically developing children. Specifically, we quantified muscle and tendon stiffness, tendon slack length, tendon strain, cross-sectional area, Young's Modulus and the strain rate dependence of tendon stiffness.

FINDINGS: Children with CP had a greater muscle to tendon stiffness ratio compared to typically developing children. Despite a smaller tendon cross-sectional area and greater tendon slack length, no group differences were observed in tendon stiffness or Young's Modulus. The slope describing the stiffness strain-rate response was steeper in children with cerebral palsy.

INTERPRETATION: These results provide us with a more differentiated understanding of the muscle and tendon mechanical properties, which would be relevant for future research and paediatric clinicians.

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DOI: 10.1016/j.jbiomech.2016.07.020

PMID: 27515440 [PubMed - as supplied by publisher]

Motor function levels and pelvic parameters in walking or ambulating children with cerebral palsy.

Bernard JC, Deceuninck J, Leroy-Coudeville S, Loustalet E, Morel E, Combey A, Sutton J, Berthonnaud E, Chaléat-Valayer E

Ann Phys Rehabil Med. 2014 Aug-Sep;57(6-7):409-21. doi: 10.1016/j.rehab.2014.06.004. Epub 2014 Jun 25.

BACKGROUND: In children with cerebral palsy, spinal equilibrium and pelvic strategies may vary according to the functional status.

OBJECTIVES: To study the relationship between motor function and pelvic and spinal parameters in a population of children and adolescents with cerebral palsy (rated from level I to level IV on Gross Motor Function Classification System [GMFCS]). A sagittal X-ray of the spine in the standing position was analyzed with Optispine(®) software.

RESULTS: The study population comprised 114 children and adolescents (mean [range] age: 12.35 [4-17]). For the study population as a whole, there were significant overall correlations between the GMFCS level on one hand and pelvic incidence and pelvic tilt (PT) on the other ($P=0.013$ and 0.021 , respectively).

DISCUSSION: Pelvic parameters vary according to the GMFCS level but do not appear to affect spinal curvature. The sacrum is positioned in front of the head of the femur (i.e. negative PT) in GMFCS level I and progressively moves backwards (i.e. positive PT) in GMFCS levels II, III and IV.

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DOI: 10.1016/j.rehab.2014.06.004

PMID: 25127064 [PubMed - indexed for MEDLINE]

Multilevel Upper Body Movement Control during Gait in Children with Cerebral Palsy.

Summa A, Vannozzi G, Bergamini E, Iosa M, Morelli D, Cappozzo A

PLoS One. 2016 Mar 21;11(3):e0151792. doi: 10.1371/journal.pone.0151792. eCollection 2016.

Upper body movements during walking provide information about balance control and gait stability. Typically developing (TD) children normally present a progressive decrease of accelerations from the pelvis to the head, whereas children with cerebral palsy (CP) exhibit a general increase of upper body accelerations. However, the

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literature describing how they are transmitted from the pelvis to the head is lacking. This study proposes a multilevel motion sensor approach to characterize upper body accelerations and how they propagate from pelvis to head in children with CP, comparing with their TD peers. Two age- and gender-matched groups of 20 children performed a 10m walking test at self-selected speed while wearing three magneto-inertial sensors located at pelvis, sternum, and head levels. The root mean square value of the accelerations at each level was computed in a local anatomical frame and its variation from lower to upper levels was described using attenuation coefficients. Between-group differences were assessed performing an ANCOVA, while the mutual dependence between acceleration components and the relationship between biomechanical parameters and typical clinical scores were investigated using Regression Analysis and Spearman's Correlation, respectively ($\alpha = 0.05$). New insights were obtained on how the CP group managed the transmission of accelerations through the upper body. Despite a significant reduction of the acceleration from pelvis to sternum, children with CP do not compensate for large accelerations, which are greater than in TD children. Furthermore, those with CP showed negative sternum-to-head attenuations, in agreement with the documented rigidity of the head-trunk system observed in this population. In addition, the estimated parameters proved to correlate with the scores used in daily clinical practice. The proposed multilevel approach was fruitful in highlighting CP-TD gait differences, supported the in-field quantitative gait assessment in children with CP and might prove beneficial to designing innovative intervention protocols based on pelvis stabilization.

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DOI: 10.1371/journal.pone.0151792

PMCID: PMC4801392

PMID: 26999362 [PubMed - indexed for MEDLINE]

Postural variability and sensorimotor development in infancy.

Dusing SC

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:17-21. doi: 10.1111/dmcn.13045.

Infants develop skills through a coupling between their sensory and motor systems. Newborn infants must interpret sensory information and use it to modify movements and organize the postural control system based on the task demands. This paper starts with a brief review of evidence on the use of sensory information in the first months of life, and describes the importance of movement variability and postural control in infancy. This introduction is followed by a review of the evidence for the interactions between the sensory, motor, and postural control systems in typically development infants. The paper highlights the ability of young infants to use sensory information to modify motor behaviors and learn from their experiences. Last, the paper highlights evidence of atypical use of sensory, motor, and postural control in the first months of life in infants who were born preterm, with neonatal brain injury or later diagnosed with cerebral palsy (CP).

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DOI: 10.1111/dmcn.13045

PMID: 27027603 [PubMed - indexed for MEDLINE]

Predicting Missing Marker Trajectories in Human Motion Data Using Marker Intercorrelations.

Gløersen Ø, Federolf P

PLoS One. 2016 Mar 31;11(3):e0152616. doi: 10.1371/journal.pone.0152616. eCollection 2016.

Missing information in motion capture data caused by occlusion or detachment of markers is a common problem that is difficult to avoid entirely. The aim of this study was to develop and test an algorithm for reconstruction of corrupted marker trajectories in datasets representing human gait. The reconstruction was facilitated using information of marker inter-correlations obtained from a principal component analysis, combined with a novel weighting procedure. The method was completely data-driven, and did not require any training data. We tested the algorithm on datasets with movement patterns that can be considered both well suited (healthy subject walking on a treadmill) and less suited (transitioning from walking to running and the gait of a subject with cerebral palsy) to reconstruct. Specifically, we created 50 copies of each dataset, and corrupted them with gaps in multiple markers at random temporal and spatial positions. Reconstruction errors, quantified by the average Euclidian distance between predicted and measured marker positions, was ≤ 3 mm for the well suited dataset, even when there were gaps in up to 70% of all time frames. For the less suited datasets, median reconstruction errors were in the range 5-6 mm. However, a few reconstructions had substantially larger errors (up to 29 mm). Our results suggest that the proposed algorithm is a viable alternative both to conventional gap-filling algorithms and state-of-the-art

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reconstruction algorithms developed for motion capture systems. The strengths of the proposed algorithm are that it can fill gaps anywhere in the dataset, and that the gaps can be considerably longer than when using conventional interpolation techniques. Limitations are that it does not enforce musculoskeletal constraints, and that the reconstruction accuracy declines if applied to datasets with less predictable movement patterns.

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DOI: 10.1371/journal.pone.0152616

PMCID: PMC4816448

PMID: 27031243 [PubMed - indexed for MEDLINE]

Preliminary study of novel, timed walking tests for children with spina bifida or cerebral palsy.

Kane KJ, Lanovaz J, Bisaro D, Oates A, Musselman KE

SAGE Open Med. 2016 Jul 11;4:2050312116658908. doi: 10.1177/2050312116658908. eCollection 2016.

OBJECTIVE: Walking assessment is an important aspect of rehabilitation practice; yet, clinicians have few psychometrically sound options for evaluating walking in highly ambulatory children. The purpose of this study was to evaluate the validity and reliability of two new measures of walking function—the Obstacles and Curb tests—relative to the 10-Meter Walk test and Timed Up and Go test in children with spina bifida or cerebral palsy.

METHODS: A total of 16 ambulatory children with spina bifida (n=9) or cerebral palsy (n=7) (9 boys; mean age 7y ears, 7months; standard deviation 3years, 4months) and 16 age- and gender-matched typically developing children participated. Children completed the walking tests, at both self-selected and fast speeds, twice. To evaluate discriminative validity, scores were compared between typically developing and spina bifida/cerebral palsy groups. Within the spina bifida/cerebral palsy group, inter-test correlations evaluated convergent validity and intraclass correlation coefficients evaluated within-session test-retest reliability.

RESULTS: At fast speeds, all tests showed discriminative validity ($p < 0.006$ for typically developing and spina bifida/cerebral palsy comparisons) and convergent validity ($\rho = 0.81-0.90$, $p \leq 0.001$, for inter-test correlations). At self-selected speeds, only the Obstacles test discriminated between groups ($p = 0.001$). Moderately strong correlations ($\rho = 0.73-0.78$, $p \leq 0.001$) were seen between the 10-Meter Walk test, Curb test, and Timed Up and Go test. Intraclass correlation coefficients ranged from 0.81 to 0.97, with higher test-retest reliability for tests performed at fast speeds rather than self-selected speeds.

CONCLUSION: The Obstacles and Curb tests are promising measures for assessing walking in this population. Performing tests at fast walking speeds may improve their validity and test-retest reliability for children with spina bifida/cerebral palsy.

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DOI: 10.1177/2050312116658908

PMCID: PMC4959299

PMID: 27493754 [PubMed]

Prognostic Predictors for Ambulation in Thai Children With Cerebral Palsy Aged 2 to 18 Years.

Keeratisiroj O, Thawinchai N, Siritarativat W, Buntragulpoontawee M

J Child Neurol. 2015 Nov;30(13):1812-8. doi: 10.1177/0883073815582267. Epub 2015 Apr 28.

The objectives of this study were to determine prognostic predictors for ambulation among Thai children with cerebral palsy and identify their ambulatory status. A retrospective cohort study was performed at 6 special schools or hospitals for children with physical disabilities. The prognostic predictors for ambulation were analyzed by multivariable ordinal continuation ratio logistic regression. The 533 participants aged 2 to 18 years were divided into 3 groups: 186 with independent ambulation (Gross Motor Function Classification System [GMFCS I-II]), 71 with assisted ambulation (Gross Motor Function Classification System III), and 276 with nonambulation (Gross Motor Function Classification System IV-V). The significant positive predictors for ambulation were type of cerebral palsy (spastic diplegia, spastic hemiplegia, dyskinesia, ataxia, hypotonia, and mixed type), sitting independently at age 2 years, and eating independently. These predictors were used to develop clinical scoring for predicting the future ability to walk among Thai children with cerebral palsy.

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DOI: 10.1177/0883073815582267

PMID: 25922262 [PubMed - indexed for MEDLINE]

Relationships between Isometric Muscle Strength, Gait Parameters, and Gross Motor Function Measure in Patients with Cerebral Palsy.

Shin HI, Sung KH, Chung CY, Lee KM, Lee SY, Lee IH, Park MS

Yonsei Med J. 2016 Jan;57(1):217-24. doi: 10.3349/ymj.2016.57.1.217.

Erratum in *Yonsei Med J.* 2016 May;57(3):807.

PURPOSE: This study investigated the correlation between isometric muscle strength, gross motor function, and gait parameters in patients with spastic cerebral palsy and to find which muscle groups play an important role for gait pattern in a flexed knee gait.

MATERIALS AND METHODS: Twenty-four ambulatory patients (mean age, 10.0 years) with spastic cerebral palsy who were scheduled for single event multilevel surgery, including distal hamstring lengthening, were included. Preoperatively, peak isometric muscle strength was measured for the hip flexor, hip extensor, knee flexor, and knee extensor muscle groups using a handheld dynamometer, and three-dimensional (3D) gait analysis and gross motor function measure (GMFM) scoring were also performed. Correlations between peak isometric strength and GMFM, gait kinematics, and gait kinetics were analyzed.

RESULTS: Peak isometric muscle strength of all muscle groups was not related to the GMFM score and the gross motor function classification system level. Peak isometric strength of the hip extensor and knee extensor was significantly correlated with the mean pelvic tilt ($r=-0.588$, $p=0.003$ and $r=-0.436$, $p=0.033$) and maximum pelvic obliquity ($r=-0.450$, $p=0.031$ and $r=-0.419$, $p=0.041$). There were significant correlations between peak isometric strength of the knee extensor and peak knee extensor moment in early stance ($r=0.467$, $p=0.021$) and in terminal stance ($r=0.416$, $p=0.043$).

CONCLUSION: There is no correlation between muscle strength and gross motor function. However, this study showed that muscle strength, especially of the extensor muscle group of the hip and knee joints, might play a critical role in gait by stabilizing pelvic motion and decreasing energy consumption in a flexed knee gait.

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DOI: 10.3349/ymj.2016.57.1.217

PMCID: PMC4696956

PMID: 26632404 [PubMed - indexed for MEDLINE]

Reliability of timed walking tests and temporo-spatial gait parameters in youths with neurological gait disorders.

Graser JV, Letsch C, van Hedel HJ

BMC Neurol. 2016 Jan 31;16:15. doi: 10.1186/s12883-016-0538-y.

BACKGROUND: The 10-Meter Walk Tests (10MWT) and the 6-Minute Walk Test (6MinWT) are applied to assess gait capacity in paediatric patients. To better objectify changes in qualitative aspects of gait, temporo-spatial parameters like stride length or step symmetry could be simultaneously assessed with a GAITRite system. Reliability has not yet been evaluated in a heterogeneous sample of children with various neurological gait disorders such as is representative for paediatric neuro-rehabilitation. The aim of this study was to assess test-retest reliability of the 10MWT, the 6MinWT and simultaneously recorded gait parameters captured with the GAITRite system in children with neurological gait disorders.

METHODS: This is a cross-sectional study with two measurement time-points. Thirty participants (9 females; mean (standard deviation) age 13.0 (3.6) years, 10 with cerebral palsy, 6 after stroke, among other diagnoses) performed the 10MWT at preferred (10MWT_{pref}) and maximum speed (10MWT_{max}) and the 6MinWT on two occasions (mean time interval: 7.0 (1.9) days). Relative reliability was quantified with an intra-class correlation coefficient (ICC); the measurement error reflecting absolute reliability was quantified with the standard error of measurement and the smallest real difference.

RESULTS: ICCs of timed walking tests (time measured with a stopwatch, step count for the 10MWT and walking distance for the 6MinWT) ranged from 0.89-0.97. ICCs of temporo-spatial gait parameters ranged from 0.81-0.95 (10MWT_{pref}), from 0.61-0.90 (10MWT_{max}) and from 0.88-0.97 (6MinWT). In general, absolute reliability was greatest in the 6MinWT.

CONCLUSION: Timed walking tests and temporo-spatial gait parameters obtained from the GAITRite system appear reliable in children with neurological gait disorders. However, especially in children with poorer walking ability, the reliability of temporo-spatial parameters might have been positively influenced, as unclear steps had to be removed using the GAITRite software. As absolute reliability is rather low, the responsiveness of these measures needs to be further evaluated.

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DOI: 10.1186/s12883-016-0538-y

PMCID: PMC4736644

PMID: 26830919 [PubMed - indexed for MEDLINE]

Reliability of the modified Gross Motor Function Measure-88 (GMFM-88) for children with both Spastic Cerebral Palsy and Cerebral Visual Impairment: A preliminary study.

Salavati M, Krijnen WP Rameckers EA, Looijestijn PL, Maathuis CG, van der Schans CP, Steenberg B
Res Dev Disabil. 2015 Oct-Nov;45-46:32-48. doi: 10.1016/j.ridd.2015.07.013. Epub 2015 Jul 25.

PURPOSE: The aims of this study were to adapt the Gross Motor Function Measure-88 (GMFM-88) for children with Cerebral Palsy (CP) and Cerebral Visual Impairment (CVI) and to determine the test-retest and interobserver reliability of the adapted version.

METHOD: Sixteen paediatric physical therapists familiar with CVI participated in the adaptation process. The Delphi method was used to gain consensus among a panel of experts. Seventy-seven children with CP and CVI (44 boys and 33 girls, aged between 50 and 144 months) participated in this study. To assess test-retest and interobserver reliability, the GMFM-88 was administered twice within three weeks (Mean=9 days, SD=6 days) by trained paediatric physical therapists, one of whom was familiar with the child and one who wasn't. Percentages of identical scores, Cronbach's alphas and intraclass correlation coefficients (ICC) were computed for each dimension level.

RESULTS: All experts agreed on the proposed adaptations of the GMFM-88 for children with CP and CVI. Test-retest reliability ICCs for dimension scores were between 0.94 and 1.00, mean percentages of identical scores between 29 and 71, and interobserver reliability ICCs of the adapted GMFM-88 were 0.99-1.00 for dimension scores. Mean percentages of identical scores varied between 53 and 91. Test-retest and interobserver reliability of the GMFM-88-CVI for children with CP and CVI was excellent. Internal consistency of dimension scores lay between 0.97 and 1.00.

CONCLUSION: The psychometric properties of the adapted GMFM-88 for children with CP and CVI are reliable and comparable to the original GMFM-88.

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DOI: 10.1016/j.ridd.2015.07.013

PMID: 26210850 [PubMed - indexed for MEDLINE]

Restricted Arm Swing Affects Gait Stability and Increased Walking Speed Alters Trunk Movements in Children with Cerebral Palsy.

Delabastita T, Desloovere K, Meyns P

Front Hum Neurosci. 2016 Jul 15;10:354. doi: 10.3389/fnhum.2016.00354. eCollection 2016.

Observational research suggests that in children with cerebral palsy, the altered arm swing is linked to instability during walking. Therefore, the current study investigates whether children with cerebral palsy use their arms more than typically developing children, to enhance gait stability. Evidence also suggests an influence of walking speed on gait stability. Moreover, previous research highlighted a link between walking speed and arm swing. Hence, the experiment aimed to explore differences between typically developing children and children with cerebral palsy taking into account the combined influence of restricting arm swing and increasing walking speed on gait stability. Spatiotemporal gait characteristics, trunk movement parameters and margins of stability were obtained using three dimensional gait analysis to assess gait stability of 26 children with cerebral palsy and 24 typically developing children. Four walking conditions were evaluated: (i) free arm swing and preferred walking speed; (ii) restricted arm swing and preferred walking speed; (iii) free arm swing and high walking speed; and (iv) restricted arm swing and high walking speed. Double support time and trunk acceleration variability increased more when arm swing was restricted in children with bilateral cerebral palsy compared to typically developing children and children with unilateral cerebral palsy. Trunk sway velocity increased more when walking speed was increased in children with unilateral cerebral palsy compared to children with bilateral cerebral palsy and typically developing children and in children with bilateral cerebral palsy compared to typically developing children. Trunk sway velocity increased more when both arm swing was restricted and walking speed was increased in children with bilateral cerebral palsy compared to typically developing children. It is proposed that facilitating arm swing during gait rehabilitation can improve gait stability and decrease trunk movements in children with cerebral palsy. The current results thereby partly support the suggestion that facilitating arm swing in specific situations possibly enhances safety and reduces the risk of falling in children with cerebral palsy.

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DOI: 10.3389/fnhum.2016.00354

PMCID: PMC4945643

PMID: 27471457 [PubMed]

Spared Primary Motor Cortex and The Presence of MEP in Cerebral Palsy Dictate the Responsiveness to tDCS during Gait Training.

Grecco LA(1), Oliveira CS(2), Galli M(3), Cosmo C(4), Duarte Nde A(2), Zanon N(5), Edwards DJ(6), Fregni F
Front Hum Neurosci. 2016 Jul 19;10:361. doi: 10.3389/fnhum.2016.00361. eCollection 2016.

The current priority of investigations involving transcranial direct current stimulation (tDCS) and neurorehabilitation is to identify biomarkers associated with the positive results of the interventions such that respondent and non-respondent patients can be identified in the early phases of treatment. The aims were to determine whether: (1) present motor evoked potential (MEP); and (2) injuries involving the primary motor cortex, are associated with tDCS-enhancement in functional outcome following gait training in children with cerebral palsy (CP). We reviewed the data from our parallel, randomized, sham-controlled, double-blind studies. Fifty-six children with spastic CP received gait training (either treadmill training or virtual reality training) and tDCS (active or sham). Univariate and multivariate logistic regression analyses were employed to identify clinical, neurophysiologic and neuroanatomic predictors associated with the responsiveness to treatment with tDCS. MEP presence during the initial evaluation and the subcortical injury were associated with positive effects in the functional results. The logistic regression revealed that present MEP was a significant predictor for the six-minute walk test (6MWT; $p = 0.003$) and gait speed ($p = 0.028$), whereas the subcortical injury was a significant predictor of gait kinematics ($p = 0.013$) and gross motor function ($p = 0.021$). In this preliminary study involving children with CP, two important prediction factors of good responses to anodal tDCS combined with gait training were identified. Apparently, MEP (integrity of the corticospinal tract) and subcortical location of the brain injury exerted different influences on aspects related to gait, such as velocity and kinematics.

Free PMC Article

DOI: 10.3389/fnhum.2016.00361

PMCID: PMC4949210

PMID: 27486393 [PubMed]

The clinimetric properties of aerobic and anaerobic fitness measures in adults with cerebral palsy: A systematic review of the literature.

Lennon N, Thorpe D, Balemans AC, Fragala-Pinkham M, O'Neil M, Bjornson K, Boyd R, Dallmeijer AJ
Res Dev Disabil. 2015 Oct-Nov;45-46:316-28. doi: 10.1016/j.ridd.2015.08.002. Epub 2015 Aug 27.

OBJECTIVE: To analyze the clinimetric properties of maximal aerobic and anaerobic fitness measurement protocols in adults with cerebral palsy (CP).

DATA SOURCES: A systematic search through March 2015 of databases PubMed, Embase, SPORTDiscus and PsycINFO was performed with medical subject heading terms for 'cerebral palsy' combined with search terms adults or adolescents and multiple text words for fitness and exercise tests that yielded 864 articles.

STUDY SELECTION: Abstracts were screened by two reviewers to identify use of maximal fitness measurements in adolescents (14-18yrs) or adults (>18yrs) with CP of all abilities. Ninety-four articles were reviewed. No studies of adolescent (14-18yrs) qualified. Eight articles reported clinimetric properties for adults with CP who walk or propel a wheelchair independently. Five articles reported on aerobic capacity, one reported on anaerobic capacity and two reported on both.

DATA EXTRACTION: Methodological quality of the studies was rated using portions of the COSMIN (COnsensus-based Standards for the selection of health status Measurement INstruments) checklist. Quality of the measurement protocols was evaluated based on statistical strength of the clinimetrics. Synthesis of the overall evidence was based on the Cochrane review group guidelines which combine methodological quality and statistical strength.

DATA SYNTHESIS: Eight articles reported on 4 aerobic and 1 anaerobic protocols. Overall synthesis revealed that for ambulatory adults with CP there is (i) moderate evidence for good reliability and good construct validity of maximal aerobic and anaerobic cycle tests, (ii) moderate evidence for good criterion validity of sub-maximal aerobic cycle tests, and (iii) strong evidence for poor criterion validity of the six-minute walk test as a maximal aerobic test. And

for adults who propel a wheelchair there is limited evidence of good reliability for maximal aerobic wheelchair ergometer tests.

CONCLUSIONS: Limited quality research exists on the clinimetric properties of aerobic and anaerobic capacity measures for adults with CP who have independent mobility. Quality aerobic and anaerobic measures for adults with more severe mobility impairments are absent.

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DOI: 10.1016/j.ridd.2015.08.002

PMID: 26296079 [PubMed - indexed for MEDLINE]

The role of exaggerated patellar tendon reflex in knee joint position sense in patients with cerebral palsy.

Manikowska F, Chen BP, Józwiak M, Lebedowska MK

Res Dev Disabil. 2015 Oct-Nov;45-46:253-60. doi: 10.1016/j.ridd.2015.07.021. Epub 2015 Aug 26.

The aim of this pilot study was to determine if exaggerated patellar tendon jerk affects knee joint position sense (JPS) in cerebral palsy (CP) patients, by comparing JPS of the knee between participants with normal and exaggerated reflexes. The thresholds for reflex classification were based upon the data from able-bodied volunteers. JPS was measured as the ability of a subject (with eyes closed) to replicate a knee joint position demonstrated by an examiner. Tendon jerk was measured as the moment of force in response to patellar tendon taps. Data was collected from 27 limbs of CP patients (N=14) and 36 limbs of able-bodied volunteers (N=18). JPS was less accurate ($p=0.014$) in limbs with non-exaggerated reflexes ($50.28\pm 43.63\%$) than in control limbs ($11.84\pm 10.85\%$). There was no significant difference ($p=0.08$) in JPS accuracy between limbs with exaggerated reflexes ($18.66\pm 15.50\%$) and control limbs. Our data suggests that one component of sensorimotor impairment, JPS, is not as commonly affected in CP patients as previously reported. JPS of the knee is reduced in limbs with non-exaggerated reflexes; however in limbs with exaggerated reflexes which is seen in the majority of CP patients, JPS is not affected.

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DOI: 10.1016/j.ridd.2015.07.021

PMID: 26280690 [PubMed - indexed for MEDLINE]

Translation and construct validity of the Trunk Control Measurement Scale in children and youths with brain lesions.

Mitteregger E, Marsico P, Balzer J, van Hedel HJ

Res Dev Disabil. 2015 Oct-Nov;45-46:343-52. doi: 10.1016/j.ridd.2015.08.007. Epub 2015 Aug 27.

Trunk control is essential for the performance of everyday tasks. Children with neurological impairments such as cerebral palsy (CP) or acquired brain injury (ABI) commonly show impaired trunk control, which leads to restriction in functional activities. The aim of this study was to provide construct validity of the German version of the Trunk Control Measurement Scale (TCMS). We investigated convergent and discriminant construct validity by comparing the TCMS with the Gross Motor Function Classification System (GMFCS) and the modified Timed up and Go (mTUG). Several TCMS items were validated with force plate measurements. The centre of pressure (COP) parameters included the standard deviation of amplitude, the COP displacement and the area. Fifty-two children with CP and ten children with ABI (mean age 10.9 years 4.9 months, range 5-18 years, GMFCS levels I-IV) participated. Spearman rank correlation coefficients calculated between the TCMS and the GMFCS and mTUG amounted to -0.75 and -0.42, respectively. Validating TCMS items with COP parameters was difficult. Nevertheless, the results support the validity of the TCMS in children with brain lesions. This study provides paediatric therapists working in German speaking countries with a valid tool to assess impaired trunk control in these children. Although originally designed for children with CP, our results show that the TCMS may also be applicable to children with ABI, but more research is needed on a larger population.

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DOI: 10.1016/j.ridd.2015.08.007

PMID: 26298042 [PubMed - indexed for MEDLINE]

Validation of hip joint center localization methods during gait analysis using 3D EOS imaging in typically developing and cerebral palsy children.

Assi A, Sauret C, Massaad A, Bakouny Z, Pillet H, Skalli W, Ghanem I

Gait Posture. 2016 Jul;48:30-5. doi: 10.1016/j.gaitpost.2016.04.028. Epub 2016 Apr 30.

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Localization of the hip joint center (HJC) is essential in computation of gait data. EOS low dose biplanar X-rays have been shown to be a good reference in evaluating various methods of HJC localization in adults. The aim is to evaluate predictive and functional techniques for HJC localization in typically developing (TD) and cerebral palsy (CP) children, using EOS as an image based reference. Eleven TD and 17 CP children underwent 3D gait analysis. Six HJC localization methods were evaluated in each group bilaterally: 3 predictive (Plug in Gait, Bell and Harrington) and 3 functional methods based on the star arc technique (symmetrical center of rotation estimate, center transformation technique and geometrical sphere fitting). All children then underwent EOS low dose biplanar radiographs. Pelvis, lower limbs and their corresponding external markers were reconstructed in 3D. The center of the femoral head was considered as the reference (HJCEOS). Euclidean distances between HJCs estimated by each of the 6 methods and the HJCEOS were calculated; distances were shown to be lower in predictive compared to functional methods ($p < 0.0001$). Contrarily to findings in adults, functional methods were shown to be less accurate than predictive methods in TD and CP children, which could be mainly due to the shorter thigh segment in children. Harrington method was shown to be the most accurate in the prediction of HJC (mean error ≈ 18 mm, SD=9mm) and quasi-equivalent to the Bell method. The bias for each method was quantified, allowing its correction for an improved HJC estimation.

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DOI: 10.1016/j.gaitpost.2016.04.028

PMID: 27477704 [PubMed - in process]

Cognition

Anticipatory control and spatial cognition in locomotion and navigation through typical development and in cerebral palsy.

Belmonti V, Cioni G, Berthoz A

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:22-7. doi: 10.1111/dmcn.13044.

Behavioural evidence, summarized in this narrative review, supports a developmental model of locomotor control based on increasing neural integration of spatial reference frames. Two consistent adult locomotor behaviours are head stabilization and head anticipation: the head is stabilized to gravity and leads walking direction. This cephalocaudal orienting organization aligns gaze and vestibula with a reference frame centred on the upcoming walking direction, allowing anticipatory control on body kinematics, but is not fully developed until adolescence. Walking trajectories and those of hand movements share many aspects, including power laws coupling velocity to curvature, and minimized spatial variability. In fact, the adult brain can code trajectory geometry in an allocentric reference frame, irrespective of the end effector, regulating body kinematics thereafter. Locomotor trajectory formation, like head anticipation, matures in early adolescence, indicating common neurocomputational substrates. These late-developing control mechanisms can be distinguished from biomechanical problems in children with cerebral palsy (CP). Children's performance on a novel navigation test, the Magic Carpet, indicates that typical navigation development consists of the increasing integration of egocentric and allocentric reference frames. In CP, right-brain impairment seems to reduce navigation performance due to a maladaptive left-brain sequential egocentric strategy. Spatial integration should be considered more in rehabilitation.

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DOI: 10.1111/dmcn.13044

PMID: 27027604 [PubMed - indexed for MEDLINE]

The influence of errors during practice on motor learning in young individuals with cerebral palsy.

van Abswoude F, Santos-Vieira B, van der Kamp J, Steenbergen B

Res Dev Disabil. 2015 Oct-Nov;45-46:353-64. doi: 10.1016/j.ridd.2015.08.008. Epub 2015 Aug 27.

The aim of this study was to investigate the effect of errors during practice on motor skill learning in young individuals with cerebral palsy (CP). Minimizing errors has been validated in typically developing children and children with intellectual disabilities as a method for implicit learning, because it reduces working memory involvement during learning. The present study assessed whether a practice protocol that aims at minimizing errors can induce implicit learning in young individuals with CP as well. Accordingly, we hypothesized that reducing errors during practice would lead to enhanced learning and a decrease in the dependency of performance on working

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memory. Young individuals with CP practiced an aiming task following either an error-minimizing (N=20) or an error-strewn (N=18) practice protocol. Aiming accuracy was assessed in pre-, post- and retention test. Dual task performance was assessed to establish dependency on working memory. The two practice protocols did not invoke different amounts or types of learning in the participants with CP. Yet, participants improved aiming accuracy and showed stable motor performance after learning, irrespective of the protocol they followed. Across groups the number of errors made during practice was related to the amount of learning, and the degree of conscious monitoring of the movement. Only participants with relatively good working memory capacity and a poor initial performance showed a rudimentary form of (most likely, explicit) learning. These new findings on the effect of the amount of practice errors on motor learning in children of CP are important for designing interventions for children and adolescents with CP.

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DOI: 10.1016/j.ridd.2015.08.008

PMID: 26299638 [PubMed - indexed for MEDLINE]

Traitement - Rééducation motrice et cognitive

Management of cerebral palsy varies by healthcare region.

Rackauskaite G, Uldall PW, Bech BH, Østergaard JR.

Dan Med J. 2015 Nov;62(11):A5152.

INTRODUCTION: Cerebral palsy (CP) is the most common type of motor disability in childhood. The aim of the present paper was to describe regional differences in the management of CP in school-aged children in Denmark.

METHODS: This was a cross-sectional study based on the Danish Cerebral Palsy Registry. The parents of 462 children answered a questionnaire about their child's treatment and the family's characteristics. Descriptive and logistic regression analyses were performed for every treatment modality, stratified by the Gross Motor Function Classification System (GMFCS) level and adjusted for family and child characteristics.

RESULTS: Significant regional differences were found regarding the provision of occupational therapy at all GMFCS levels, speech therapy at GMFCS levels II-V and orthopaedic surgery at GMFCS levels I and III-V. No regional differences were observed in the frequency of physiotherapy. We found no regional differences in the severity of disability.

CONCLUSIONS: Regional differences in the management of CP cannot be explained by social differences or differences in the severity of the disability.

FUNDING: This study was funded by the Research Foundation from the Central Denmark Region and the Department of Clinical Medicine at Aarhus University Hospital, the Augustinus Foundation, the Beveca Foundation, the Dagmar Marshalls Foundation, the Ludvig and Sara Elsass Foundation, and the Civil Engineer Frode V. Nyegaard's and his Wife's Foundation.

TRIAL REGISTRATION: not relevant.

PMID: 26522483 [PubMed - indexed for MEDLINE]

Medication, rehabilitation and health care consumption in adults with cerebral palsy: A population based study.

Pons C, Brochard S, Gallien P, Nicolas B, Duruflé A, Roquet M, Rémy-Néris O, Garlantezec R

Clin Rehabil. 2016 Aug 9. pii: 0269215516663286. [Epub ahead of print]

OBJECTIVE: To evaluate medication, rehabilitation and healthcare consumption in adults with CP as a function of Gross Motor Function Classification System (GMFCS) level.

DESIGN: Questionnaire-based cross-sectional study.

SETTING: Brittany, a French county.

SUBJECTS: Adults with cerebral palsy.

INTERVENTIONS: Questionnaires relating to drugs, orthotic devices, mobility aids, rehabilitation and medical input were sent to 435 members of a unique regional French network dedicated to adults with cerebral palsy. The questionnaire was completed by the participant or a helper if necessary.

RESULTS: Of the 282 responders, 7.8% had a GMFCS level of I, 14.2% II, 17.7% III, 29.1% IV and 31.2% V. Participants consumed a large amount of healthcare. Almost three-quarters took orally administered drugs, of which antispastic and antiepileptic drugs were among the most frequent. Nearly all patients had at least one type of rehabilitation,

87.2% had physiotherapy, 78% used at least one mobility aid and 69.5% used at least one orthotic device. The frequency of numerous inputs increased with GMFCS level. Specificities were found for each GMFCS level, e.g. participants with GMFCS level IV and V had a high level of medical input and a greater use of trunk-supporting devices, antireflux and laxative. Profiles could be established based on GMFCS levels.

CONCLUSIONS: Adults with cerebral palsy use a large amount of drugs, mobility aids, orthotic devices, rehabilitation and medical input. Healthcare is targeted at cerebral palsy-related issues. GMFCS is a determinant of healthcare consumption and thus a useful tool for clinical practice to target care appropriately.

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DOI: 10.1177/0269215516663286

PMID: 27506220 [PubMed - as supplied by publisher]

Pharmacologie Efficacite Tolérance

Botulinum toxin injections for chronic sialorrhoea in children are effective regardless of the degree of neurological dysfunction: A single tertiary institution experience.

Mahadevan M, Gruber M, Bilish D, Edwards K, Davies-Payne D, van der Meer G

Int J Pediatr Otorhinolaryngol. 2016 Sep;88:142-5. doi: 10.1016/j.ijporl.2016.06.031. Epub 2016 Jun 11.

OBJECTIVE: To determine the effectiveness of submandibular salivary gland Botulinum Toxin Type-A (BTX-A) injection in the treatment of drooling in children with varying degrees of neurological dysfunction.

METHODS: A retrospective review of pre- and post-procedure drooling frequency and severity scores of patients receiving BTX-A between January 2008 and January 2013. Stratification to different subgroups of neurological impairment was performed according to Gross Motor Function Classification System (GMFCS) score. Drooling severity was assessed using Thomas-Stonell and Greenberg symptom questionnaires administered at time of initial consultation and 3 months after treatment.

RESULTS: 48 sets of BTX-A injections in 26 patients with an average age of 9.45 years (range 7 months-18 years) were included in the study. Marked improvement in drooling was seen in 60.4% of patients, a marginal or brief improvement was seen in 20.8% and there was no improvement in 18.8%. No adverse events were reported following any of the BTX-A injections. BTX-A was safe and effective in the eight patients with pre-existing swallowing dysfunction. Subsequent drooling surgery was performed in 15 (57.7%) of the cohort, all 15 patients responded to BTX-A injections. In patients with Cerebral Palsy, there was no correlation between the severity of the neurological dysfunction as measured by the Gross Motor Function Classification System (GMFCS) score and the response to BTX-A treatment.

CONCLUSIONS: Injection of BTX-A to the submandibular glands of children with neurological disorders is a safe procedure and results in a reduction in drooling in the majority of patients. Children with severe neurological dysfunction respond to BTX-A injections as effectively as their less impaired peers and the degree of response does not appear to be associated with the severity of neurological disability. BTX-A injection is a good initial procedure when drooling surgery is being considered.

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DOI: 10.1016/j.ijporl.2016.06.031

PMID: 27497402 [PubMed - in process]

Clinical outcomes of botulinum toxin injection in patients with cerebral palsy and esotropia.

Ameri A, Mirmohammadsadeghi A, Makateb A, Bazvand F, Hosseini S.

Strabismus. 2015;23(1):8-13. doi: 10.3109/09273972.2014.999798. Epub 2015 Mar 19.

PURPOSE: To assess the efficacy of botulinum toxin (Novotox) injection in patients with cerebral palsy (CP) and esotropia.

PATIENTS AND METHODS: In a non-comparative, prospective interventional case series botulinum toxin injection was done in 44 patients with CP and esotropia. A single dose of botulinum toxin was injected in both medial rectus muscles of all patients and was repeated in 12 patients. Angle of deviation within 10 prism diopters (PD) of orthotropia was defined as a successful outcome.

RESULT: Forty-four patients (21 males) with the mean age of 47.56 ± 35.86 months were included in the study. The mean esotropia in all patients was 52.27 ± 18.40 PD (25-123 PD). The range of follow-up was 12-24 months. Thirty

patients (68.18%) were treated successfully one year after surgery. The rates of success, consecutive exotropia, and residual esotropia were 61.4%, 13.63%, and 25% in the last follow-up, respectively. The logistic regression showed statistically significant results between success result and lower age, higher pre-injection deviation, one month post-injection deviation, and severe ptosis. Complications included subconjunctival hemorrhage and ptosis.

CONCLUSION: Botulinum toxin injection is reasonably less invasive with light anesthesia, scar free, and a therapeutic alternative for the patient with esotropia and CP. Therefore, it can provide more possible surgical options in future.

DOI: 10.3109/09273972.2014.999798

PMID: 25789846 [PubMed - indexed for MEDLINE]

Cost-minimization analysis in the treatment of spasticity in children with cerebral palsy with botulinum toxin type A: an observational, longitudinal, retrospective study.

Tapias G, García-Romero M, Crespo C, Cuesta M, Forné C, Pascual-Pascual SI

Farm Hosp. 2016 Sep 1;40(5):412-26. doi: 10.7399/fh.2016.40.5.10429.

OBJECTIVE: Cost-minimization analysis of onabotulinumtoxinA and abobotulinumtoxinA, taking into account the real dose administered to children with spasticity associated with dynamic equinus foot deformity due to cerebral palsy.

METHOD: A single centre, observational, longitudinal, and retrospective study which included spastic paediatric patients aged 2-to-18-years and treated with onabotulinumtoxinA or abobotulinumtoxinA from December 1995 to October 2012, in the Paediatric Neurology Unit of a first-level Spanish hospital. A longitudinal analysis of spasticity severity was made to confirm the similar efficacy of both treatments. Cost minimization was analyzed using the dose administered and the direct costs (pharmacological and medical visits costs) from the perspective of the National Health System (in euros from 2016).

RESULTS: We analyzed 895 patients with paediatric spasticity: 543 were treated only with onabotulinumtoxinA, 292 only with abobotulinumtoxinA, and 60 with both treatments. The mean doses administered were 5.44 U/kg (SD = 2.17) for onabotulinumtoxinA, and 14.73 U/kg (5.26) for abobotulinumtoxinA. The total annual direct cost (pharmacological and medical visits) was € 839.56 for onabotulinumtoxinA and € 631.23 for abobotulinumtoxinA, which represents a difference of € 208.34 per year in favour of treatment with abobotulinumtoxinA.

CONCLUSIONS: It has been demonstrated that in real clinical practice, the cost per patient and year for treatment of paediatric spasticity was lower when abobotulinumtoxinA was used.

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DOI: 10.7399/fh.2016.40.5.10429

PMID: 27570991 [PubMed - in process]

Effectiveness of Oral Baclofen in the Treatment of Spasticity in Children and Adolescents With Cerebral Palsy.

Navarrete-Opazo AA, Gonzalez W, Nahuelhual P

Arch Phys Med Rehabil. 2016 Apr;97(4):604-18. doi: 10.1016/j.apmr.2015.08.417. Epub 2015 Aug 28.

OBJECTIVE: To systematically review the effectiveness of oral baclofen versus placebo or other antispastic oral medications in terms of body function, level of activity, and quality of life in children and adolescents with spastic cerebral palsy who are younger than 18 years.

DATA SOURCES: Cochrane Library, Health Science Databases, DARE, LILACS, Embase,

MEDLINE, OTseeker, PEDro, PsycINFO, SpeechBITE, ScienceDirect, Scopus, Trip, ClinicalTrials.gov, Google Scholar, OpenGrey, and manual search.

STUDY SELECTION: Randomized or not randomized controlled trials and cohort studies comparing the effect of any dosage of oral baclofen with that of no treatment, placebo, or another antispastic medication in children and adolescents with spastic cerebral palsy were selected.

DATA EXTRACTION: Following the Cochrane Handbook for Systematic Reviews of Interventions guidelines, 2 reviewers independently searched articles in databases from their inceptions until October 2014.

DATA SYNTHESIS: Six randomized controlled trials involving a total of 130 patients were selected. Studies show a great variability in motor classification, dosage of baclofen, and outcome measures. There is conflicting evidence on the effectiveness of oral baclofen in reducing muscle tone or improving motor function or the level of activity. The overall methodological quality of the studies was low. The main qualitative limitations of the studies correspond to serious risk of bias, inconsistency of results, unpowered sample size, and publication bias.

Science Infos Paralyse Cérébrale, Août 2016, FONDATION PARALYSIE CEREBRALE, 67 rue Vergniaud
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CONCLUSIONS: There are insufficient data to support or refute the use of oral baclofen for reducing spasticity or improving motor function in children and adolescents with spastic cerebral palsy.

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DOI: 10.1016/j.apmr.2015.08.417

PMID: 26321489 [PubMed - indexed for MEDLINE]

Gabapentin can significantly improve dystonia severity and quality of life in children.

Liow NY, Gimeno H, Lumsden DE, Marianczak J, Kaminska M, Tomlin S, Lin JP.

Eur J Paediatr Neurol. 2016 Jan;20(1):100-7. doi: 10.1016/j.ejpn.2015.09.007. Epub 2015 Sep 28.

INTRODUCTION: Gabapentin has been used in the management of neuropathic pain, epilepsy and occasionally movement disorders.

METHODS: A four-year retrospective, observational study analysed the use of gabapentin for severe dystonia in children at the Evelina London Children's Hospital. Motor severity was classified according to the Gross Motor Function Classification System (GMFCS), Dystonia Severity Assessment Plan (DSAP) and levels of impairment in activities of daily living were graded according to the WHO International Classification of Functioning, Disability and Health, Children & Youth version (ICF-CY) before and after gabapentin.

RESULTS: The majority of the 69 children reported were level 5 GMFCS (non-ambulant). The DSAP grade fell significantly from grade 3 before to grade 1 after gabapentin. Significant improvements in median ICF-CY grades were seen following gabapentin in sleep quality, sleep amount, mood & agreeableness, pain, general muscle tone, involuntary muscle contractions and seating tolerance ($p < 0.01$ in all areas). A significantly higher mean dose of 18.1 mg/kg/dose (SD: 13.3) for dystonia, compared to 7.61 mg/kg/dose (SD: 4.14) for pain relief without dystonia ($z = -2.54$, $p = 0.011$) was noted.

DISCUSSION & CONCLUSION: Gabapentin may significantly ameliorate dystonia severity and improve activities of daily living and quality of life in children with severe dystonia.

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DOI: 10.1016/j.ejpn.2015.09.007

PMID: 26455274 [PubMed - indexed for MEDLINE]

Isotopic Scintigraphy Coupled With Computed Tomography for the Investigation of Intrathecal Baclofen Device Malfunction.

Frémondrière F, Lacoëuille F, Sher A, Couturier O, Menei P, Richard I, Dinomais M

Arch Phys Med Rehabil. 2016 Apr;97(4):646-9. doi: 10.1016/j.apmr.2015.10.101. Epub 2015 Nov 12.

OBJECTIVE: To assess the potential use of indium-111 diethylenetriamine pentaacetic acid (^{111}In -DTPA) scintigraphy coupled with computed tomography (CT) for the investigation of intrathecal baclofen (ITB) device malfunction.

DESIGN: Retrospective study of a case series of patients.

SETTING: Neurosurgical and physical and rehabilitation medicine departments.

PARTICIPANTS: Patients ($N=7$) with reduced ITB effectiveness in whom prior conventional radiographs were inconclusive.

INTERVENTION: Nine ^{111}In -DTPA scintigraphic studies and 8 CT scans. Planar acquisitions were followed by tomoscintigraphy combined with CT.

MAIN OUTCOME MEASURE: Progression of the radiotracer in the pump, catheters, and in the subarachnoid space.

RESULTS: In 7 cases, scintigraphy coupled with CT showed leakage behind the pump, lack of activity outside the pump reservoir, abrupt interruption of activity in the catheter, or abnormal distribution of the radiotracer, thus demonstrating that the drug did not reach its target. Surgical revision confirmed these findings in 5 cases. In 1 case, combined imagery ruled out device dysfunction. In the remaining case, only planar acquisitions were performed, showing correct diffusion of the radiotracer.

CONCLUSIONS: The combination of scintigraphy and CT provides simultaneous functional and anatomic imagery of the device. The slow infusion of the radioisotope mimics the diffusion of baclofen, and this could be a useful method to explore intrathecal device malfunction. Further studies are required to compare scintigraphy coupled with CT, to radiopaque injection followed by fluoroscopy or CT.

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Literature Review and Comparison of Two Statistical Methods to Evaluate the Effect of Botulinum Toxin Treatment on Gait in Children with Cerebral Palsy.

Nieuwenhuys A, Papageorgiou E, Pataky T, De Laet T, Molenaers G, Desloovere K
PLoS One. 2016 Mar 31;11(3):e0152697. doi: 10.1371/journal.pone.0152697. eCollection 2016.

IM: This study aimed at comparing two statistical approaches to analyze the effect of Botulinum Toxin A (BTX-A) treatment on gait in children with a diagnosis of spastic cerebral palsy (CP), based on three-dimensional gait analysis (3DGA) data. Through a literature review, the available expert knowledge on gait changes after BTX-A treatment in children with CP is summarized.

METHODS: Part 1--Intervention studies on BTX-A treatment in children with CP between 4-18 years that used 3DGA data as an outcome measure and were written in English, were identified through a broad systematic literature search. Reported kinematic and kinetic gait features were extracted from the identified studies. Part 2--A retrospective sample of 53 children with CP (6.1 ± 2.3 years, GMFCS I-III) received 3DGA before and after multilevel BTX-A injections. The effect of BTX-A on gait was interpreted by comparing the results of paired samples t-tests on the kinematic gait features that were identified from literature to the results of statistical parametric mapping analysis on the kinematic waveforms of the lower limb joints.

RESULTS: Part 1-53 kinematic and 33 kinetic features were described in literature. Overall, there is no consensus on which features should be evaluated after BTX-A treatment as 49 features were reported only once or twice. Part 2--Post-BTX-A, both statistical approaches found increased ankle dorsiflexion throughout the gait cycle. Statistical parametric mapping analyses additionally found increased knee extension during terminal stance. In turn, feature analyses found increased outtoeing during stance after BTX-A.

CONCLUSION: This study confirms that BTX-A injections are a valuable treatment option to improve gait function in children with CP. However, different statistical approaches may lead to different interpretations of treatment outcome. We suggest that a clear, definite hypothesis should be stated a priori and a commensurate statistical approach should accompany this hypothesis.

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DOI: 10.1371/journal.pone.0152697
PMCID: PMC4816309
PMID: 27030973 [PubMed - indexed for MEDLINE]

Prospective Randomized Study of Oral Diazepam and Baclofen on Spasticity in Cerebral Palsy.

Goyal V, Laisram N, Wadhwa RK, Kothari SY
J Clin Diagn Res. 2016 Jun;10(6):RC01-5. doi: 10.7860/JCDR/2016/17067.7975. Epub 2016 Jun 1.

INTRODUCTION: Spastic cerebral palsy (CP) is the most common form of CP. Diazepam and Baclofen are the most commonly used oral drugs to manage spasticity. Study was designed to evaluate and compare their effects and safety in CP children.

AIM: Study was aimed to assess and compare outcome of oral Diazepam and Baclofen in spastic cerebral palsy children in terms of extent of reduction of spasticity and side effects profile.

MATERIALS AND METHODS: Randomized prospective follow-up study was done for one year after giving Diazepam and Baclofen in weekly incremental doses upto recommended maximum dose to 60 children for three months. Two primary outcome measures were spasticity reduction and adverse effect profile. Spasticity reduction was measured by Modified Ashworth's Scale (MAS) and Range of Motion improvement (ROM).

RESULTS: After random allocation, there was no baseline difference between groups. Mean MAS score improved from 1.96 ± 0.4 at baseline to 1.63 ± 0.40 and 1.41 ± 0.36 at 1 month and 3 months for Diazepam and from 1.84 ± 0.64 to 1.57 ± 0.59 and 1.31 ± 0.48 respectively for Baclofen. Within the group reduction was significant with p-value = 0.0001. Intergroup comparison showed no statistically significant difference with p-value of 0.48 and 0.22 at 1 and 3 months. Baseline ROM showed significant improvement at 1 and 3 months with p value of 0.004 and 0.001 for Diazepam and 0.01 and 0.000 for Baclofen respectively with no statistically significant difference among two groups. Drowsiness was most common observed side effect in both the groups.

CONCLUSION: Patients showed significant improvement in spasticity as measured by Mean MAS score and range of motion in Diazepam as well as Baclofen group. Both drugs were found safe for use in children. Study couldn't establish any difference between the two drugs. However studies with bigger sample size and longer follow-up assessing functional improvement in patients will be required in near future.

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DOI: 10.7860/JCDR/2016/17067.7975

PMCID: PMC4963720

PMID: 27504360 [PubMed]

Quantitative evaluation for spasticity of calf muscle after botulinum toxin injection in patients with cerebral palsy: a pilot study.

Lin YC, Lin IL, Chou TF, Lee HM

J Neuroeng Rehabil. 2016 Mar 12;13:25. doi: 10.1186/s12984-016-0135-8.

BACKGROUND: Cerebral palsy (CP) is the most common pediatric disease to cause motor disability. Two common symptoms in CP are spasticity and contracture. If this occurred in the ankle plantar flexors of children with CP, it will impair their gait and active daily living profoundly. Most children with CP receive botulinum toxin type A (BoNT-A) injection to reduce muscle tone, but a knowledge gap exists in the understanding of changes of neural and non-neural components of spasticity after injection. The purpose of this study was to determine if our device for quantitative modified Tardieu approach (QMTA) is a valid method to assess spasticity of calf muscles after botulinum toxin injection.

METHODS: In this study, we intended to develop a device for quantitative measurement of spasticity in calf muscles based on the modified Tardieu scale (MTS) and techniques of biomedical engineering. Our QMTA measures the angular displacement and resistance of stretched joint with a device that is light, portable and can be operated similar to conventional approaches for MTS. The static (R2), dynamic (R1) and R2-R1 angles derived from the reactive signals collected by the miniature sensors are used to represent the non-neural and neural components of stretched spastic muscles. Four children with CP were recruited to assess the change in spasticity in their gastrocnemius muscles before and 4 weeks after BoNT-A injection.

RESULTS: A simulated ankle model validated the performance of our device in measuring joint displacement and estimating the angle of catch. Data from our participants with CP showed that R2 and R2-R1 improved significantly after BoNT-A administration. It indicates both neural and non-neural components of the spastic gastrocnemius muscles improved at four weeks after BoNT-A injection in children with CP.

CONCLUSION: Our device for QMTA can objectively measure the changes in spasticity of the gastrocnemius muscle in children with cerebral palsy after BoNT-A injection.

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DOI: 10.1186/s12984-016-0135-8

PMCID: PMC4788868

PMID: 26969526 [PubMed - indexed for MEDLINE]

Questionnaire about the adverse events and side effects following botulinum toxin A treatment in patients with cerebral palsy.

Błaszczuk I, Foumani NP, Ljungberg C, Wiberg M

Toxins (Basel). 2015 Nov 6;7(11):4645-54. doi: 10.3390/toxins7114645.

Botulinum toxin A (BoNT-A) injections for treatment of spasticity in patients with cerebral palsy (CP) have been used for about two decades. The treatment is considered safe but a low frequency of adverse events (AE) has been reported. A good method to report AEs is necessary to verify the safety of the treatment. We decided to use an active surveillance of treatment-induced harm using a questionnaire we created. We studied the incidence of reported AEs and side effects in patients with CP treated with BoNT-A. We investigated the relationship between the incidence of AEs or side effects and gender, age, weight, total dose, dose per body weight, Gross Motor Function Classification System (GMFCS) and number of treated body parts. Seventy-four patients with CP participated in our study. In 54 (51%) of 105 BoNT-A treatments performed in 45 (61%) patients, there were 95 AEs and side effects reported, out of which 50 were generalized and/or focal distant. Severe AEs occurred in three patients (4%), and their BoNT-A treatment was discontinued. Consecutive collection of the AE and side-effect incidence using our questionnaire can increase the safety of BoNT-A treatment in patients with CP.

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DOI: 10.3390/toxins7114645

PMCID: PMC4663525

PMID: 26561833 [PubMed - indexed for MEDLINE]

Unusual placement of intrathecal baclofen pumps: report of two cases.

Devine O, Harborne A, Lo WB, Weinberg D, Ciras M, Price R

Acta Neurochir (Wien). 2016 Jan;158(1):167-70. doi: 10.1007/s00701-015-2636-9. Epub 2015 Nov 23.

Intrathecal baclofen delivery via implantable pump represents an important modality for symptomatic relief in patients with chronic spasticity. Pumps are routinely implanted subcutaneously in the anterior abdominal wall. We describe two unusual cases where skin-related complications necessitated revision surgery in order to relocate the pump to alternative sites. The first patient was an international power canoeist, whose strenuous exercise programme interfered with his pump's original siting. The second patient was a cachectic university student with a history of cerebral palsy, who maintained low body mass despite attempted weight gain. The relocation of these two intrathecal devices to the medial compartment of the right thigh and right iliac fossa, respectively, is described.

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DOI: 10.1007/s00701-015-2636-9

PMCID: PMC4684582

PMID: 26592253 [PubMed - indexed for MEDLINE]

Chirurgie

A cohort study of tibialis anterior tendon shortening in combination with calf muscle lengthening in spastic equinus in cerebral palsy.

Tsang ST, McMorran D, Robinson L, Herman J, Robb JE, Gaston MS

Gait Posture. 2016 Aug 17;50:23-27. doi: 10.1016/j.gaitpost.2016.08.015. [Epub ahead of print]

The aim of this study was to evaluate the outcome of combined tibialis anterior tendon shortening (TATS) and calf muscle-tendon lengthening (CMTL) in spastic equinus. Prospectively collected data was analysed in 26 patients with hemiplegic (n=13) and diplegic (n=13) cerebral palsy (CP) (GMFCS level I or II, 14 males, 12 females, age range 10-35 years; mean 16.8 years). All patients had pre-operative 3D gait analysis and a further analysis at a mean of 17.1 months (± 5.6 months) after surgery. None was lost to follow-up. Twenty-eight combined TATS and CMTL were undertaken and 19 patients had additional synchronous multilevel surgery. At follow-up 79% of patients had improved foot positioning at initial contact, whilst 68% reported improved fitting or reduced requirement of orthotic support. Statistically significant improvements were seen in the Movement Analysis Profile for ankle dorsi-/plantarflexion (4.15° , $p=0.032$), maximum ankle dorsiflexion during swing phase (11.68° , $p<0.001$), and Edinburgh Visual Gait Score (EVGS) (4.85, $p=0.014$). Diplegic patients had a greater improvement in the EVGS than hemiplegics (6.27 vs- 2.21, $p=0.024$). The originators of combined TATS and CMTL showed that it improved foot positioning during gait. The present study has independently confirmed favourable outcomes in a similar patient population and added additional outcome measures, the EVGS, foot positioning at initial contact, and maximum ankle dorsiflexion during swing phase. Study limitations include short term follow-up in a heterogeneous population and that 19 patients had additional surgery. TATS combined with CMTL is a recommended option for spastic equinus in ambulatory patients with CP.

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DOI: 10.1016/j.gaitpost.2016.08.015

PMID: 27559938 [PubMed - as supplied by publisher]

Comparison of lumbar epidural bupivacaine with fentanyl or clonidine for postoperative analgesia in children with cerebral palsy after single-event multilevel surgery.

Chalkiadis GA, Sommerfield D, Low J, Orsini F, Dowden SJ, Tay M, Penrose S, Pirpiris M, Graham HK

Dev Med Child Neurol. 2016 Apr;58(4):402-8. doi: 10.1111/dmcn.12930. Epub 2015 Sep 23.

AIM: To compare diazepam use, muscle spasm, analgesia, and side effects when clonidine or fentanyl are added to epidural bupivacaine in children with cerebral palsy after multilevel orthopaedic surgery.

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METHOD: Fifty children were prospectively randomized to receive clonidine (n=24, mean age 10y 10mo [SD 2y 11mo]) or fentanyl (n=26, mean age 10y 11mo [SD 2y 10mo]).

RESULTS: There was no difference in primary outcome measures: median diazepam use (fentanyl 0, interquartile range [IQR] 0-0; clonidine 0, IQR 0-0; p=0.46), any muscle spasm (no muscle spasms in: fentanyl, 36%; clonidine, 62%; p=0.11), painful muscle spasm (fentanyl 40%; clonidine 25%; p=0.46), or pain score ≥ 6 (none: fentanyl 44%; clonidine 42%; p=0.29). There were differences in secondary outcome measures: no vomiting (clonidine 63%; fentanyl 20%); vomiting occurred more frequently with fentanyl (32% vomited more than three times; clonidine none; p=0.001). Fentanyl resulted in more oxygen desaturation (at least two episodes: fentanyl 20%; clonidine 0; p<0.001). Clonidine resulted in lower mean (SD) area under the curve for systolic blood pressure (fentanyl 106.5 [11.0]; clonidine 95.7mmHg [7.9]) and heart rate (fentanyl 104.9 beats per minute [13.6]; clonidine 85.3 [11.5]; p<0.001).

INTERPRETATION: Clonidine and fentanyl provide adequate analgesia with low rates of muscle spasm, resulting in low diazepam use. The choice of epidural additive should be based upon the most tolerable side-effect profile.

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DOI: 10.1111/dmnc.12930

PMID: 26400818 [PubMed - indexed for MEDLINE]

Excellent functional outcome following selective dorsal rhizotomy in a child with spasticity secondary to transverse myelitis.

Mazarakis NK, Ughratdar I, Vloeberghs MH

Childs Nerv Syst. 2015 Nov;31(11):2189-91. doi: 10.1007/s00381-015-2779-2. Epub 2015 Jun 16.

PURPOSE: Selective dorsal rhizotomy (SDR) is a neurosurgical procedure used to treat spasticity in children with cerebral palsy (CP). The vast majority of studies to date suggest SDR is particularly effective in reducing lower limb spasticity in spastic diplegia with long-lasting effect.

METHOD: We report, to the best of our knowledge for the first time, the case of a teenager who underwent SDR for the management of spasticity secondary to transverse myelitis.

RESULTS: This is an unusual indication for SDR which resulted in completely loose lower limbs and an excellent functional outcome. At a follow-up 18 months following the procedure, the child had no re-occurrence of his symptoms.

CONCLUSION: This report raises the possibility that the use of SDR could be expanded to include other pathologies. We discuss the case and the relevant literature. Our spasticity service at NUH has to date inserted 300 baclofen pumps and performed 60 SDRs mainly in children with cerebral palsy.

DOI: 10.1007/s00381-015-2779-2

PMID: 26077594 [PubMed - indexed for MEDLINE]

Femoral derotation osteotomy in adults with cerebral palsy.

Putz C, Wolf SI, Geisbüsch A, Niklasch M, Döderlein L, Dreher T

Gait Posture. 2016 Jun 27;49:290-296. doi: 10.1016/j.gaitpost.2016.06.034. [Epub ahead of print]

BACKGROUND: Internal rotation gait constitutes a complex gait disorder in bilateral spastic cerebral palsy (BSCP) including static torsional and dynamic components resulting in lever arm dysfunction. Although femoral derotation osteotomy (FDO) is a standard procedure to correct increased femoral anteversion in children, unpredictable outcome has been reported. The effect of FDO when it is done as part of single-event multilevel surgery (SEMLS) in adulthood has not been investigated.

METHODS: In this study mid-term data of 63 adults with BSCP and internal rotation gait, undergoing SEMLS including FDO were analyzed pre- and 1.7 years postoperatively by clinical examination and 3D-instrumented gait analysis. All legs were categorized as the more or less involved side to consider asymmetry. The mean hip rotation in stance preoperatively and the intraoperative derotation was correlated with the difference pre- and postoperatively.

RESULTS: The group as a whole experienced the following results postoperatively: improved mean hip rotation in stance (p=0.0001), mean foot progression angle (p=0.0001) and a significant improvement of the clinical parameter: passive internal and external hip rotation, midpoint and anteversion (p=0.0001) for both legs separately. With regard to the less and more involved side, clinical and kinematic parameters showed comparable significant changes (p=0.0001). The anteversion improved significantly in proximal compared to distal FDO (p=0.03).

CONCLUSION: This study emphasizes an overall good correction of internal rotation gait in adults with bilateral involvement after FDO. However, the results are more predictable in adults compared to studies reporting outcome after FDO in children.

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DOI: 10.1016/j.gaitpost.2016.06.034

PMID: 27475618 [PubMed - as supplied by publisher]

Infra-Conus Single-Level Laminectomy for Selective Dorsal Rhizotomy: Technical Advance.

Bales J, Apkon S, Osorio M, Kinney G, Robison RA, Hooper E, Browd S.

Pediatr Neurosurg. 2016 Aug 23. [Epub ahead of print]

BACKGROUND/AIMS: Selective dorsal rhizotomy for spastic cerebral palsy is an effective and well-validated surgical approach. Multiple techniques have been described in the past including multiple laminectomies and a single-level laminectomy at the level of the conus. There is considerable technical challenge involved with a single-level laminectomy approach.

METHODS: We report here a modification of the single-level laminectomy that selectively analyzes each individual nerve root with electromyography to separate dorsal and ventral nerve roots through comparison of stimulus responses.

RESULTS: In 18 children with cerebral palsy who underwent this operation there was a mean improvement in the Modified Ashworth Scale of 2.0 with no reported incidence of muscle weakness, sensory loss, or neurogenic bladder.

CONCLUSION: This approach allows for a modification of selective dorsal rhizotomy through a single-level laminectomy and tailors the selection of nerve root sectioning to the individual patient of interest while still maintaining its effectiveness.

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DOI: 10.1159/000448046

PMID: 27548353 [PubMed - as supplied by publisher]

Neuromuscular Foot: Spastic Cerebral Palsy.

Karamitopoulos MS, Nirenstein L

Foot Ankle Clin. 2015 Dec;20(4):657-68. doi: 10.1016/j.fcl.2015.07.008. Epub 2015 Oct 21.

Foot and ankle deformities in cerebral palsy can be effectively treated with surgery. Surgery should be considered in patients with significant deformity and those who have pain or difficulty with orthotic and shoe wear. Equinus contracture of both gastrocnemius and soleus can be treated with open tendoachilles lengthening; ankle valgus with medial epiphysiodesis. Equinovarus is more commonly seen in hemiplegic patients and this deformity can usually be treated with tendon transfers. Triple arthrodesis is an option in children with severe degenerative changes. It is important to address all aspects of the child's pathology at the time of surgical correction.

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DOI: 10.1016/j.fcl.2015.07.008

PMID: 26589084 [PubMed - indexed for MEDLINE]

Management of Spinal Deformity in Adult Patients With Neuromuscular Disease.

Protosaltis TS, Boniello AJ, Schwab FJ.

J Am Acad Orthop Surg. 2016 Jul 28. [Epub ahead of print]

A wide range of neuromuscular diseases, including Parkinson disease, cerebral palsy, multiple sclerosis, and myopathy, are associated with spinal deformities. The most common postural deformities include anterocollis, Pisa syndrome (pleurothotonus), scoliosis, and camptocormia. Nonsurgical management of spinal deformity in patients with neuromuscular disease centers on maximizing the medical management of the underlying neurodegenerative pathology before surgical intervention is contemplated. Surgical management can include decompression alone, or decompression and fusion with short or long fusion constructs. Patients with neuromuscular disease are susceptible to postoperative medical complications, such as delirium, epidural hematomas, pulmonary emboli, and cardiac events. Compared with outcomes in the typical patient with spinal deformity, postoperative outcomes in patients with neuromuscular disease have higher rates of surgical complications, such as instrumentation failure, proximal

junctional kyphosis, loss of correction, and the need for revision surgery, regardless of the magnitude of surgical treatment.

DOI: 10.5435/JAAOS-D-15-00421

PMID: 27471900 [PubMed - as supplied by publisher]

Management of spinal infections in children with cerebral palsy.

Sebaaly A, El Rachkidi R, Yaacoub JJ, Saliba E, Ghanem I

Orthop Traumatol Surg Res. 2016 Jul 29. pii: S1877-0568(16)30072-X. doi: 10.1016/j.otsr.2016.04.015. [Epub ahead of print]

Cerebral palsy patients who undergo posterior spinal instrumentation for scoliosis are at a greater risk of surgical site infection compared to adolescents with idiopathic scoliosis. Many infecting organisms are reported. Risk factors include patients' specific factors, nutritional status as well as surgery related factors. Although surgical management is still controversial, it is always based on irrigation and debridement followed or not by implant removal. The purpose of this paper is to review the pathophysiology of surgical site infection in this patient population and to propose a treatment algorithm, based on a thorough review of the current literature and personal experience.

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DOI: 10.1016/j.otsr.2016.04.015

PMID: 27480292 [PubMed - as supplied by publisher]

Midterm Follow-Up of Talectomy for Severe Rigid Equinovarus Feet.

El-Sherbini MH, Omran AA

J Foot Ankle Surg. 2015 Nov-Dec;54(6):1093-8. doi: 10.1053/j.jfas.2015.07.004. Epub 2015 Sep 7.

Rigid equinovarus foot is a challenging problem. Talectomy has been advocated as a salvage procedure to achieve a plantigrade painless foot in the treatment of rigid equinovarus deformity. The present prospective observational study evaluated the effectiveness of talectomy in the treatment of Dimeglio grade IV rigid equinovarus feet. Nineteen feet in 13 patients were treated by talectomy from September 2001 through January 2012 (10-year, 2-month period). Of the 13 patients, 9 (69.23%) had a foot deformity due to arthrogryposis multiplex congenita and 1 (7.69%) each due to sacral agenesis, spastic cerebral palsy, neglected congenital talipes equinovarus, and post-traumatic contracture. Of the 13 patients, 9 (69.23%) were male and 4 (30.77%) were female. Their mean age was 7.7 (range 3 to 26) years. The mean follow-up duration was 6.4 (range 2 to 11) years. Along with talectomy, excision of the navicular was performed in 8 feet (42.11%), calcaneal osteotomy with a laterally based wedge in 8 (42.11%), and calcaneocuboid fusion in 3 feet (15.79%). Postoperatively, all the feet improved to Dimeglio grade II and were painless, and 16 feet (84.22%) were plantigrade; 1 foot (5.26%) had residual equinus resulting from incomplete removal of the talus and 2 (10.53%) had residual varus. Also, 3 feet (15.79%) had forefoot adduction (2 residual and 1 recurrent) that required a second surgery to correct the deformity. From our experience, talectomy is an effective procedure for correction of severe rigid equinovarus feet, provided that the talus is completely removed and the calcaneus is positioned correctly in the ankle mortise.

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DOI: 10.1053/j.jfas.2015.07.004

PMID: 26359619 [PubMed - indexed for MEDLINE]

Outcomes of Cutaneous Scar Revision During Surgical Implant Removal in Children with Cerebral Palsy.

Davids JR, Diaz K, Leba TB, Adams S, Westberry D, Bagley AM

J Bone Joint Surg Am. 2016 Aug 17;98(16):1351-8. doi: 10.2106/JBJS.15.01418.

BACKGROUND: Children who have had surgery involving the placement of an implant frequently undergo a subsequent surgery for hardware removal. The cosmesis of surgical scars following initial and subsequent surgeries is unpredictable. Scar incision (subsequent surgical incision through the initial scar) or excision (around the initial scar) is selected on the basis of the quality of the initial scar. The outcomes following these techniques have not been determined.

METHODS: This prospective, consecutive case series was designed to compare outcomes following surgical scar incision versus excision at the time of implant removal in children with cerebral palsy. Photographs of the scars were made preoperatively and at 6 and 12 months following implant removal and were graded for scar quality utilizing

the modified Stony Brook Scar Evaluation Scale (SBSES). Parental assessment of scar appearance was performed at the same time points utilizing a visual analog cosmetic scale (VACS).

RESULTS: The scars that were selected for incision had significantly worse SBSES scores at 6 and 12 months following the second surgery compared with preoperative values. However, parents' VACS scores of the incised scars, although worse at 6 months, were comparable with preoperative scores at 12 months. Scars that were selected for excision had significantly worse SBSES scores at 6 months but scores that were comparable with preoperative values at 12 months. VACS scores for the excised scars were comparable at the 3 time points.

CONCLUSIONS: Surgical incisions that initially healed with good scar quality generally healed well (from the parents' perspective) following subsequent incision through the previous scar. Surgical incisions that initially healed with poor scar quality did not heal better following excision of the previous scar. In such situations, surgical excision of the existing scar should occur in conjunction with additional adjuvant therapies to improve cosmesis.

LEVEL OF EVIDENCE: Therapeutic Level II. See Instructions for Authors for a complete description of levels of evidence.

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DOI: 10.2106/JBJS.15.01418

PMID: 27535437 [PubMed - in process]

Percutaneous Adductor Release in Nonambulant Children with Cerebral Palsy.

Sahu RL

JNMA J Nepal Med Assoc. 2014 Jan-Mar;52(193):702-6.

INTRODUCTION: Adductor spasticity at hips is the main barrier in functional activities and rehabilitation of spastic cerebral palsy patients. The aim of this study is to evaluate the results of percutaneous adductor release under general anaesthesia.

METHODS: From July 2005 to July 2010, 64 hips in 32 patients (19 males and 13 females) were recruited from outpatient department having adductor contracture at hips in cerebral palsy children. All children were operated under general anaesthesia. All children were followed for twenty-four months. The clinical results were evaluated radiologically, including measurement of CE- angle, AC-index and femoral head coverage and in terms of activity level of children.

RESULTS: Of the thirty-two children, twenty-eight showed marked and immediate improvement. None of our children was functionally worse at follow-up. The CE-angle and femoral head coverage did not change significantly. The AC-index improved significantly ($P = 0.01$). The results were excellent in 12.5% children, good in 50%, fair in 25% and poor in 12.5%.

CONCLUSIONS: Bilateral mini-invasive adductor release can be an effective treatment for children suffering from adductor contracture refractory to nonoperative management and early adductor release can prevent subluxation and possibly the need for future bony procedure on the proximal femur and pelvis.

PMID: 26905552 [PubMed - indexed for MEDLINE]

Perioperative complications and outcomes in children with cerebral palsy undergoing scoliosis surgery.

Bendon AA, George KA, Patel D

Paediatr Anaesth. 2016 Aug 8. doi: 10.1111/pan.12981. [Epub ahead of print]

INTRODUCTION: Neuromuscular scoliosis is a known risk factor for postoperative complications after corrective spine surgery. Few studies have looked at the preoperative factors affecting postoperative complications in children with cerebral palsy.

AIM: The aim of this study was to examine the factors that might influence postoperative course in patients with cerebral palsy undergoing spine surgery for scoliosis.

METHODS: Nineteen case notes of children with cerebral palsy who had spine surgery (2008-2014) were reviewed retrospectively. Preoperative comorbidities and postoperative complications were noted and complications were classified as major and minor.

RESULTS: Thirteen out of 19 (68.4%) patients had two or more systemic comorbidities. Most common comorbidities included reflux and seizure disorder. Nine patients (49%) had at least one major complication. About 5/19 patients had respiratory complications requiring ventilation and 4/19 had massive blood loss. A higher incidence of postoperative major complication was recorded in the group with two systemic comorbidities as compared to those

with less than two systemic comorbidities (47% vs 16%). Both patients who had a single-stage anterior release and posterior fixation had a major complication.

CONCLUSION: Presence of two or more comorbidities and thoracotomy are risk factors for perioperative complications in children with cerebral palsy undergoing surgery for scoliosis correction.

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DOI: 10.1111/pan.12981

PMID: 27501478 [PubMed - as supplied by publisher]

Risk factors for pancreatitis after posterior spinal fusion in children with cerebral palsy.

Abousamra O, Nishnianidze T, Rogers KJ, Er MS, Sees JP, Dabney KW, Miller F.

J Pediatr Orthop B. 2016 Aug 6. [Epub ahead of print]

This study reports on the prevalence and risk factors of acute pancreatitis after posterior spinal fusion for cerebral palsy scoliosis. Pancreatitis diagnosis was based on elevated amylase or lipase above three times the upper normal limit. Perioperative data were compared between patients with and without pancreatitis. We included 300 patients; 55% developed acute pancreatitis. Gastrostomy dependence was more common in the pancreatitis group (P=0.048). Perioperative data were similar between groups. Patients with pancreatitis had longer duration of hospitalization (19 vs. 13 days, P<0.001). Acute pancreatitis is common after cerebral palsy scoliosis surgery. Gastrostomy dependence increases its risk. Although no mortality was reported, hospital stay was longer.

DOI: 10.1097/BPB.0000000000000376

PMID: 27509481 [PubMed - as supplied by publisher]

Technique of Pronator Teres Rerouting in Pediatric Patients With Spastic Hemiparesis.

Oishi S, Butler L

J Hand Surg Am. 2016 Aug 18. pii: S0363-5023(16)30416-6. doi: 10.1016/j.jhsa.2016.07.104. [Epub ahead of print]

Children with spastic hemiparesis can present with forearm pronation deformities that can greatly impair function. In the appropriate setting, pronator teres rerouting can provide active supination while preserving active pronation, which may improve function in these patients. Patient selection is imperative for the success of this procedure because, in the wrong setting, pronator teres rerouting can lead to fixed supination deformity that may actually worsen position and function in these patients.

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DOI: 10.1016/j.jhsa.2016.07.104

PMID: 27546440 [PubMed - as supplied by publisher]

The Effects of Selective Dorsal Rhizotomy on Balance and Symmetry of Gait in Children with Cerebral Palsy.

Rumberg F, Bakir MS, Taylor WR, Haberl H, Sarpong A, Sharankou I, Lebek S, Funk JF

PLoS One. 2016 Apr 4;11(4):e0152930. doi: 10.1371/journal.pone.0152930. eCollection 2016.

AIM: Cerebral palsy (CP) is associated with dysfunction of the upper motor neuron and results in balance problems and asymmetry during locomotion. Selective dorsal rhizotomy (SDR) is a surgical procedure that results in reduced afferent neuromotor signals from the lower extremities with the aim of improving gait. Its influence on balance and symmetry has not been assessed. The aim of this prospective cohort study was to evaluate the impact of SDR on balance and symmetry during walking.

METHODS: 18 children (10 girls, 8 boys; age 6 years (y) 3 months (m), SD 1y 8m) with bilateral spastic CP and Gross Motor Function Classification System levels I to II underwent gait analysis before and 6 to 12 months after SDR. Results were compared to 11 typically developing children (TDC; 6 girls, 5 boys; age 6y 6m, SD 1y 11m). To analyse balance, sway velocity, radial displacement and frequency were calculated. Symmetry ratios were calculated for balance measures and spatio-temporal parameters during walking.

RESULTS: Most spatio-temporal parameters of gait, as well as all parameters of balance, improved significantly after SDR. Preoperative values of symmetry did not vary considerably between CP and TDC group and significant postoperative improvement did not occur.

INTERPRETATION: The reduction of afferent signalling through SDR improves gait by reducing balance problems rather than enhancing movement symmetry.

Free PMC Article

DOI: 10.1371/journal.pone.0152930

PMCID: PMC4820221

PMID: 27043310 [PubMed - indexed for MEDLINE]

Réadaptation fonctionnelle

A Single Session of Mirror-based Tactile and Motor Training Improves Tactile Dysfunction in Children with Unilateral Cerebral Palsy: A Replicated Randomized Controlled Case Series.

Auld ML, Johnston LM, Russo RN, Moseley GL

Physiother Res Int. 2016 Aug 17. doi: 10.1002/pri.1674. [Epub ahead of print]

INTRODUCTION: This replicated randomized controlled crossover case series investigated the effect of mirror-based tactile and motor training on tactile registration and perception in children with unilateral cerebral palsy (UCP).

METHODS: Six children with UCP (6-18 years; median 10 years, five male, three-left hemiplegia, four-manual ability classification system (MACS) I, one MACS II and one MACS III) participated. They attended two 90-minute sessions - one of mirror-based training and one of standard practice, bimanual therapy - in alternated order. Tactile registration (Semmes Weinstein Monofilaments) and perception (double simultaneous or single-point localization) were assessed before and after each session. Change was estimated using reliable change index (RCI).

RESULTS: Tactile perception improved in four participants (RCI > 1.75), with mirror-based training, but was unchanged with bimanual therapy (RCI < 1.0 for all participants). Neither intervention affected tactile registration.

DISCUSSION: Mirror-based training demonstrates potential to improve tactile perception in children with UCP.

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DOI: 10.002/pri.1674

PMID: 27530980 [PubMed - as supplied by publisher]

Action observation in infancy: implications for neuro-rehabilitation.

Burzi V, Tealdi G, Boyd RN, Guzzetta A

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:74-7. doi: 10.1111/dmcn.13048.

Action observation therapy has been found to be effective in improving hand motor function in both adults with stroke and children with unilateral cerebral palsy. We here propose a provocative hypothesis arguing that the same therapy might be effective in very early intervention in infants with unilateral or asymmetric brain damage, but through a different underlying mechanism. If the activation of motor networks induced in infancy by action observation enhances the excitability of the damaged sensorimotor cortex, it could also accelerate the maturation of the corticospinal tract and the adaptive shaping of the spinal motor circuits. This hypothesis should be explored carefully in prospective studies and, if confirmed, might support the use of action observation therapy at a much earlier time than experimented so far.

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DOI: 10.1111/dmcn.13048

PMID: 27027611 [PubMed - indexed for MEDLINE]

CAN-flip: A Pilot Gymnastics Program for Children With Cerebral Palsy.

Cook O, Frost G, Twose D, Wallman L, Falk B, Galea V, Adkin A, Klentrou P.

Adapt Phys Activ Q. 2015 Oct;32(4):349-70. doi: 10.1123/APAQ.2015-0026.

This pilot study examined whether an adapted gymnastics program, CAN-flip, could be a feasible activity for children with cerebral palsy (CP) leading to improvements in muscle fitness, motor performance, and physical self-perception. Four girls and 1 boy (9.8 ± 1.3 yr) with CP participated in this multiple-baseline across-subjects design and were randomly assigned to start either the 6-wk gymnastics or the 6-wk control period. Muscle strength, neuromuscular activation, range of motion, gross motor performance, balance, and physical self-perception were assessed at baseline, after the first 6-wk period, and at the conclusion of the study. The gymnastics program comprised two 1-hr individualized classes per week. All participants were able to complete the gymnastics classes

without injury and showed improvement in specific gymnastics skills. In addition, 3 of the 5 participants registered for regular gymnastics classes after the study, demonstrating the program's usability as a link to inclusive gymnastic classes.

DOI: 10.1123/APAQ.2015-0026

PMID: 26485738 [PubMed - indexed for MEDLINE]

Does long-term passive stretching alter muscle-tendon unit mechanics in children with spastic cerebral palsy?

Theis N, Korff T, Mohagheghi AA.

Clin Biomech (Bristol, Avon). 2015 Dec;30(10):1071-6. doi: 10.1016/j.clinbiomech.2015.09.004. Epub 2015 Sep 8.

BACKGROUND: Cerebral palsy causes motor impairments during development and many children may experience excessive neural and mechanical muscle stiffness. The clinical assumption is that excessive stiffness is thought to be one of the main reasons for functional impairments in cerebral palsy. As such, passive stretching is widely used to reduce stiffness, with a view to improving function. However, current research evidence on passive stretching in cerebral palsy is not adequate to support or refute the effectiveness of stretching as a management strategy to reduce stiffness and/or improve function. The purpose was to identify the effect of six weeks passive ankle stretching on muscle-tendon unit parameters in children with spastic cerebral palsy.

METHODS: Thirteen children (8-14 y) with quadriplegic/diplegic cerebral palsy were randomly assigned to either an experimental group (n=7) or a control group (n=6). The experimental group underwent an additional six weeks of passive ankle dorsiflexion stretching for 15 min (per leg), four days per week, whilst the control group continued with their normal routine, which was similar for the two groups. Measures of muscle and tendon stiffness, strain and resting length were acquired pre- and post-intervention.

FINDINGS: The experimental group demonstrated a 3° increase in maximum ankle dorsiflexion. This was accompanied by a 13% reduction in triceps surae muscle stiffness, with no change in tendon stiffness. Additionally, there was an increase in fascicle strain with no changes in resting length, suggesting muscle stiffness reductions were a result of alterations in intra/extra-muscular connective tissue.

INTERPRETATION: The results demonstrate that stretching can reduce muscle stiffness by altering fascicle strain but not resting fascicle length.

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DOI: 10.1016/j.clinbiomech.2015.09.004

PMID: 26403361 [PubMed - indexed for MEDLINE]

Effects of a group circuit progressive resistance training program compared with a treadmill training program for adolescents with cerebral palsy.

Aviram R, Harries N, Namourah I, Amro A, Bar-Haim S

Dev Neurorehabil. 2016 Aug 18:1-8. [Epub ahead of print]

OBJECTIVE: To determine whether goal-directed group circuit progressive resistance exercise training (GT) can improve motor function in adolescents with cerebral palsy (CP) and to compare outcomes with a treadmill training (TT) intervention.

METHODS: In a multi-centered matched pairs study, 95 adolescents with spastic CP (GMFCS II-III) were allocated to GT or TT interventions for 30 bi-weekly one hour training. Outcome measures of GMFM-66, GMFM-D%, GMFM-E%, TUG, 10 meter walk test (10 MWT), and 6 minute walk test (6 MWT) were made at baseline (T1), after interventions (T2) and 6 months post training (T3).

RESULTS: Both training programs induced significant improvement in all outcome measures (T2-T1) that were mostly retained at T3. At the end of the intervention, the GT group showed an advantage in all measured changes compared to the TT group and in percentage changes. Differences were significant ($p < 0.02$) for GMFM-66, GMFM-D%, GMFM-E% and TUG. The advantage trend for the GT group was less apparent at follow up (T3-T1).

CONCLUSION: Both programs were effective in improving motor function in adolescents with cerebral palsy. The GT program had generally greater benefits based on the functional measures.

DOI: 10.1080/17518423.2016.1212946

PMID: 27536805 [PubMed - as supplied by publisher]

Effects of concentric and eccentric control exercise on gross motor function and balance ability of paretic leg in children with spastic hemiplegia.

Science Infos Paralyse Cérébrale, Août 2016, FONDATION PARALYSIE CEREBRALE, 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

Park SI, Kim MS, Choi JD

J Phys Ther Sci. 2016 Jul;28(7):2128-31. doi: 10.1589/jpts.28.2128. Epub 2016 Jul 29.

[Purpose] This study examines the effect of concentric and eccentric control training of the paretic leg on balance and gross motor function in children with spastic hemiplegia.

[Subjects and Methods] Thirty children with spastic hemiplegia were randomly divided into experimental and control groups. In the experimental group, 20 min of neurodevelopmental therapy and 20 min of concentric and eccentric control exercise were applied to the paretic leg. In the control group, 40 min of neurodevelopmental therapy was applied. The Pediatric Balance Scale test and standing and gait items of the Gross Motor Function Measure were evaluated before and after intervention.

[Results] In the experimental group, Gross Motor Function Measure and Pediatric Balance Scale scores statistically significantly increased after the intervention. The control group showed no statistically significant difference in either score after the intervention.

[Conclusion] Concentric and eccentric control exercise therapy in children with spastic hemiplegia can be effective in improving gross motor function and balance ability, and can be used to solve functional problems in a paretic leg.

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DOI: 10.1589/jpts.28.2128

PMCID: PMC4968522

PMID: 27512281 [PubMed]

Efficacy of suit therapy on functioning in children and adolescents with cerebral palsy: a systematic review and meta-analysis.

Martins E, Cordovil R, Oliveira R, Letras S, Lourenço S, Pereira I, Ferro A, Lopes I, Silva CR, Marques M

Dev Med Child Neurol. 2016 Apr;58(4):348-60. doi: 10.1111/dmcn.12988. Epub 2015 Nov 27.

Comment in Dev Med Child Neurol. 2016 Apr;58(4):322-3.

AIM: This systematic review and meta-analysis presents an overview of the efficacy of suit therapy on functioning in children and adolescents with cerebral palsy (CP).

METHOD: A systematic review with meta-analysis was conducted. A comprehensive search of peer-reviewed articles was performed on electronic databases, from their inception to May 2014. Studies included were rated for methodological quality using the Physiotherapy Evidence Database scale. Effects of suit therapy on functioning were assessed using meta-analytic techniques.

RESULTS: From the 46 identified studies, four met the inclusion criteria and were included in the meta-analysis. Small, pooled effect sizes were found for gross motor function at post-treatment ($g=0.46$, 95% confidence interval [CI] 0.10-0.82) and follow-up ($g=0.47$, 95% CI 0.03-0.90).

INTERPRETATION: The small number of studies, the variability between them, and the low sample sizes are limitations of this review. Findings suggest that to weigh and balance benefits against harms, clinicians, patients, and families need better evidence to examine and prove the effects of short intensive treatment such as suit therapy on gross motor function in children and adolescents with CP. Therefore, more research based on high-quality studies focusing on functioning in all dimensions of the International Classification of Functioning, Disability and Health perspective is necessary to clarify the impact of suit therapy.

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DOI: 10.1111/dmcn.12988

PMID: 26613800 [PubMed - 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. 2016 Aug 9. doi: 10.1111/dmcn.13216. [Epub ahead of print]

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

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75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org](#)

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.

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DOI: 10.1111/dmnc.13216

PMID: 27503605 [PubMed - as supplied by publisher]

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

Güçhan Z, Mutlu A

Dev Med Child Neurol. 2016 Aug 1. doi: 10.1111/dmnc.13213. [Epub ahead of print]

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.

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DOI: 10.1111/dmnc.13213

PMID: 27476831 [PubMed - as supplied by publisher]

Training postural control and sitting in children with cerebral palsy: Kinesio taping vs. neuromuscular electrical stimulation.

Karabay İ, Doğan A, Ekiz T, Köseoğlu BF, Ersöz M

Complement Ther Clin Pract. 2016 Aug;24:67-72. doi: 10.1016/j.ctcp.2016.05.009. Epub 2016 May 12.

OBJECTIVE: To elucidate the effects of Kinesio Taping (KT) in addition to neurodevelopmental therapy (NDT) on posture and sitting, and to compare the effects of KT and neuromuscular electrical stimulation (NMES).

MATERIALS-METHODS: Seventy-five children were randomized into control, KT, and NMES groups. NDT was applied to all children 4 times a week for 4 weeks. In addition, KT and NMES were applied to KT and NMES groups, respectively. Sitting subset of Gross Motor Function Measure (GMFM) and kyphosis levels of the groups were analyzed by two way mixed ANOVA.

RESULTS: GMFM and kyphosis values improved significantly in all groups (all $p < 0.01$), yet change levels were more prominent in the KT and NMES groups than the control group. Moreover, NMES group showed better improvement.

CONCLUSION: KT or NMES application for four weeks in addition to NDT is effective on improving kyphosis and sitting. Besides, NMES is more effective than KT.

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DOI: 10.1016/j.ctcp.2016.05.009

PMID: 27502803 [PubMed - in process]

Orthèses

Examination of the torque required to passively palmar abduct the thumb CMC joint in a pediatric population with hemiplegia and stroke.

Stirling L, Ahmad MQ, Kelty-Stephen D, Correia A.

J Biomech. 2015 Dec 16;48(16):4246-52. doi: 10.1016/j.jbiomech.2015.10.027. Epub 2015 Oct 28.

Many activities of daily living involve precision grasping and bimanual manipulation, such as putting toothpaste on a toothbrush or feeding oneself. However, children afflicted by stroke, cerebral palsy, or traumatic brain injury may have lost or never had the ability to actively and accurately control the thumb. To translate insights from adult rehabilitation robotics to innovative therapies for hand rehabilitation in pediatric care, specifically for thumb deformities, an understanding of the torque needed to abduct the thumb to assist grasping tasks is required. Participants (n=16, 10 female, 13.2±3.1 years) had an upper extremity evaluation and measures were made of their passive range of motion, anthropometrics, and torques to abduct the thumb for both their affected and non-affected sides. Torque measures were made using a custom wrist orthosis that was adjusted for each participant. The torque to achieve maximum abduction was 1.47±0.61inlb for the non-affected side and 1.51±0.68inlb for the affected side, with a maximum recorded value of 4.87inlb. The overall maximum applied torque was observed during adduction and was 5.10inlb. We saw variation in the applied torque, which could have been due to the applied torques by the Occupational Therapist or the participant actively assisting or resisting the motion rather than remaining passive. We expect similar muscle and participant variation to exist with an assistive device. Thus, the data presented here can be used to inform the specifications for the development of an assistive thumb orthosis for children with "thumb-in-palm" deformity.

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DOI: 10.1016/j.jbiomech.2015.10.027

PMID: 26542786 [PubMed - indexed for MEDLINE]

Robots - Exosquelette

A Robotic Exoskeleton for Treatment of Crouch Gait in Children with Cerebral Palsy: Design and Initial Application.

Lerner Z, Damiano D, Park HS, Gravunder A, Bulea T.

IEEE Trans Neural Syst Rehabil Eng. 2016 Jul 27. [Epub ahead of print]

Crouch gait, a pathological pattern of walking characterized by excessive knee flexion, is one of the most common gait disorders observed in children with cerebral palsy (CP). Effective treatment of crouch during childhood is critical to maintain mobility into adulthood, yet current interventions do not adequately alleviate crouch in most individuals. Powered exoskeletons provide an untapped opportunity for intervention. The multiple contributors to crouch, including spasticity, contracture, muscle weakness, and poor motor control make design and control of such devices challenging in this population. To our knowledge, no evidence exists regarding the feasibility or efficacy of utilizing motorized assistance to alleviate knee flexion in crouch gait. Here, we present the design of and first results from a powered exoskeleton for extension assistance as a treatment for crouch gait in children with CP. Our exoskeleton, based on the architecture of a knee-ankle-foot orthosis, is lightweight (3.2 kg) and modular. On board sensors enable knee extension assistance to be provided during distinct phases of the gait cycle. We tested our device on one 6 year old male participant with spastic diplegia from CP. Our results show that the powered exoskeleton improved knee extension during stance by 18.1° while total knee range of motion improved 21.0°. Importantly, we observed no significant decrease in knee extensor muscle activity, indicating the user did not rely solely on the exoskeleton to extend the limb. These results establish the initial feasibility of robotic exoskeletons for treatment of crouch and provide impetus for continued investigation of these devices with the aim of deployment for long term gait training in this population.

DOI: 10.1109/TNSRE.2016.2595501

PMID: 27479974 [PubMed - as supplied by publisher]

Effects of robotic therapy on upper-extremity function in children with cerebral palsy: A systematic review.

Chen YP, Howard AM

Dev Neurorehabil. 2016;19(1):64-71. doi: 10.3109/17518423.2014.899648. Epub 2014 Apr 11.

OBJECTIVE: To systematically examine the effects of robotic therapy on upper extremity (UE) function in children with cerebral palsy (CP).

METHODS: A systematic literature search was conducted in Pubmed, CINAHL, Cochrane, PsychInfo, TRIP, and Web of Science up to July 2013. Studies of children with CP, using robotic therapy and measures of UE were included.

RESULTS: Nine articles using three different robotic systems were included. Of these, seven were case studies. Overall, robotic therapy showed the potential effects as all studies reported at least one positive outcome: a moderate effect in improving reaching duration, smoothness, or decreased muscle tone, and a small to large effect in standardized clinical assessment (e.g. Fugl-Meyer).

CONCLUSION: This review confirms the potential for robotic therapy to improve UE function in children with CP. However, the paucity of group design studies summons the need for more rigorous research before conclusive recommendations can be made.

DOI: 10.3109/17518423.2014.899648

PMID: 24724587 [PubMed - indexed for MEDLINE]

Orthotic correction of lower limb function during gait does not immediately influence spinal kinematics in spastic hemiplegic cerebral palsy.

Schmid S, Romkes J, Taylor WR, Lorenzetti S, Brunner R

Gait Posture. 2016 Aug 12;49:457-462. doi: 10.1016/j.gaitpost.2016.08.013. [Epub ahead of print]

BACKGROUND AND PURPOSE: Foot equinus and leg length discrepancy (LLD) are common problems in hemiplegic cerebral palsy (hCP), both causing secondary deviations of pelvic motion during gait. It can therefore be assumed that the spinal deviations observed in hCP patients are secondary as a compensation for the position of the pelvis arising from the disturbed leg function. This study investigated the effects of correcting lower extremity function by orthotics on spinal gait kinematics in hCP patients.

METHODS: Ten adolescent hCP patients and 15 healthy controls were included. Using a validated and previously used enhanced marker set, sagittal and frontal plane spinal curvature angles as well as general trunk and lower extremity kinematics were measured while walking barefoot as well as with an orthotic correction (only hCP patients) using a 12-camera motion capture system.

RESULTS: The hCP patients in both the barefoot and orthotic conditions indicated clinically relevant greater lumbar lordosis angles ($d \geq 0.96$, $p \leq 0.071$), smaller thoracic kyphosis angles ($d \geq 0.84$, $p \leq 0.142$) and differences in frontal plane lumbar curvature angles ($d \geq 1.00$, $p \leq 0.105$) compared to controls. However, these angles were not influenced by the successful restoration of a normal heel-to-toe gait pattern and the correction of any LLD using lower extremity orthotics.

CONCLUSIONS: Spinal gait deviations in adolescents with mild hCP seemed not to result secondarily from foot equinus or LLD, but probably from structural deformities such as hip flexor contractures. Future research should address long-term effects of an AFO treatment as well as the relationship between spinal kinematics and severity of disease.

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DOI: 10.1016/j.gaitpost.2016.08.013

PMID: 27543740 [PubMed - as supplied by publisher]

Stimulation cérébrale - Stimulation neurosensorielle

Advancing non-invasive neuromodulation clinical trials in children: Lessons from perinatal stroke.

Kirton A.

Eur J Paediatr Neurol. 2016 Jul 9. pii: S1090-3798(16)30091-5. doi: 10.1016/j.ejpn.2016.07.002. [Epub ahead of print]

Applications of non-invasive brain stimulation including therapeutic neuromodulation are expanding at an alarming rate. Increasingly established scientific principles, including directional modulation of well-informed cortical targets, are advancing clinical trial development. However, high levels of disease burden coupled with zealous enthusiasm may be getting ahead of rational research and evidence. Experience is limited in the developing brain where additional issues must be considered. Properly designed and meticulously executed clinical trials are essential and required to advance and optimize the potential of non-invasive neuromodulation without risking the well-being of

children and families. Perinatal stroke causes most hemiplegic cerebral palsy and, as a focal injury of defined timing in an otherwise healthy brain, is an ideal human model of developmental plasticity. Advanced models of how the motor systems of young brains develop following early stroke are affording novel windows of opportunity for neuromodulation clinical trials, possibly directing neuroplasticity toward better outcomes. Reviewing the principles of clinical trial design relevant to neuromodulation and using perinatal stroke as a model, this article reviews the current and future issues of advancing such trials in children.

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DOI: 10.1016/j.ejpn.2016.07.002

PMID: 27470654 [PubMed - as supplied by publisher]

Transcranial direct current stimulation combined with upper limb functional training in children with spastic, hemiparetic cerebral palsy: study protocol for a randomized controlled trial.

Moura RC, Santos CA, Grecco LA, Lazzari RD, Dumont AJ, Duarte NC, Braun LA, Lopes JB, Santos LA, Rodrigues EL, Albertini G, Cimolin V, Galli M, Oliveira CS

Trials. 2016 Aug 17;17(1):405.

BACKGROUND: The aim of the proposed study is to perform a comparative analysis of functional training effects for the paretic upper limb with and without transcranial direct current stimulation over the primary motor cortex in children with spastic hemiparetic cerebral palsy.

METHODS: The sample will comprise 34 individuals with spastic hemiparetic cerebral palsy, 6 to 16 years old, classified at level I, II, or III of the Manual Ability Classification System. Participants will be randomly allocated to two groups: (1) functional training of the paretic upper limb combined with anodic transcranial stimulation; (2) functional training of the paretic upper limb combined with sham transcranial stimulation. Evaluation will involve three-dimensional movement analysis and electromyography using the SMART-D 140® system (BTS Engineering) and the FREEMG® system (BTS Engineering), the Quality of Upper Extremity Skills Test, to assess functional mobility, the Portable Device and Ashworth Scale, to measure movement resistance and spasticity, and the Pediatric Evaluation of Disability Inventory, to evaluate performance. Functional reach training of the paretic upper limb will include a range of manual activities using educational toys associated with an induced constraint of the non-paretic limb during the training. Training will be performed in five weekly 20-minute sessions for two weeks. Transcranial stimulation over the primary motor cortex will be performed during the training sessions at an intensity of 1 mA. Findings will be analyzed statistically considering a 5 % significance level ($P \leq 0.05$).

DISCUSSION: This paper presents a detailed description of a prospective, randomized, controlled, double-blind, clinical trial designed to demonstrate the effects of combining transcranial direct current stimulation over the primary motor cortex and functional training of the paretic limb in children with cerebral palsy classified at level I, II, or III of the Manual Ability Classification System. The results will be published and evidence found may contribute to the use of transcranial stimulation for this population.

TRIAL REGISTRATION: ReBEC RBR-6V4Y3K . Registered on 11 February 2015.

DOI: 10.1186/s13063-016-1534-7

PMID: 27530758 [PubMed - as supplied by publisher]

Réalité virtuelle - Jeux video

Effects of a Nintendo Wii exercise program on spasticity and static standing balance in spastic cerebral palsy.

Gatica-Rojas V, Cartes-Velásquez R, Méndez-Rebolledo G, Guzman-Muñoz E, Lizama LE

Dev Neurorehabil. 2016 Aug 18:1-4. [Epub ahead of print]

OBJECTIVE: This study sought to evaluate the effects of a Nintendo Wii Balance Board (NWBB) intervention on ankle spasticity and static standing balance in young people with spastic cerebral palsy (SCP).

METHODS: Ten children and adolescents (aged 72-204 months) with SCP participated in an exercise program with NWBB. The intervention lasted 6 weeks, 3 sessions per week, 25 minutes for each session. Ankle spasticity was assessed using the Modified Modified Ashworth Scale (MMAS), and static standing balance was quantified using posturographic measures (center-of-pressure [CoP] measures). Pre- and post-intervention measures were compared.

RESULTS: Significant decreases of spasticity in the ankle plantar flexor muscles ($p < 0.01$). There was also a significant reduction in the CoP sway area ($p = 0.04$), CoP mediolateral velocity ($p = 0.03$), and CoP anterior-posterior velocity ($p = 0.03$).

CONCLUSION: A 6-session NWBB program reduces the spasticity at the ankle plantar flexors and improves the static standing balance in young people with SCP.

DOI: 10.1080/17518423.2016.1211770

PMID: 27538127 [PubMed - as supplied by publisher]

Preparing a neuropediatric upper limb exergame rehabilitation system for home-use: a feasibility study.

Gerber CN, Kunz B, van Hedel HJ

J Neuroeng Rehabil. 2016 Mar 23;13:33. doi: 10.1186/s12984-016-0141-x.

BACKGROUND: Home-based, computer-enhanced therapy of hand and arm function can complement conventional interventions and increase the amount and intensity of training, without interfering too much with family routines. The objective of the present study was to investigate the feasibility and usability of the new portable version of the YouGrabber® system (YouRehab AG, Zurich, Switzerland) in the home setting.

METHODS: Fifteen families of children (7 girls, mean age: 11.3y) with neuromotor disorders and affected upper limbs participated. They received instructions and took the system home to train for 2 weeks. After returning it, they answered questions about usability, motivation, and their general opinion of the system (Visual Analogue Scale; 0 indicating worst score, 100 indicating best score; ≤ 30 not satisfied, 31-69 average, ≥ 70 satisfied). Furthermore, total pure playtime and number of training sessions were quantified. To prove the usability of the system, number and sort of support requests were logged.

RESULTS: The usability of the system was considered average to satisfying (mean 60.1-93.1). The lowest score was given for the occurrence of technical errors. Parents had to motivate their children to start (mean 66.5) and continue (mean 68.5) with the training. But in general, parents estimated the therapeutic benefit as high (mean 73.1) and the whole system as very good (mean 87.4). Children played on average 7 times during the 2 weeks; total pure playtime was 185 ± 45 min. Especially at the beginning of the trial, systems were very error-prone. Fortunately, we, or the company, solved most problems before the patients took the systems home. Nevertheless, 10 of 15 families contacted us at least once because of technical problems.

CONCLUSIONS: Despite that the YouGrabber® is a promising and highly accepted training tool for home-use, currently, it is still error-prone, and the requested support exceeds the support that can be provided by clinical therapists. A technically more robust system, combined with additional attractive games, likely results in higher patient motivation and better compliance. This would reduce the need for parents to motivate their children extrinsically and allow for clinical trials to investigate the effectiveness of the system.

TRIAL REGISTRATION: ClinicalTrials.gov NCT02368223.

[Free PMC Article](#)

DOI: 10.1186/s12984-016-0141-x

PMCID: PMC4806437

PMID: 27008504 [PubMed - indexed for MEDLINE]

The use of commercial video games in rehabilitation: a systematic review.

Bonnechère B, Jansen B, Omelina L, Van Sint Jan S.

Int J Rehabil Res. 2016 Aug 9. [Epub ahead of print]

The aim of this paper was to investigate the effect of commercial video games (VGs) in physical rehabilitation of motor functions. Several databases were screened (Medline, SAGE Journals Online, and ScienceDirect) using combinations of the following free-text terms: commercial games, video games, exergames, serious gaming, rehabilitation games, PlayStation, Nintendo, Wii, Wii Fit, Xbox, and Kinect. The search was limited to peer-reviewed English journals. The beginning of the search time frame was not restricted and the end of the search time frame was 31 December 2015. Only randomized controlled trial, cohort, and observational studies evaluating the effect of VGs on physical rehabilitation were included in the review. A total of 4728 abstracts were screened, 275 were fully reviewed, and 126 papers were eventually included. The following information was extracted from the selected studies: device type, number and type of patients, intervention, and main outcomes. The integration of into physical rehabilitation has been tested for various pathological conditions, including stroke, cerebral palsy, Parkinson's

disease, balance training, weight loss, and aging. There was large variability in the protocols used (e.g. number of sessions, intervention duration, outcome measures, and sample size). The results of this review show that in most cases, the introduction of VG training in physical rehabilitation offered similar results as conventional therapy. Therefore, VGs could be added as an adjunct treatment in rehabilitation for various pathologies to stimulate patient motivation. VGs could also be used at home to maintain rehabilitation benefits.

DOI: 10.1097/MRR.000000000000190

PMID: 27508968 [PubMed - as supplied by publisher]

Thérapie cellulaire Médecine régénérative

The Role of Stem Cells in the Treatment of Cerebral Palsy: a Review.

Kiasatdolatabadi A, Lotfibakhshaiesh N, Yazdankhah M, Ebrahimi-Barough S, Jafarabadi M, Ai A, Sadroddiny E, Ai J
Mol Neurobiol. 2016 Aug 13. [Epub ahead of print]

Cerebral palsy (CP) is a neuromuscular disease due to injury in the infant's brain. The CP disorder causes many neurologic dysfunctions in the patient. Various treatment methods have been used for the management of CP disorder. However, there has been no absolute cure for this condition. Furthermore, some of the procedures which are currently used for relief of symptoms in CP cause discomfort or side effects in the patient. Recently, stem cell therapy has attracted a huge interest as a new therapeutic method for treatment of CP. Several investigations in animal and human with CP have demonstrated positive potential of stem cell transplantation for the treatment of CP disorder. The ultimate goal of this therapeutic method is to harness the regenerative capacity of the stem cells causing a formation of new tissues to replace the damaged tissue. During the recent years, there have been many investigations on stem cell therapy. However, there are still many unclear issues regarding this method and high effort is needed to create a technology as a perfect treatment. This review will discuss the scientific background of stem cell therapy for cerebral palsy including evidences from current clinical trials.

DOI: 10.1007/s12035-016-0030-0

PMID: 27520277 [PubMed - as supplied by publisher]

Autres

Different horse's paces during hippotherapy on spatio-temporal parameters of gait in children with bilateral spastic cerebral palsy: A feasibility study.

Res Dev Disabil. 2016 Aug 9;59:65-72. doi: 10.1016/j.ridd.2016.07.015. [Epub ahead of print]Antunes FN, Pinho AS, Kleiner AF, Salazar AP, Eltz GD, de Oliveira Junior AA, Cechetti F, Galli M, Pagnussat AS

Hippotherapy is often carried out for the rehabilitation of children with Cerebral Palsy (CP), with the horse riding at a walking pace. This study aimed to explore the immediate effects of a hippotherapy protocol using a walk-trot pace on spatio-temporal gait parameters and muscle tone in children with Bilateral Spastic CP (BS-CP). Ten children diagnosed with BS-CP and 10 healthy aged-matched children (reference group) took part in this study. The children with BS-CP underwent two sessions of hippotherapy for one week of washout between them. Two protocols (lasting 30min) were applied on separate days: Protocol 1: the horse's pace was a walking pace; and Protocol 2: the horse's pace was a walk-trot pace. Children from the reference group were not subjected to treatment. A wireless inertial measurement unit measured gait spatio-temporal parameters before and after each session. The Modified Ashworth Scale was applied for muscle tone measurement of hip adductors. The participants underwent the gait assessment on a path with surface irregularities (ecological context). The comparisons between BS-CP and the reference group found differences in all spatio-temporal parameters, except for gait velocity. Within-group analysis of children with BS-CP showed that the swing phase did not change after the walk pace and after the walk-trot pace. The percentage of rolling phase and double support improved after the walk-trot. The spasticity of the hip adductors was significantly reduced as an immediate result of both protocols, but this decrease was more evident after the walk-trot. The walk-trot protocol is feasible and is able to induce an immediate effect that improves the gait spatio-temporal parameters and the hip adductors spasticity.

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DOI: 10.1016/j.ridd.2016.07.015

PMID: 27518920 [PubMed - as supplied by publisher]

Langage – Communication

AAC and Early Intervention for Children with Cerebral Palsy: Parent Perceptions and Child Risk Factors.

Smith AL, Hustad KC

Augment Altern Commun. 2015;31(4):336-50. doi: 10.3109/07434618.2015.1084373. Epub 2015 Sep 24.

The current study examined parent perceptions of communication, the focus of early intervention goals and strategies, and factors predicting the implementation of augmentative and alternative communication (AAC) for 26 two-year-old children with cerebral palsy. Parents completed a communication questionnaire and provided early intervention plans detailing child speech and language goals. Results indicated that receptive language had the strongest association with parent perceptions of communication. Children who were not talking received a greater number of intervention goals, had a greater variety of goals, and had more AAC goals than children who were emerging and established talkers. Finally, expressive language had the strongest influence on AAC decisions. Results are discussed in terms of the relationship between parent perceptions and language skills, communication as an emphasis in early intervention, AAC intervention decisions, and the importance of receptive language.

DOI: 10.3109/07434618.2015.1084373

PMCID: PMC4628599 [Available on 2016-12-01]

PMID: 26401966 [PubMed - indexed for MEDLINE]

Thought-based row-column scanning communication board for individuals with cerebral palsy.

Scherer R, Billinger M, Wagner J, Schwarz A, Hettich DT, Bolinger E, Lloria Garcia M, Navarro J, Müller-Putz G

Ann Phys Rehabil Med. 2015 Feb;58(1):14-22. doi: 10.1016/j.rehab.2014.11.005. Epub 2015 Jan 9.

Impairment of an individual's ability to communicate is a major hurdle for active participation in education and social life. A lot of individuals with cerebral palsy (CP) have normal intelligence, however, due to their inability to communicate, they fall behind. Non-invasive electroencephalogram (EEG) based brain-computer interfaces (BCIs) have been proposed as potential assistive devices for individuals with CP. BCIs translate brain signals directly into action. Motor activity is no longer required. However, translation of EEG signals may be unreliable and requires months of training. Moreover, individuals with CP may exhibit high levels of spontaneous and uncontrolled movement, which has a large impact on EEG signal quality and results in incorrect translations. We introduce a novel thought-based row-column scanning communication board that was developed following user-centered design principles. Key features include an automatic online artifact reduction method and an evidence accumulation procedure for decision making. The latter allows robust decision making with unreliable BCI input. Fourteen users with CP participated in a supporting online study and helped to evaluate the performance of the developed system. Users were asked to select target items with the row-column scanning communication board. The results suggest that seven among eleven remaining users performed better than chance and were consequently able to communicate by using the developed system. Three users were excluded because of insufficient EEG signal quality. These results are very encouraging and represent a good foundation for the development of real-world BCI-based communication devices for users with CP.

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DOI: 10.1016/j.rehab.2014.11.005

PMID: 25661447 [PubMed - indexed for MEDLINE]

Douleur

Eina! Ouch! Eish! Professionals' Perceptions of How Children with Cerebral Palsy Communicate About Pain in South African School Settings: Implications for the use of AAC.

Johnson E, Nilsson S, Adolfsson M.

Augment Altern Commun. 2015;31(4):325-35. doi: 10.3109/07434618.2015.1084042. Epub 2015 Sep 15.

Most children with severe cerebral palsy experience daily pain that affects their school performance. School professionals need to assess pain in these children, who may also have communication difficulties, in order to pay

attention to the pain and support the children's continued participation in school. In this study, South African school professionals' perceptions of how they observed pain in children with cerebral palsy, how they questioned them about it and how the children communicated their pain back to them were investigated. Thirty-eight school professionals participated in five focus groups. Their statements were categorized using qualitative content analysis. From the results it became clear that professionals observed children's pain communication through their bodily expressions, behavioral changes, and verbal and non-verbal messages. Augmentative and alternative communication (AAC) methods were rarely used. The necessity of considering pain-related vocabulary in a multilingual South African context, and of advocating for the use of AAC strategies to enable children with cerebral palsy to communicate their pain was highlighted in this study.

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DOI: 10.3109/07434618.2015.1084042

PMCID: PMC4659340

PMID: 26372118 [PubMed - indexed for MEDLINE]

Parent-reported pain in non-verbal children and adolescents with cerebral palsy.

Jayanath S, Ong LC, Marret MJ, Fauzi AA

Dev Med Child Neurol. 2016 Apr;58(4):395-401. doi: 10.1111/dmcn.12943. Epub 2015 Oct 28.

Comment in *Dev Med Child Neurol.* 2016 Apr;58(4):328.

AIM: This cross-sectional study aimed to determine the prevalence, frequency, and intensity of parent-reported pain among non-verbal children with cerebral palsy (CP) and explore associations with medical, demographic, and parental psychosocial factors.

METHOD: Participants were parents of non-verbal outpatients (aged 2-20y) with CP at University of Malaya Medical Centre, Kuala Lumpur and two community centres. Parents answered the Caregiver Priorities and Child Health Index of Life with Disabilities Questionnaire and a pro forma regarding parent-reported frequency and intensity of pain during the preceding 4 weeks. Parental psychosocial well-being was assessed via the Depression, Anxiety and Stress Scale and Multidimensional Scale of Perceived Social Support.

RESULTS: The response rate was 94%; 104 children (54 males, 50 females) were studied. The majority (51%) were in Gross Motor Function Classification System level V and 65% had spastic quadriplegia. Parents reported pain in 65%, intense pain in 17%, and daily pain in 28%. Intense and frequent pain was reported during physiotherapy. More intense pain was reported in older children ($p=0.016$) and those with spastic quadriplegia ($p=0.020$).

INTERPRETATION: Caregivers of non-verbal children with CP report a high frequency of pain. Pain intensity is associated with patient factors but not parental psychosocial factors.

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DOI: 10.1111/dmcn.12943

PMID: 26510627 [PubMed - indexed for MEDLINE]

Physiological and Behavioral Responses to Calibrated Noxious Stimuli Among Individuals with Cerebral Palsy and Intellectual Disability.

Benromano T, Pick CG, Merick J, Defrin R

Pain Med. 2016 Jul 29. pii: pnw155. [Epub ahead of print]

OBJECTIVE: As individuals with intellectual disability (ID) due to cerebral palsy (CP) are at high risk of experiencing pain, measuring their pain is crucial for adequate treatment. While verbal reports are the gold standard in pain measurements, they may not be sufficient in ID. The aim was to detect behavioral/autonomic responses that may indicate the presence and intensity of pain in individuals with CP and ID, using calibrated stimuli, here for the first time.

SUBJECTS: Thirteen adults with CP and ID (CPID), 15 healthy controls (HC), and 5 adults with CP with no ID (CPNID).

METHODS: Subjects received pressure stimuli of various intensities. Self-reports (using a pyramid scale), facial expressions (retrospectively analyzed with Facial Action Coding System = FACS), and autonomic function (heart rate, heart rate variability, pulse, galvanic skin response) were analyzed.

RESULTS: Self-reports and facial expressions but not the autonomic function exhibited stimulus-response relationship to pressure stimulation among all groups. The CPID group had increased pain ratings and facial

expressions compared with controls. In addition, the increase in facial expressions along the increase in noxious stimulation was larger than in controls. Freezing in response to pain was frequent in CPID.

CONCLUSIONS: 1) Individuals with CP and ID have increased responses to pain; 2) facial expressions and self-reports, but not autonomic variables can reliably indicate their pain intensity; 3) the pyramid scale is suitable for self-report in this population. Although facial expressions may replace verbal reports, increased facial expressions at rest among these individuals may mask pain, especially at lower intensities.

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DOI: 10.1093/pm/pnw155

PMID: 27473634 [PubMed - as supplied by publisher]

Autres Troubles /troubles concomitants

Scalp Haematoma in Cerebral Palsy Case due to Unknown Cause - A Rare Case Report.

Uthamalingam M, Singh DS

J Clin Diagn Res. 2016 Jun;10(6):PD05-6. doi: 10.7860/JCDR/2016/18761.7965. Epub 2016 Jun 1.

Incidences of cerebral palsy (CP) in children are not quite common even though it is the most common motor disorder in children. Further quality of life in CP cases is not so good in young adult stages and has to face certain problems. However scalp haematoma formation in CP patient without injury to head is rarely been reported. The case is being reported for the first time from Malaysia. We report on a unique case of scalp haematoma in an 18-year-old girl of known CP patient with unknown cause. No history of trauma or fall with any of the focal neurological signs or symptoms was found. Clinical examination showed soft boggy swelling of 8 x 10 cm size, involving most of scalp and upper face. CT – scan showed scalp haematoma with right orbital extraconal lesion. She underwent incision and drainage of scalp lesion; consequently around 100 ml of clotted blood came out. At follow-up she was doing well.

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DOI: 10.7860/JCDR/2016/18761.7965

PMCID: PMC4963707

PMID: 27504347 [PubMed]

Troubles respiratoires

Tracheostomy Complications in Institutionalized Children with Long-term Tracheostomy and Ventilator Dependence.

Wilcox LJ, Weber BC, Cunningham TD, Baldassari CM.

Otolaryngol Head Neck Surg. 2016 Apr;154(4):725-30. doi: 10.1177/0194599816628486. Epub 2016 Feb 16.

OBJECTIVES: (1) To identify tracheostomy complications in institutionalized children with chronic tracheostomy. (2) To determine factors that predispose to development of tracheostomy complications in institutionalized children with chronic tracheostomy.

STUDY DESIGN: Case series with chart review over 10 years.

SETTING: Tertiary children's hospital.

SUBJECTS AND METHODS: Children were included if they underwent tracheostomy before 21 years of age and resided at a pediatric nursing facility. Most children were ventilator dependent and had severe comorbid medical conditions, including developmental delay and cerebral palsy. The number of tracheostomy complications and unplanned hospital admissions were recorded. Interventions for tracheostomy complications were also reviewed.

RESULTS: Thirty-two institutionalized children with chronic tracheostomy were included. The mean age at time of tracheostomy was 5.4 years, with a mean duration of institutionalization of 9.1 years. Twenty-seven children (84%) experienced tracheostomy complications. The total number of complications was 79. The most common tracheostomy complications identified were peristomal granulation (n = 13) and suprastomal granulation (n = 12). Age at time of tracheostomy, duration of institutionalization, and ventilator dependence did not predict the likelihood of developing a complication. Of 32 patients, 20 were evaluated in the emergency room during the study,

Science Infos Paralysie Cérébrale, Août 2016, FONDATION PARALYSIE CEREBRALE, 67 rue Vergniaud 55
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and there were 48 unplanned admissions for tracheostomy-related complications during the study. Forty-five urgent direct laryngoscopy and bronchoscopy procedures were performed in a total of 20 children with tracheostomy complications.

CONCLUSIONS: Tracheostomy complications are common in institutionalized children with chronic tracheostomy and are challenging to manage. Further research is necessary to determine novel ways to reduce tracheostomy complications in this population.

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DOI: 10.1177/0194599816628486

PMID: 26884369 [PubMed - indexed for MEDLINE]

Troubles musculosquelettiques, des tissus conjonctifs et osseux

Bone health in cerebral palsy and introduction of a novel therapy. [Article in English, Portuguese]

Scheinberg MA, Golmia RP, Sallum AM, Pippa MG, Cortada AP, Silva TG

Einstein (Sao Paulo). 2015 Oct-Dec;13(4):555-9. doi: 10.1590/S1679-45082015AO3321.

OBJECTIVE: To assess the bone health status of children with cerebral palsy and the therapeutic effect of denosumab in a subgroup of children with cerebral palsy and decreased bone mass.

METHODS: Children with cerebral palsy were evaluated according to their motor disability score (classification system gross motor functions III to V), bone density and bone turnover markers. Dual X-ray energy absorption was used to measure the lumbar spine, and total body, except the head. Thereafter a group of children with cerebral palsy and osteoporosis was treated with denosumab, a fully human monoclonal antibody. Bone turnover markers were measured before and three months after treatment.

RESULTS: Reduction in bone mineral density was observed, particularly in children with greater impairment evaluated by the motor score. Decreased bone turnover markers were found in a selected group of children three months after exposure to denosumab.

CONCLUSION: Bone loss was present in children with significant impairment of motor function, as well as decreased serum levels of bone resorption markers with new forms.

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DOI: 10.1590/S1679-45082015AO3321

PMCID: PMC4878630

PMID: 26761553 [PubMed - indexed for MEDLINE]

Musculoskeletal and Endocrine Health in Adults With Cerebral Palsy: New Opportunities for Intervention.

Trinh A, Wong P, Fahey MC, Brown J, Churchyard A, Strauss BJ, Ebeling PR, Fuller PJ, Milat F.

J Clin Endocrinol Metab. 2016 Mar;101(3):1190-7. doi: 10.1210/jc.2015-3888. Epub 2016 Jan 11.

CONTEXT: Cerebral palsy (CP) increases fracture risk through diminished ambulation, nutritional deficiencies, and anticonvulsant medication use. Studies examining bone mineral density (BMD) in adults with CP are limited.

OBJECTIVE: To examine the relationship between body composition, BMD, and fractures in adults with CP. The effect of functional, nutritional, and endocrine factors on BMD and body composition is also explored.

DESIGN: Retrospective cross-sectional study.

SETTING AND PARTICIPANTS: Forty-five adults with CP (mean age, 28.3 ± 11.0 years) who had dual-energy x-ray absorptiometry imaging at a single tertiary hospital between 2005 and 2015.

RESULTS: Seventeen (38%) had a past history of fragility fracture; 43% had a Z-score of ≤ -2.0 at the lumbar spine (LS) and 41% at the femoral neck (FN). In nonambulatory patients, every one unit decrease in FN Z-score increased the risk of fracture 3.2-fold (95% confidence interval, 1.07-9.70; P = .044). Stepwise linear regression revealed that the Gross Motor Function Classification System was the best predictor of LS Z-score (R(2) = 0.550; β = -0.582; P = .002) and FN Z-score (R(2) = 0.428; β = -0.494; P = .004); 35.7% of the variance in BMD was accounted for by lean tissue mass. Hypogonadism, present in 20% of patients, was associated with reduced lean tissue mass and reduced LS BMD. Lean tissue mass positively correlated with BMD in eugonadal patients, but not in hypogonadal patients.

CONCLUSIONS: Low BMD and fractures are common in adults with CP. This is the first study to document hypogonadism in adults with CP with detrimental changes in body composition and BMD.

DOI: 10.1210/jc.2015-3888

PMID: 26751195 [PubMed - indexed for MEDLINE]

Skeletal Maturation and Mineralisation of Children with Moderate to Severe Spastic Quadriplegia.

Sharawat IK, Sitaraman S.

J Clin Diagn Res. 2016 Jun;10(6):SC01-5. doi: 10.7860/JCDR/2016/18620.7921. Epub 2016 Jun 1.

INTRODUCTION: Diminished bone mineral density and delayed skeletal maturation are common in children with spastic quadriplegia.

AIM: The purpose of our study was to evaluate the Bone Mineral Density (BMD) of children with moderate to severe spastic quadriplegia and its relationship with other variables like nutrition and growth.

MATERIALS AND METHODS: This was a hospital based, cross-sectional, case-control study. Forty-two (28 males, 14 females) children with spastic quadriplegia and 42 (24 males, 18 females) healthy children were included in the study. BMD of cases and control were measured by Dual Energy X-ray Absorptiometry (DEXA). Radiographs of left hand and wrist of cases and controls were taken and bone age was determined.

RESULTS: BMD values of upper extremity, lower extremity, thoraco-lumbar spine and pelvis in cases were lower than those of controls ($p < 0.0001$). In children with non severe malnutrition, 75% of the cases had lower bone age than chronological age, whereas all cases with severe malnutrition had lower bone age than chronological age. Step wise regression analysis showed that nutritional status independently contributed to lower BMD values but the BMD values did not correlate significantly with the use of anticonvulsant drugs and presence of physical therapy.

CONCLUSION: Decreased BMD and delayed bone age is prevalent in children with spastic quadriplegia and nutritional status is an important contributing factor.

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DOI: 10.7860/JCDR/2016/18620.7921

PMCID: PMC4963726

PMID: 27504366 [PubMed]

Skeletal muscle fiber-type specific succinate dehydrogenase activity in cerebral palsy.

Zogby AM, Dayanidhi S, Chambers HG, Schenk S, Lieber RL

Muscle Nerve. 2016 Aug 12. doi: 10.1002/mus.25379. [Epub ahead of print]

INTRODUCTION: Children with cerebral palsy (CP) exhibit increased energy expenditure during movement, but whether this is due in part to decrements in skeletal muscle mitochondrial oxidative capacity is unknown. Accordingly, we compared fiber-type specific succinate dehydrogenase (SDH) activity in children with CP to typically developing (TD) children.

METHODS: SDH activity and myofiber areas of type 1 and 2A fibers were measured in semitendinosus biopsies of both groups ($n=5$ /group) Results: SDH activity was ~35% higher in type 1 compared to type 2A fibers, but there were no differences between groups. Average myofiber area was 45% smaller in CP vs. TD ($P<0.05$), and type 2A fibers were 32% larger than type 1 fibers ($P<0.05$) only in TD children.

DISCUSSION: Fiber-type specific SDH activity is similar between TD children and children with CP. This suggests that increased energy expenditure in children with CP is not related to impaired mitochondrial oxidative capacity. This article is protected by copyright. All rights reserved.

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DOI: 10.1002/mus.25379

PMID: 27515237 [PubMed - as supplied by publisher]

Nutrition – Troubles nutritionnels

Dietary Intakes and Nutritional Issues in Neurologically Impaired Children.

Penagini F, Mameli C, Fabiano V, Brunetti D, Dilillo D, Zuccotti GV

Nutrients. 2015 Nov 13;7(11):9400-15. doi: 10.3390/nu7115469.

Neurologically impaired (NI) children are at increased risk of malnutrition due to several nutritional and non-nutritional factors. Among the nutritional factors, insufficient dietary intake as a consequence of feeding difficulties

is one of the main issues. Feeding problems are frequently secondary to oropharyngeal dysphagia, which usually correlates with the severity of motor impairment and presents in around 90% of preschool children with cerebral palsy (CP) during the first year of life. Other nutritional factors are represented by excessive nutrient losses, often subsequent to gastroesophageal reflux and altered energy metabolism. Among the non-nutritional factors, the type and severity of neurological impairment, ambulatory status, the degree of cognitive impairment, and use of antiepileptic medication altogether concur to determination of nutritional status. With the present review, the current literature is discussed and a practical approach for nutritional assessment in NI children is proposed. Early identification and intervention of nutritional issues of NI children with a multidisciplinary approach is crucial to improve the overall health and quality of life of these complex children.

[Free PMC Article](#)

DOI: 10.3390/nu7115469

PMCID: PMC4663597

PMID: 26580646 [PubMed - indexed for MEDLINE]

Nutrition, brain function, and plasticity in cerebral palsy.

Dan B.

[Free Article](#)

DOI: 10.1111/dmnc.13208

PMID: 27518534 [PubMed - in process]

Dev Med Child Neurol. 2016 Sep;58(9):890. doi: 10.1111/dmnc.13208.

Sphère bucco-dentaire – Troubles de la déglutition

Longitudinal Study of Oropharyngeal Dysphagia in Preschool Children With Cerebral Palsy.

Benfer KA, Weir KA, Bell KL, Ware RS, Davies PS, Boyd RN

Arch Phys Med Rehabil. 2016 Apr;97(4):552-60.e9. doi: 10.1016/j.apmr.2015.11.016. Epub 2015 Dec 18.

OBJECTIVES: To determine changes in prevalence and severity of oropharyngeal dysphagia (OPD) in children with cerebral palsy (CP) and the relationship to health outcomes.

DESIGN: Longitudinal cohort study.

SETTING: Community and tertiary institutions.

PARTICIPANTS: Children (N=53, 33 boys) with a confirmed diagnosis of CP assessed first at 18 to 24 months (Assessment 1: mean age \pm SD, 22.9 \pm 2.9 mo corrected age; Gross Motor Function Classification System [GMFCS]: I, n=22; II, n=7; III, n=11; IV, n=5; V, n=8) and at 36 months (Assessment 2).

INTERVENTIONS: Not applicable.

MAIN OUTCOME MEASURES: OPD was classified using the Dysphagia Disorders Survey (DDS) and signs suggestive of pharyngeal dysphagia. Nutritional status was measured using Z scores for weight, height, and body mass index (BMI). Gross motor skills were classified on GMFCS and motor type/distribution.

RESULTS: Prevalence of OPD decreased from 62% to 59% between the ages of 18 to 24 months and 36 months. Thirty percent of children had an improvement in severity of OPD (greater than smallest detectable change), and 4% had worse OPD. Gross motor function was strongly associated with OPD at both assessments, on the DDS (Assessment 1: odds ratio [OR]=20.3, P=.011; Assessment 2: OR=28.9, P=.002), pharyngeal signs (Assessment 1: OR=10.6, P=.007; Assessment 2: OR=15.8, P=.003), and OPD severity (Assessment 1: β =6.1, P<.001; Assessment 2: β =5.5, P<.001). OPD at 18 to 24 months was related to health outcomes at 36 months: low Z scores for weight (adjusted β =1.2, P=.03) and BMI (adjusted β =1.1, P=.048), and increased parent stress (adjusted OR=1.1, P=.049).

CONCLUSIONS: Classification and severity of OPD remained relatively stable between 18 to 24 months and 36 months. Gross motor function was the best predictor of OPD. These findings contribute to developing more effective screening processes that consider critical developmental transitions that are anticipated to present challenges for children from each of the GMFCS levels.

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DOI: 10.1016/j.apmr.2015.11.016

PMID: 26707458 [PubMed - indexed for MEDLINE]

Prevalence of orofacial dysfunction in cerebral palsy and its association with gross motor function and manual ability.

Edvinsson SE, Lundqvist LO

Dev Med Child Neurol. 2016 Apr;58(4):385-94. doi: 10.1111/dmcn.12867. Epub 2015 Sep 10.

Comment in Dev Med Child Neurol. 2016 Apr;58(4):327.

AIM: To investigate the prevalence of orofacial dysfunction (OFD) and explore factors associated with OFD in young individuals with cerebral palsy (CP).

METHOD: We conducted a cross-sectional study on a population with CP in a Swedish county (132 individuals, mean age 14y 2mo [SD 4y 5mo], range 5-22y) using the Nordic Orofacial Test - Screening (NOT-S), Gross Motor Function Classification System (GMFCS), and Manual Ability Classification System (MACS). The NOT-S interview was completed by 129 individuals (76 males, 53 females) of whom 52 (30 males, 22 females) also agreed to complete the NOT-S examination.

RESULTS: OFD occurred in at least one NOT-S domain in about 80% of the individuals and was present in all subdiagnoses, GMFCS levels, and MACS levels. Prevalence of OFD increased with increasing levels of GMFCS and MACS from level I=55% to level V=100%. Within the 12 NOT-S domains, the prevalence of OFD varied between 19% and 69%, wherein seven of them were at least 40%: 'Drooling', 'Nose breathing', 'Chewing and swallowing', 'Face at rest', 'Oral motor function', 'Speech', and 'Facial expression' (in ascending order).

INTERPRETATION: OFD is common in CP. The use of OFD screening in health service planning would assist detection of areas in need of further evaluation.

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DOI: 10.1111/dmcn.12867

PMID: 26356495 [PubMed - indexed for MEDLINE]

The impact of submandibular duct relocation on drooling and the well-being of children with neurodevelopmental disabilities.

Kok SE, van der Burg JJ, van Hulst K, Erasmus CE, van den Hoogen FJ.

Int J Pediatr Otorhinolaryngol. 2016 Sep;88:173-8. doi: 10.1016/j.ijporl.2016.06.043. Epub 2016 Jun 28.

OBJECTIVE: The aim of this study was to evaluate the impact of a reduction in drooling after bilateral submandibular duct relocation (SMDR) with sublingual gland excision on daily life and care, as well as social and emotional consequences in children and adolescents with neurodevelopmental disabilities.

METHODS: This prospective cohort study included 72 children and adolescents (46 males, 26 females) with moderate to severe drooling, and their caregivers. Mean age at the time of surgery was 15 years 2 months (SD 4y 3mo). Fifty-two children were diagnosed with cerebral palsy and 20 had other non-progressive developmental disabilities. A caregiver questionnaire to document the impact of drooling on daily care and economic consequences, social interaction and emotional development and self-esteem was administered before, and 8 and 32 weeks after surgery.

RESULTS: Following bilateral SMDR the mean Visual Analogue Scale (VAS, 0-100) scores demonstrated a significant ($p < 0.001$) reduction in the severity of drooling from 81 at baseline to 28 and 36 after 8 and 32 weeks, respectively. This was accompanied by a decrease in the amount of daily care required and reduced economic consequences. In addition, an increase in social contact with other children and adults was reported by caregivers after surgery.

CONCLUSION: Bilateral SMDR with sublingual gland excision provides a significant positive reduction in daily care of children suffering from drooling. Caregivers also report positive changes in their child's social interaction and sense of self-esteem.

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DOI: 10.1016/j.ijporl.2016.06.043

PMID: 27497408 [PubMed - in process]

Troubles urinaires

Dantrolene an unusual option for detrusor overactivity: observations of a patient with cerebral palsy.

Bulchandani S, Toozs-Hobson P, Kennedy A, Sturman S.

Science Infos Paralysie Cérébrale, Août 2016, **FONDATION PARALYSIE CEREBRALE**, 67 rue Vergniaud
75013 Paris - tel +33 1 45 54 03 03 contact: Christine Doumergue cdoumergue@lafondationmotrice.org

We report a case of a 49-year-old female with cerebral palsy with spastic tri-plegia and lumbar spondylolisthesis diagnosed to have overactive neurogenic bladder, which improved on treatment with Dantrolene along with antimuscarinics. She was initially treated with antimuscarinics both transdermal and oral simultaneously and later received intravesical OnaBotulinum toxinA. Following lumbar spine fixation for spondylolisthesis, her bowel and bladder function deteriorated and she was commenced on Dantrolene for her spasticity, along with being on Oxybutinin and Mirabegron. This significantly improved her symptoms. Overactive bladder symptoms are a common manifestation in cases of CP. In refractory cases where antimuscarinics and intravesical botulinum toxin therapy have failed, a combination of Dantrolene with antimuscarinics and/or beta 3 receptor agonists may prove to be beneficial. While on therapy, regular monitoring of liver functions is required to promptly diagnose and treat hepatotoxicity.

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DOI: 10.1016/j.ejogrb.2015.08.012

PMID: 26365833 [PubMed - indexed for MEDLINE]

Troubles de la vision

Development and face validity of a cerebral visual impairment motor questionnaire for children with cerebral palsy.

Salavati M, Waninge A, Rameckers EA, van der Steen J, Krijnen WP, van der Schans CP, Steenbergen B
Child Care Health Dev. 2016 Aug 1. doi: 10.1111/cch.12377. [Epub ahead of print]

AIM: The objectives of this study were (i) to develop two cerebral visual impairment motor questionnaires (CVI-MQ's) for children with cerebral palsy (CP): one for children with Gross Motor Function Classification System (GMFCS) levels I, II and III and one for children with GMFCS levels IV and V; (ii) to describe their face validity and usability; and (iii) to determine their sensitivity and specificity.

BACKGROUND: The initial versions of the two CVI-MQ's were developed based on literature. Subsequently, the Delphi method was used in two groups of experts, one familiar with CVI and one not familiar with CVI, in order to gain consensus about face validity and usability. The sensitivity and specificity of the CVI-MQ's were subsequently assessed in 82 children with CP with (n = 39) and without CVI (n = 43). With the receiver operating curve the cut-off scores were determined to detect possible presence or absence of CVI in children with CP.

RESULTS: Both questionnaires showed very good face validity (percentage agreement above 96%) and good usability (percentage agreement 95%) for practical use. The CVI-MQ version for GMFCS levels I, II and III had a sensitivity of 1.00 and specificity of 0.96, with a cut-off score of 12 points or higher, and the version for GMFCS levels IV and V had a sensitivity of 0.97 and a specificity of 0.98, with a cut-off score of eight points or higher.

CONCLUSION: The CVI-MQ is able to identify at-risk children with CP for the probability of having CVI.

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DOI: 10.1111/cch.12377

PMID: 27481724 [PubMed - as supplied by publisher]

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 \geq 0.5) if 2 ophthalmologists independently agreed after an ophthalmoscopic examination. Inter-rater reliability was excellent.

RESULTS: Mean age at examination was 10.98±6.49years; mean gestational period was 33.26±4.78weeks. 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.

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DOI: 10.1016/j.jns.2016.06.029

PMID: 27538596 [PubMed - in process]

The role of visual stimuli on standing posture in children with bilateral cerebral palsy.

Lidbeck C, Bartonek Å, Yadav P, Tedroff K, Åstrand P, Hellgren K, Gutierrez-Farewik EM
BMC Neurol. 2016 Aug 24;16(1):151. doi: 10.1186/s12883-016-0676-2.

BACKGROUND: In children with bilateral cerebral palsy (CP) maintaining a standing position can be difficult. The fundamental motor task of standing independently is achieved by an interaction between the visual, somatosensory, and vestibular systems. In CP, the motor disorders are commonly accompanied by sensory and perceptual disturbances. Our aims were to examine the influence of visual stimuli on standing posture in relation to standing ability.

METHODS: Three dimensional motion analysis with surface electromyography was recorded to describe body position, body movement, and muscle activity during three standing tasks: in a self-selected position, while blindfolded, and during an attention-demanding task. Participants were twenty-seven typically-developing (TD) children and 36 children with bilateral CP, of which 17 required support for standing (CP-SwS) and 19 stood without support (CP-SwoS).

RESULTS: All children with CP stood with a more flexed body position than the TD children, even more pronounced in the children in CP-SwS. While blindfolded, the CP-SwS group further flexed their hips and knees, and increased muscle activity in knee extensors. In contrast, the children in CP-SwoS maintained the same body position but increased calf muscle activity. During the attention-demanding task, the children in CP-SwoS stood with more still head and knee positions and with less muscle activity.

CONCLUSIONS: Visual input was important for children with CP to maintain a standing position. Without visual input the children who required support dropped into a further crouched position. The somatosensory and vestibular systems alone could not provide enough information about the body position in space without visual cues as a reference frame. In the children who stood without support, an intensified visual stimulus enhanced the ability to maintain a quiet standing position. It may be that impairments in the sensory systems are major contributors to the difficulties to stand erect in children with CP.

DOI: 10.1186/s12883-016-0676-2

PMID: 27557808 [PubMed - in process]

Qualité de vie et rapport au monde

✚Qualité de vie

A study of the development of the Korean version of PedsQL(TM) 3.0 cerebral palsy module and reliability and validity.

Yun YJ, Shin YB, Kim SY, Shin MJ, Kim RJ, Oh TY

J Phys Ther Sci. 2016 Jul;28(7):2132-9. doi: 10.1589/jpts.28.2132. Epub 2016 Jul 29

[Purpose] The purpose of this study was to develop the Korean version of the PedsQL(TM) 3.0 Cerebral Palsy Module to evaluate the health-related quality of life of children with cerebral palsy and to test the reliability and validity.

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[Subjects and Methods] The study included 108 caregivers of children with cerebral palsy aged 2 to 4 years and 72 caregivers of children aged 5 to 7 years, who visited multiple sites between February and August 2015. The Translation Commission performed the first translation with the approval of the Mapi Research Trust Company to create a Korean-version of the PedsQL(TM). Afterwards, back-translation was performed by one translator specializing in health and medical treatment who was a native English-speaker fluent in Korean, and one native Korean-speaker fluent in English. The consistency of each question was confirmed and a translation-integrated version was created. Test components were explained to caregivers during a one-on-one interview; caregivers then completed the PedsQL(TM) questionnaire and a Pediatric Evaluation Disability Inventory (PEDI) questionnaire. Subjects contributing to test-retest measures were asked to repeat the PedsQL questionnaire one week later and return it by mail. To assess data quality for the survey question results, non-response rate, ceiling effect, and floor effect were analyzed. Test-retest reliability and internal consistency reliability were assessed. For test-retest reliability, an intraclass correlation coefficient (ICC) was calculated, and for internal consistency reliability, Cronbach's alpha was used. To test criterion-related validity, Pearson's correlation coefficient was used.

[Results] The content validity of the PedsQL 3.0 Cerebral Palsy Module was high for both age groups, and demonstrated significant internal consistency (>0.7) in all areas. For test-retest reliability, both groups demonstrated a significant ICC (>0.61). Correlation with the PEDI was statistically significant in all areas except pain and hurt.

[Conclusion] The Korean version of the PedsQL(TM) 3.0 Cerebral Palsy Module was found to be reliable and valid, and is expected to contribute greatly to the evaluation of the quality of life of children with cerebral palsy.

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DOI: 10.1589/jpts.28.2132

PMCID: PMC4971132

PMID: 27512282 [PubMed]

The formula for health and well-being in individuals with cerebral palsy: physical activity, sleep, and nutrition.

Verschuren O, McPhee P, Rosenbaum P, Gorter JW

Dev Med Child Neurol. 2016 Sep;58(9):989-90. doi: 10.1111/dmcn.13212.

[Free Article](#)

DOI: 10.1111/dmcn.13212

PMID: 27518536 [PubMed - in process]

Vie quotidienne

Computer and microswitch-based programs to improve academic activities by six children with cerebral palsy.

Stasolla F, Damiani R, Perilli V, D'Amico F, Caffò AO, Stella A, Albano V, Damato C, Leone AD

Res Dev Disabil. 2015 Oct-Nov;45-46:1-13. doi: 10.1016/j.ridd.2015.07.005. Epub 2015 Jul 19.

This study was aimed at extending the use of assistive technology (i.e. microswitch such as a pressure sensor, interface and laptop) with a new setup, allowing six children with cerebral palsy and extensive motor disabilities to improve their academic activities during classroom. A second objective of the study was to assess a maintenance/generalization phase, occurring three months after the end of the intervention, at participants' homes, involving their parents. A third purpose of the study was to monitor the effects of the intervention program on the indices of positive participations (i.e. constructive engagement) of participants involved. Finally, a social validation procedure involving 36 support teachers as raters was conducted. The study was carried out according to a multiple probe design across behaviours followed by maintenance/generalization phase for each participant. That is, the two behaviours (i.e. choice among academic disciplines and literacy) were learned first singly, then combined together. Results showed an increasing of the performances for all participants involved during intervention phases. Furthermore, during maintenance phase participants consolidated their results. Moreover, positive participation augmented as well. Support teachers, involved in the social validation assessment, considered the combined intervention as more favourable with respect to those singly learned. Clinical, educational and practical implications of the findings are discussed.

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DOI: 10.1016/j.ridd.2015.07.005

PMID: 26196086 [PubMed - indexed for MEDLINE]

Developing the Observatory Test of Capacity, Performance, and Developmental Disregard (OTCPDD) for Children with Cerebral Palsy.

Liu KC, Chen HL, Wang TN, Shieh JY

PLoS One. 2016 Mar 24;11(3):e0151798. doi: 10.1371/journal.pone.0151798. eCollection 2016.

PURPOSE: The purpose of this study was to develop a reliable and valid instrument, named the Observatory Test of Capacity, Performance, and Developmental Disregard (OTCPDD), for measuring the amount and quality of use of affected upper limb functions in the daily routines of children with CP.

METHODS: Forty-eight participants (24 children with CP and 24 matched typically developing children) were recruited. The OTCPDD was administered twice (the spontaneous use condition first, followed by the forced use condition) on children with CP. Their parents were asked to complete the Pediatric Motor Activity Log-Revised (PMAL-R). The internal consistency, the intrarater and interrater reliabilities, and the convergent and discriminate validities were measured.

RESULTS: The internal consistency (Cronbach's alpha) and the intrarater and interrater reliabilities were higher than 0.9 for all of the OTCPDD scores. The convergent validity was confirmed by significant correlations between the OTCPDD and the PMAL-R. For the discriminant validity, significant differences ($p < 0.05$) were found between children with CP and typically developing children.

CONCLUSIONS: The results support that the OTCPDD is a reliable and valid observation-based assessment. The OTCPDD, which uses bimanual daily living activities, is able to represent the children's general affected hand functions (including capacity, performance, and developmental disregard) in their daily routines.

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DOI: 10.1371/journal.pone.0151798

PMCID: PMC4806991

PMID: 27010941 [PubMed - indexed for MEDLINE]

From numeracy to arithmetic: Precursors of arithmetic performance in children with cerebral palsy from 6 till 8 years of age.

Van Rooijen M, Verhoeven L, Steenbergen B

Res Dev Disabil. 2015 Oct-Nov;45-46:49-57. doi: 10.1016/j.ridd.2015.07.001. Epub 2015 Jul 24.

Children with cerebral palsy (CP) are generally delayed in arithmetic compared to their peers. The development of early numeracy performance in children with CP is not yet evident, nor have the factors associated with change over time been identified. Therefore, we examined the development of numeracy in children with CP over a two year period and studied which cognitive factors were predictive of arithmetic performance. A longitudinal study with three measurement waves separated by one year was conducted. 56 children participated (37 boys, $M = 6.0$ years, $SD = .58$). Standardized tasks were used to assess verbal- and visual-spatial working memory, executive functioning, fine motor skills and early numeracy performance. In addition, experimental tasks were developed to measure counting and arithmetic. The results showed that early numeracy performance of children with CP increased between 6 and 8 years of age. Structural equation modelling showed that early numeracy was strongly related to arithmetic performance at the consecutive year. Working memory, counting and fine motor skills were all positively related to early numeracy performance a year later. Furthermore, working memory and fine motor skills were precursors of the development of early numeracy. Considering the importance of numeracy and arithmetic in daily life and in academic and work success, children with CP could substantially benefit from intervention programs aimed at increasing working memory and early numeracy performance.

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DOI: 10.1016/j.ridd.2015.07.001

PMID: 26209773 [PubMed - indexed for MEDLINE]

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

Imms C, Adair B

Dev Med Child Neurol. 2016 Aug 13. doi: 10.1111/dmcn.13229. [Epub ahead of print]

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.

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DOI: 10.1111/dmnc.13229

PMID: 27521188 [PubMed - as supplied by publisher]

The Relationship between the School Function Assessment (SFA) and the Gross Motor Function Classification System (GMFCS) in Ambulatory Patients with Cerebral Palsy.

Rabinovich RV, Patel NV, Gates PE, Otsuka NY.

Bull Hosp Jt Dis (2013). 2015 Jul;73(3):204-9.

PURPOSE: Determine the relationship between the SFA and GMFCS in children with cerebral palsy (CP).

METHODS: Through correlation, regression, and ANOVA analysis, data from 103 children were examined. A regression model was used to compare SFA-predicted versus actual GMFCS levels. One-way ANOVA was utilized to determine differences between SFA subscale scores in the context of GMFCS.

RESULTS: A significant correlation between composite SFA scores and GMFCS levels ($r = -0.847$, $p < 0.020$) was observed. Subscale-SFA and GMFCS correlations included Regular Class ($r = -0.338$, $p < 0.001$), Physical Tasks Adaptation (Phys1; $r = -0.340$, $p < 0.001$) and Assistance (Phys2; $r = -0.340$, $p < 0.001$), Position ($r = -0.338$, $p < 0.001$), Recreational Movement (RecMvmt; $r = -0.387$, $p < 0.0001$), Manipulation Movement (ManMvmt; $r = -0.494$, $p < 0.0001$), and Up/Down Stairs (UDStairs; $r = -0.453$, $p < 0.0001$). Between predicted and actual GMFCS levels, no statistical difference was observed. One-way ANOVA demonstrated SFA differences at GMFCS levels: Phys1 ($F = 5.32$, $p < 0.002$), Phys2 ($F = 4.54$, $p < 0.005$), Position ($F = 4.63$, $p < 0.004$), RecMvmt ($F = 7.92$, $p < 0.0001$), ManMvmt ($F = 13.50$, $p < 0.0001$), and UDStairs ($F = 6.18$, $p < 0.001$).

CONCLUSION: Utilizing both SFA-predicted and actual GMFCS levels may help determine if a child is performing at an expected level of daily function.

PMID: 26535600 [PubMed - indexed for MEDLINE]

Passage à l'âge adulte – Vieillesse

Characteristics of young people with long term conditions close to transfer to adult health services.

Merrick H, McConachie H, Le Couteur A, Mann K, Parr JR, Pearce MS, Colver A, Transition Collaborative Group.

BMC Health Serv Res. 2015 Sep 30;15:435. doi: 10.1186/s12913-015-1095-6.

BACKGROUND: For many young people with long term conditions (LTC), transferring from paediatric to adult health services can be difficult and outcomes are often reported to be poor. We report the characteristics and representativeness of three groups of young people with LTCs as they approach transfer to adult services: those with autism spectrum disorder with additional mental health problems (ASD); cerebral palsy (CP); or diabetes.

METHODS: Young people aged 14 years-18 years 11 months with ASD, or those with diabetes were identified from children's services and those with CP from population databases. Questionnaires, completed by the young person and a parent, included the 'Mind the Gap' Scale, the Rotterdam Transition Profile, and the Warwick and Edinburgh Mental Wellbeing Scale.

RESULTS: Three hundred seventy four young people joined the study; 118 with ASD, 106 with CP, and 150 with diabetes. Participants had a significant ($p < 0.001$) but not substantial difference in socio-economic status (less deprived) compared to those who declined to take part or did not respond. Condition-specific severity of participants was similar to that of population data. Satisfaction with services was good as the 'gap' scores (the difference between their ideal and current care) reported by parents and young people were small. Parents' satisfaction was significantly lower than their children's ($p < 0.001$). On every domain of the Rotterdam Transition Profile, except for education and employment, significant differences were found between the three groups. A larger proportion of young people with diabetes were in a more independent phase of participation than those with ASD or CP. The wellbeing scores of those with diabetes (median = 53, IQR: 47-58) and CP (median = 53, IQR: 48-60) were similar, and significantly higher than for those with ASD (median = 47, IQR: 41-52; $p < 0.001$).

CONCLUSIONS: Having established that our sample of young people with one of three LTCs recruited close to transfer to adult services was representative, we have described aspects of their satisfaction with services, participation and wellbeing, noting similarities and differences by LTC. This information about levels of current functioning is important for subsequent evaluation of the impact of service features on the health and wellbeing of young people with LTCs following transfer from child services to adult services.

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DOI: 10.1186/s12913-015-1095-6

PMCID: PMC4589084

PMID: 26424085 [PubMed - indexed for MEDLINE]

Clinical transition for adolescents with developmental disabilities in Hong Kong: a pilot study.

Pin TW, Chan WL, Chan CL, Foo KH, Fung KH, Li LK, Tsang TC

Hong Kong Med J. 2016 Aug 19. doi: 10.12809/hkmj154747. [Epub ahead of print]

INTRODUCTION: Children with developmental disabilities usually move from the paediatric to adult health service after the age of 18 years. This clinical transition is fragmented in Hong Kong. There are no local data for adolescents with developmental disabilities and their families about the issues they face during the clinical transition. This pilot study aimed to explore and collect information from adolescents with developmental disabilities and their caregivers about their transition from paediatric to adult health care services in Hong Kong.

METHODS: This exploratory survey was carried out in two special schools in Hong Kong. Convenient samples of adolescents with developmental disabilities and their parents were taken. The questionnaire was administered by interviewers in Cantonese. Descriptive statistics were used to analyse the answers to closed-ended questions. Responses to open-ended questions were summarised.

RESULTS: In this study, 22 parents (mean age \pm standard deviation: 49.9 ± 10.0 years) and 13 adolescents (19.6 ± 1.0 years) completed the face-to-face questionnaire. The main diagnoses of the adolescents were cerebral palsy (59%) and cognitive impairment (55%). Of the study parents, 77% were reluctant to transition. For the 10 families who did move to adult care, 60% of the parents were not satisfied with the services. The main reasons were reluctant to change and dissatisfaction with the adult medical service. The participants emphasised their need for a structured clinical transition service to support them during this challenging time.

CONCLUSIONS: This study is the first in Hong Kong to present preliminary data on adolescents with developmental disabilities and their families during transition from paediatric to adult medical care. Further studies are required to understand the needs of this population group during clinical transition.

DOI: 10.12809/hkmj154747

PMID: 27538386 [PubMed - as supplied by publisher]

Transition of Care in Adolescents with Cerebral Palsy: A Survey of Current Practices.

Bolger A, Vargus-Adams J, McMahon M

PM R. 2016 Aug 9. pii: S1934-1482(16)30824-3. doi: 10.1016/j.pmrj.2016.08.001. [Epub ahead of print]

BACKGROUND: Transition of care from pediatric to adult healthcare providers for youth with special needs (including cerebral palsy) is of current interest as these individuals are now living well into adulthood. Studies have attempted to identify barriers to transition, ideal timing for transition of care, and key elements for successful transition programs. These studies often encompass a wide range of diagnoses, and results cannot be fully applied to those with cerebral palsy (CP).

OBJECTIVE: To identify and describe current transition of care (TOC) practices and beliefs among physician providers of adolescents with CP in multidisciplinary CP clinics.

DESIGN: Descriptive Survey **SETTING:** Multidisciplinary CP clinics in the United States **PARTICIPANTS:** Physician leaders in above CP clinics **METHODS:** Respondents completed an electronic survey. Responses were de-identified and reported in aggregate using descriptive statistics.

MAIN OUTCOME MEASURE: Electronic survey addressing three domains: demographics of clinics, current opinions/practices related to TOC processes, and perceived barriers to successful TOC.

RESULTS: Fifteen surveys were sent with eleven returned (response rate = 73%). TOC practices varied among clinics surveyed. Fifty-five percent of clinics had a structured transition program, but only one transitioned 100% of their patients to adult providers by 22 years of age. Only one clinic had an absolute upper age limit for seeing patients, and thirty six percent of clinics accepted new patients older than 21 years. No respondent was "completely satisfied" with their transition process, and only one respondent was "moderately satisfied." The majority of respondents felt the ideal care setting for adults with CP was a comprehensive, multidisciplinary adult-focused clinic in an adult hospital/clinic with primarily adult providers. They noted the top three perceived barriers to successful TOC were limited adult providers willing to accept CP patients, concern about the level of care in the adult health care system and lack of financial resources.

CONCLUSIONS: Current TOC practices vary considerably among multidisciplinary pediatric CP clinics and are not satisfactory to individual physician providers within these clinics. Respondents desired a multidisciplinary clinic in an adult care setting with adult providers; however, the top three perceived barriers involved the adult health care system, making it difficult for pediatric providers to develop effective TOC programs.

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DOI: 10.1016/j.pmrj.2016.08.001

PMID: 27519825 [PubMed - as supplied by publisher]

Activité physique - Sport

Variability of total step activity in children with cerebral palsy: influence of definition of a day on participant retention within the study.

Wilson NC, Mudge S, Stott NS

BMC Res Notes. 2016 Aug 20;9:411. doi: 10.1186/s13104-016-2218-9.

BACKGROUND: Activity monitoring is important to establish accurate daily physical activity levels in children with cerebral palsy (CP). However, few studies address issues around inclusion or exclusion of step count data; in particular, how a valid day should be defined and what impact different lengths of monitoring have on retention of participant data within a study. This study assessed how different 'valid day' definitions influenced inclusion of participant data in final analyses and the subsequent variability of the data.

RESULTS: Sixty-nine children with CP were fitted with a StepWatch™ Activity Monitor and instructed to wear it for a week. Data analysis used two broad definitions of a day, based on either number of steps in a 24 h monitoring period or the number of hours of recorded activity in a 24 h monitoring period. Eight children either did not use the monitor, or used it for only 1 day. The remaining 61 children provided 2 valid days of monitoring defined as >100 recorded steps per 24 h period and 55 (90 %) completed 2 valid days of monitoring with ≥10 h recorded activity per 24 h period. Performance variability in daily step count was lower across 2 days of monitoring when a valid day was defined as ≥10 h recorded activity per 24 h period (ICC = 0.765) and, higher when the definition >100 recorded steps per 24 h period (ICC = 0.62). Only 46 participants (75 %) completed 5 days of monitoring with >100 recorded steps per 24 h period and only 23 (38 %) achieved 5 days of monitoring with ≥10 h recorded activity per 24 h period. Datasets of participants who functioned at GMFCS level II were differentially excluded when the criteria for inclusion in final analysis was 5 valid days of ≥10 h recorded activity per 24 h period, leaving datasets available for only 8 of 32 participant datasets retained in the study.

CONCLUSION: We conclude that changes in definition of a valid day have significant impacts on both inclusion of participant data in final analysis and measured variability of total step count.

DOI: 10.1186/s13104-016-2218-9

PMCID: PMC4992568

PMID: 27544209 [PubMed - in process]

Prise en charge et Accompagnement

Parental satisfaction with inpatient care of children with cerebral palsy.

Iannelli M, Harvey A, O'Neill J, Reddihough D

J Paediatr Child Health. 2015 Nov;51(11):1089-96. doi: 10.1111/jpc.12908. Epub 2015 May 4.

AIM: Children with cerebral palsy (CP) have complex health-care needs. This study examines levels of parental satisfaction with inpatient care for children with CP at a tertiary care hospital to identify areas for improvement.

METHODS: Parents/guardians of children with CP and parents/guardians of children without a disability admitted to hospital completed a custom-designed questionnaire assessing six areas of the hospital admission: (i) the admission process; (ii) the child's personal care; (iii) the child's medical care; (iv) overall care of the child; (v) the parent's experience in hospital; and (vi) keeping up to date in hospital. Differences between the two groups were analysed using Student's t-tests.

RESULTS: Parents of children with CP were significantly less satisfied with the inpatient care as compared with parents of children without a disability in four of the six categories: 'my child's personal care' (P = 0.0033), 'my child's medical care' (P = 0.0350), 'overall care' (P = 0.0081) and 'my experience in the hospital' (P = 0.0209). When the overall questionnaire was compared between the two groups, parents of children with CP were less satisfied with care than parents of children without a disability (P = 0.0036).

CONCLUSION: Parents of children with CP are less satisfied with the inpatient care of their child compared with parents of children without a disability. This information should be instrumental in informing change to ensure that parent satisfaction levels improve to a level consistent with other children admitted to a tertiary care setting.

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DOI: 10.1111/jpc.12908

PMID: 25939305 [PubMed - indexed for MEDLINE]

Domotique – Technologie

Lessons learned from studying the functional impact of adaptive seating interventions for children with cerebral palsy.

Ryan SE

Dev Med Child Neurol. 2016 Mar;58 Suppl 4:78-82. doi: 10.1111/dmnc.13046.

Little empirical evidence exists about the effectiveness of assistive technology interventions for children with cerebral palsy (CP) to inform clinical practice. This article reviews what we know about the functional impact of adaptive seating interventions - a common assistive technology type recommended for children with CP. A contemporary assistive technology outcomes framework is considered as a way to model the temporality and measure the effects of seating interventions and moderating cofactors. Three research studies are profiled to illustrate different research methods, measurement approaches, and follow-up periods to learn about adaptive seating outcomes. Recommendations for future research include the adoption of common measurement indicators, consideration of quality assessment criteria, and the use of varied methodologies to generate new knowledge about functional outcomes. It is suggested that the proposed strategies will lead to new understandings, clinical applications, and ultimately improvements in the everyday lives of children with CP and their families.

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DOI: 10.1111/dmnc.13046

PMID: 27027612 [PubMed - indexed for MEDLINE]



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