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**Professor Nadia Badawi**

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## Interventions and Management

### 1. Clin Rehabil. 2012 Nov 28. [Epub ahead of print]

#### **Interrater reliability and construct validity of the Posture and Postural Ability Scale in adults with cerebral palsy in supine, prone, sitting and standing positions.**

Rodby-Bousquet E, Agústsson A, Jónsdóttir G, Czuba T, Johansson AC, Hägglund G.

Department of Orthopaedics, Lund University, Skåne University Hospital, Lund, Sweden.

Objective: To evaluate reliability, internal consistency and construct validity of the Posture and Postural Ability Scale for adults with cerebral palsy. Design: Psychometric evaluation of a clinical assessment tool. Setting: Rehabilitation centres in Sweden and Iceland. Subjects: Thirty adults with cerebral palsy aged 19-22 years, six people at each level I-V of the Gross Motor Function Classification System. Main measures: The Posture and Postural Ability Scale contains a 7-point ordinal scale for postural ability in supine, prone, sitting and standing, and items for assessment of posture. Posture and postural ability was rated from photos and videos by three independent assessors. Interrater reliability was calculated using weighted kappa. Internal consistency was analysed with Cronbach's alpha if item deleted and corrected item-total correlation. Construct validity was evaluated based on known groups, using Jonckheere Terpstra for averaged values of the three raters relative to the Gross Motor Function Classification System. Results: There was an excellent interrater reliability (kappa = 0.85-0.99) and a high internal consistency (alpha = 0.96-0.97, item-total correlation = 0.60-0.91). Median values differed ( $P < 0.02$ ) between known groups represented by the levels of gross motor function, showing construct validity for all items. Conclusion: The Posture and Postural Ability Scale showed an excellent interrater reliability for experienced raters, a high internal consistency and construct validity. It can detect postural asymmetries in adults with cerebral palsy at all levels of gross motor function.

[PMID: 23193177](https://pubmed.ncbi.nlm.nih.gov/23193177/) [PubMed - as supplied by publisher]

### 2. IEEE Trans Neural Syst Rehabil Eng. 2012 Nov 16. [Epub ahead of print]

#### **Feasibility of Gestural Feedback Treatment for Upper Extremity Movement in Children with Cerebral Palsy.**

Coleman Wood K, Lathan CE, Kaufman KR.

Background: External feedback of performance is an important component of therapy, especially for children with impairments due to cerebral palsy because they lack intrinsic experience of good movements to compare effort

and determine performance outcomes. A robotic therapy system was developed to provide feedback for specific upper extremity movements (gestures) which are therapeutically desirable.

[PMID: 23193461](#) [PubMed - as supplied by publisher]

### 3. Res Dev Disabil. 2013 Jan;34(1):721-8. doi: 10.1016/j.ridd.2012.10.009. Epub 2012 Nov 21.

#### **Potential predictors of changes in gross motor function during various tasks for children with cerebral palsy: A follow-up study.**

Chen CL, Chen CY, Chen HC, Liu WY, Shen IH, Lin KC.

Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, 5 Fu-Hsing Street, Kwei-Shan, Tao-Yuan 333, Taiwan; Graduate Institute of Early Intervention, Chang Gung University, 259 Wen-Hwa 1st Road, Kwei-Shan, Tao-Yuan 333, Taiwan.

Very few studies have investigated predictors of change in various gross motor outcomes in ambulatory children with cerebral palsy (CP). The aim of this study was to identify potential predictors for change in gross motor outcomes measured during various tasks in children with CP. A group of 45 children (age, 6-15 years) with CP and 7 potential predictors were identified, including age, gender, CP subtypes, gross motor function classification system (GMFCS) levels, abdominal muscle endurance, and muscles strength of knee extensor and knee flexor measured by isokinetic dynamometer. Motor outcome was assessed by means of the gross motor composite (GMC) of Bruininks-Oseretsky Test of Motor Proficiency (BOTMP), including four gross motor subtests: running speed and agility (RSA), balance (BAL), bilateral coordination (BCO), and strength (STR). The outcomes were measured at baseline and 12-week later (follow-up). The regression analyses showed that knee extensor strength was a robust predictor of change in BAL, BCO, and GMC (adjusted  $R^2=0.07-0.19$ ,  $P<0.05$ ). Additionally, abdominal muscle strength was a negative predictor for the changes in the RSA (adjusted  $R^2=0.08$ ,  $P<0.05$ ). However, STR model revealed no significant predictors. These findings suggest that ambulatory children with greater knee muscle strength may benefit more from therapy than those with lower strength. The knee muscle strength can be used as a biomarker to predict the changes in the gross motor functions.

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[PMID: 23178177](#) [PubMed - in process]

### 4. Clin Orthop Relat Res. 2012 Nov 21. [Epub ahead of print]

#### **Calcaneal Lengthening for Planovalgus Foot Deformity in Patients With Cerebral Palsy.**

Sung KH, Chung CY, Lee KM, Lee SY, Park MS.

Department of Orthopaedic Surgery, Seoul National University Bundang Hospital, 300 Gumi-Dong, Bundang-Gu, Sungnam, Kyungki, 463-707, Korea.

**BACKGROUND:** Calcaneal lengthening has been used to correct planovalgus foot deformities in patients with cerebral palsy (CP). **QUESTIONS/PURPOSES:** This study was performed to investigate the amount of correction that can be achieved after calcaneal lengthening for the treatment of a planovalgus deformity in patients with CP and to provide cutoff values based on the preoperative radiographic measurements that suggest additional procedures to achieve satisfactory correction. **METHODS:** Seventy-five consecutive patients with CP who underwent calcaneal lengthening for planovalgus deformity were included. Radiographic indices were measured on preoperative and latest followup weightbearing foot radiographs. The cutoff values of the preoperative radiographic measurements between the corrected and undercorrected groups were analyzed. The cutoff values are the reference values that can judge the possibilities of sufficient correction of a planovalgus deformity by calcaneal lengthening. **RESULTS:** The mean age of the patients at the time of surgery was  $11.0 \pm 5.2$  years and the minimum followup was 1.0 years (mean,  $3.1 \pm 2.2$  years; range, 1.0-8.4 years). AP talus-first metatarsal angle, calcaneal pitch angle, talocalcaneal angle, lateral talus-first metatarsal angle, and naviculocuboid overlap showed major improvements after calcaneal lengthening. The cutoff values of preoperative measurements between the corrected and undercorrected groups were  $23^\circ$  AP talus-first metatarsal angle,  $36^\circ$  lateral talus-first metatarsal angle, and

72% naviculocuboid overlap. **CONCLUSIONS:** Calcaneal lengthening with concomitant peroneus brevis lengthening is an effective procedure for correcting a planovalgus foot deformity in patients with CP. However, for patients with greater than 23° AP talus-first metatarsal angle, 36° lateral talus-first metatarsal angle, and 72% naviculocuboid overlap, additional procedures for medial stabilization, such as tibialis posterior tendon reefing and talonavicular arthrodesis, should be considered as a result of the possibility of undercorrection with calcaneal lengthening alone.

**LEVEL OF EVIDENCE:** Level IV, therapeutic study. See the Guidelines for Authors for a complete description of levels of evidence.

[PMID: 23179128](#) [PubMed - as supplied by publisher]

**5. J Pediatr Orthop B. 2013 Jan;22(1):14-9. doi: 10.1097/BPB.0b013e32835717b0.**

**Mesh Achilles tendon lengthening - a new method to treat equinus deformity in patients with spastic cerebral palsy: surgical technique and early results.**

Lin CL, Lin CJ, Huang MT, Su WR, Wu TT.

Institute of Biomedical Engineering bDepartment of Orthopaedics, National Cheng Kung University Hospital, College of Medicine cMedical Device Innovation Center, National Cheng Kung University, Tainan, Taiwan.

Equinus of the ankle is a common deformity in spastic cerebral palsy. Many methods have been developed to lengthen the Achilles tendon to correct the deformity. A new mesh Achilles tendon lengthening (ATL) procedure that might decrease immobilization and promote recovery was performed in 36 tendons with equinus deformity (22 patients, average age=6.2). The results were compared with those of two other methods: the Vulpius group and the Z-lengthening group. The corrected dorsiflexion angle of the ankle at a subsequent 2-year follow-up of the mesh ATL and Vulpius groups matched ( $25.5\pm 3.0$  and  $27.1\pm 3.5^\circ$ , respectively), whereas that of the Z-lengthening group was higher ( $33.9\pm 3.8^\circ$ ). Nevertheless, statistics of the timing of each patient's readiness to begin rehabilitation and walking as well as gaining better stability for running and one-legged hopping indicated that the mesh ATL group recovered significantly quicker than the Vulpius and Z-lengthening groups. The mesh ATL procedure achieves a successful correction of the equinus deformity in spastic cerebral palsy comparable with that of the Vulpius procedure, with the advantage of preserving the gastrocnemius without a complete section. This confers greater antigravity stability and quicker recovery in patients.

[PMID: 23192252](#) [PubMed - in process]

**6. Eur J Paediatr Neurol. 2012 Nov 21. pii: S1090-3798(12)00223-1. doi: 10.1016/j.ejpn.2012.10.004. [Epub ahead of print]**

**Can the Dyskinesia Impairment Scale be used by inexperienced raters? A reliability study.**

Monbaliu E, Ortibus E, Prinzie P, Dan B, De Cat J, De Cock P, Feys H.

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**BACKGROUND:** The Dyskinesia Impairment Scale (DIS) is a new scale for measuring dystonia and choreoathetosis in dyskinetic Cerebral Palsy (CP). Previously, reliability of this scale has only been assessed for raters highly experienced in discriminating between dystonia and choreoathetosis. **AIMS:** The aims of this study are to examine the reliability of the DIS used by inexperienced raters, new to discriminating between dystonia and choreoathetosis and to determine the effect of clinical expertise on reliability. **METHODS:** Twenty-five patients (17 males; 8 females; age range 5-22 years; mean age = 13 years 6 months; SD = 5 years 4 months) with dyskinetic CP were filmed with the DIS standard video protocol. Two junior physiotherapists (PTs) and three senior PTs, all of whom were new to discriminating between dystonia and choreoathetosis, were trained in scoring the DIS. Afterward, they independently scored all patients from the video recordings using the DIS. Reliability was assessed by (1) Intraclass Correlation Coefficient (ICC), (2) Standard Error of Measurement (SEM) and Minimal Detectable Difference (MDD) and (3) Cronbach's alpha for internal consistency. **RESULTS:** Interrater reliability for the total

DIS, and for the dystonia and choreoathetosis subscales was good for the junior PTs and moderately high to excellent for the senior PTs. SEM and MDD values for the total DIS were 6% and 15% respectively for the junior PTs and 4% and 12% respectively for the senior PTs. Cronbach's alpha ranged between 0.87 and 0.95 for the junior PTs and between 0.76 and 0.93 for the senior PTs. CONCLUSIONS: Reliability of the DIS scores for the inexperienced junior and senior PTs was sufficient in comparison with scores from the experienced raters in the previous study, indicating that the DIS can be used by inexperienced PTs new to discriminating between dystonia and choreoathetosis, and also that its reliability is not dependent on clinical expertise. However, based on the measurement errors and questionnaire data, familiarity with operational definitions of dystonia and choreoathetosis is crucial to improve scoring reliability.

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## 7. Technol Health Care. 2012 Jan 1;20(6):501-10. doi: 10.3233/THC-2012-0696.

### Can balance in children with cerebral palsy improve through use of an activity promoting computer game?

Ramstrand N, Lyngnegård F.

Department of Rehabilitation, School of Health Sciences, Jönköping University, Jönköping, Sweden.

Introduction: This study aimed to evaluate if use of an activity promoting computer game, used in the home (Nintendo Wii Fit; Nintendo Co Ltd, Japan), could influence balance related outcome measures in children with cerebral palsy. Method: Eighteen children with hemiplegic or diplegic cerebral palsy were recruited for the study. A randomised cross-over design was used with children tested at baseline, after five weeks of playing Wii Fit games and after five weeks without any intervention. Outcome measures of interest included: performance on the modified sensory organisation test, reactive balance test and rhythmic weight shift test. Results: No significant difference was observed between testing occasions for any of the balance measures investigated ( $p > 0.05$ ). Conclusion: Our results suggest that use of a Nintendo Wii balance board and Wii Fit software for a minimum of thirty minutes per day in the patient's own home, over a five week period, is not effective as a balance training tool in children with cerebral palsy.

[PMID: 23187015](#) [PubMed - in process]

## 8. Int J Sports Med. 2012 Nov 26. [Epub ahead of print]

### Aerobic Training in Children with Cerebral Palsy.

Nsenga AL, Shephard RJ, Ahmadi S.

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Rehabilitation is a major goal for children with cerebral palsy, although the potential to enhance cardio-respiratory fitness in such individuals remains unclear. This study thus compared current cardio-respiratory status between children with cerebral palsy and able-bodied children, and examined the ability to enhance the cardio-respiratory fitness of children with cerebral palsy by cycle ergometer training. 10 children with cerebral palsy (Gross Motor Function Classification System levels I and II) participated in thrice-weekly 30 min cycle ergometer training sessions for 8 weeks (mean age:  $14.2 \pm 1.9$  yrs). 10 additional subjects with cerebral palsy (mean age:  $14.2 \pm 1.8$  yrs) and 10 able-bodied subjects (mean age:  $14.1 \pm 2.1$  yrs) served as controls, undertaking no training. All subjects undertook a progressive cycle ergometer test of cardio-respiratory fitness at the beginning and end of the 8-week period. Cardio-respiratory parameters [oxygen intake  $\dot{V} \cdot O_2$ , ventilation  $\dot{V} \cdot E$  and heart rate (HR)] during testing were measured by Cosmed K4 b gas analyzer. The children with cerebral palsy who engaged in aerobic training improved their peak oxygen consumption, heart rate and ventilation significantly ( $p < 0.05$ ) and they also showed a non-significant trend to increased peak power output. In conclusion, children with cerebral palsy can benefit significantly from cardio-respiratory training, and such training should be included in rehabilitation programs.

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**9. Arch Phys Med Rehabil. 2012 Dec;93(12):2382. doi: 10.1016/j.apmr.2012.08.220.**

**Does the six-minute walk test measure aerobic capacity in persons with cerebral palsy?**

Slaman J, Dallmeijer A, van den Berg-Emons R.

Department of Rehabilitation Medicine and Physical Therapy, Research lines MoveFit & Transition into Adulthood, Erasmus MC, University Medical Center, Rotterdam, The Netherlands.

[PMID: 23176804](#) [PubMed - in process]

**10. Nig Q J Hosp Med. 2012 Apr-Jun;22(2):99-102.**

**Relationship between spasticity and health related quality of life in individuals with cerebral palsy.**

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**BACKGROUND:** There is growing awareness of health related quality of life in cerebral palsy patients, though there is paucity of data in determining its relationship with spasticity in cerebral palsy patients. **OBJECTIVE:** The purpose of this study was to determine the relationship between spasticity and health related quality of life in cerebral palsy patients. **METHOD:** A cross-sectional survey design was employed in this study. A total of fifty individuals with cerebral palsy, males (54%) and females (46%) within the age range of 5 years and 18 years (9.06 +/- 3.38 years) participated in the study. Measurement of spasticity was done by the researcher using the Modified Ashworth Scale (MAS) and the parents or primary caregivers of the participants were required to complete the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) questionnaire, which is a 37-item questionnaire that collects information on the health related quality of life. Data was analysed separately for each of the six domains of the questionnaire using the Pearson Product-Moment Correlation coefficient on SPSS version 17 and the level of significance was set at  $p=0.05$ . **RESULTS:** According to the results, the domains of comfort and emotions with communication and social interaction do not have an influence on spasticity. The results also revealed that there was a significant relationship between spasticity and health related quality of life in cerebral palsy patients ( $p=0.01$ ). **CONCLUSION:** Personal care and mobility which are aspects of the health related quality of life should be paid more attention to, as they are negatively affected by spasticity in patients with cerebral palsy.

[PMID: 23175906](#) [PubMed - in process]

**11. Clin Nutr. 2012 Nov 17. pii: S0261-5614(12)00256-7. doi: 10.1016/j.clnu.2012.11.010. [Epub ahead of print]**

**Nissen fundoplication in children with cerebral palsy: Influence on rate of gastric emptying and postprandial symptoms in relation to protein source in caloric liquid meals.**

Brun AC, Størdal K, Johannesdottir GB, Fossum V, Bentsen BS, Medhus AW.

Paediatric Department, Vestfold Hospital, N-3103 Tønsberg, Norway. Electronic address: acbrun@gmail.com.

**BACKGROUND & AIMS:** The aim was to study the influence of Nissen fundoplication on rate of gastric emptying and postprandial symptoms in relation to protein source in liquid meals in children with cerebral palsy. **METHODS:** Ten children with cerebral palsy and Nissen fundoplication and ten with cerebral palsy without Nissen fundoplication were studied. Patients had gastrostomy and received two meals, double-blinded, in random order, on separate days. Meals contained a standardised carbohydrate and fat base plus one of two protein modules (Meal A: 100% casein; Meal B: 40% casein/60% whey). The (13)C octanoic acid breath test was used to assess gastric emptying. Postprandial symptoms were recorded. Results are given as median. **RESULTS:** For meal A and B,

respectively, time until 50% of the meal had emptied ( $T(1/2)$ ) was 110 in the Nissen fundoplication- and 181 min in the non-Nissen fundoplication group, ( $p = 0.35$ ) and 50 and 85 min ( $p = 0.25$ ). Seven in the Nissen fundoplication group reported postprandial symptoms to meal B, none in the non-Nissen fundoplication group ( $p < 0.01$ ).  
**CONCLUSIONS:** Compared with cerebral palsy-children without Nissen fundoplication, those with Nissen fundoplication have postprandial symptoms more frequently after receiving a rapid emptying meal. Gastric emptying alone, however, does not seem to explain the symptom occurrence. ClinicalTrials.gov: UUSKBK 28200706.

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## 12. Acta Paediatr. 2012 Nov 3. doi: 10.1111/apa.12076. [Epub ahead of print]

### Speech problems affect more than one in two children with cerebral palsy: Swedish population-based study.

Nordberg A, Miniscalco C, Lohmander A, Himmelmann K.

Division of Speech and Language Pathology, Department of Clinical Neuroscience and Rehabilitation, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden. [ann.nordberg@neuro.gu.se](mailto:ann.nordberg@neuro.gu.se).

**AIM:** To describe speech ability in a population-based study of children with cerebral palsy (CP), in relation to CP subtype, motor function, cognitive level and neuroimaging findings. **METHODS:** A retrospective chart review of 129 children (66 girls, 63 boys) with CP, born in 1999-2002, was carried out. Speech ability and background information, such as type of CP, motor function, cognitive level and neuroimaging data, were collected and analysed. **RESULTS:** Speech disorders were found in 21% of the children and were present in all types of CP. Forty-one per cent of the children with speech disorders also had mental retardation, and 42% were able to walk independently. A further 32% of the children were nonverbal, and maldevelopment and basal ganglia lesions were most common in this group. The remaining 47% had no speech disorders, and this group was most likely to display white matter lesions of immaturity. **CONCLUSION:** More than half of the children in this CP cohort had a speech disorder (21%) or were nonverbal (32%). Speech ability was related to the type of CP, gross motor function, the presence of mental retardation and the localization of brain maldevelopment and lesions. Neuroimaging results differed between the three speech ability groups.

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## Prevention and Cure

### 13. Dev Med Child Neurol. 2012 Nov 26. doi: 10.1111/dmcn.12017. [Epub ahead of print]

#### A systematic review of risk factors for cerebral palsy in children born at term in developed countries.

McIntyre S, Taitz D, Keogh J, Goldsmith S, Badawi N, Blair E.

Paediatrics and Child Health, School of Medicine, University of Sydney, Sydney; Cerebral Palsy Alliance Research Institute, Darlinghurst; School of Medicine, University of Notre Dame Australia, Darlinghurst; Sydney Adventist Hospital Campus, University of Sydney, Wahroonga; Grace Centre for Newborn Care, Sydney Children's Hospital Network, Westmead; Centre for Child Health Research, University of Western Australia at the Telethon Institute for Child Health Research, Perth, Australia.

**Aim:** The aim of this study was to conduct a systematic review in order to identify the risk factors for cerebral palsy (CP) in children born at term. The secondary aim was to ascertain if the potential for prevention of these risk factors has been adequately explored. **Method:** A MEDLINE search up to 31 July 2011 was completed, following the Meta-

Analysis of Observational Studies in Epidemiology guidelines. Publications were reviewed to identify those with both a primary aim of identifying risk factors for all children or term-born children with CP and a cohort or case-control study design. Studies were examined for potential chance or systematic bias. The range of point estimates of relative risk is reported. Results: From 21 articles meeting inclusion/exclusion criteria and at low risk of bias, data from 6297 children with CP and 3,804,791 children without CP were extracted. Ten risk factors for term-born infants were statistically significant in each study: placental abnormalities, major and minor birth defects, low birthweight, meconium aspiration, instrumental/emergency Caesarean delivery, birth asphyxia, neonatal seizures, respiratory distress syndrome, hypoglycaemia, and neonatal infections. Strategies for possible prevention currently exist for three of these. Interpretation: Ten consistent risk factors have been identified, some with potential for prevention. Efforts to prevent these risk factors to interrupt the pathway to CP should be extended.

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**14. Dev Med Child Neurol. 2012 Nov 28. doi: 10.1111/dmcn.12039. [Epub ahead of print]**

**Risk factors for cerebral palsy: current knowledge and future causal inference.**

Day SM, Reynolds RJ.

Mortality Research & Consulting, CA University of Texas Health Science Center at Houston, School of Public Health, TX, USA.

[PMID: 23190146](#) [PubMed - as supplied by publisher]

**15. Dtsch Arztebl Int. 2012 Oct;109(43):721-6. doi: 10.3238/arztebl.2012.0721. Epub 2012 Oct 26.**

**Risks Associated With Delivering Infants 2 to 6 Weeks Before Term-a Review of Recent Data.**

Poets CF, Wallwiener D, Vetter K.

Department of Neonatology, University Children's Hospital Tübingen.

**BACKGROUND:** There is an increasing trend towards delivery before 39 weeks of gestational age. The short- and long-term effects of early delivery on the infant have only recently received scientific attention. **METHODS:** Selective review of the literature. **RESULTS:** Delivery at any time before 39 weeks is associated with significantly higher infant mortality and with an increase of the risk of impairments after birth from 8% to 11%. The increase in risks of various kinds is disproportionately more pronounced the earlier the child is delivered. For example, the risk of needing respiratory support or artificial ventilation after birth increases from 0.3% with delivery at 39-41 weeks of gestational age to 1.4% at 37 weeks and 10% at 35 weeks, while the risk of death or neurological complications increases from 0.15% at 39-41 weeks of gestation to 0.66% at 35 weeks. Delivery at 34.0 to 36.6 weeks of gestation also has long-term effects. Compared to delivery at term, the frequency of cerebral palsy rises threefold, from 0.14% to 0.43%; the risk of death in early adulthood rises by about half, from 0.046 to 0.065%; and the risk of dependence on government benefits in early adulthood also rises by about half, from 1.7% to 2.5%. **CONCLUSION:** Studies from the USA have shown that the number of medically indicated deliveries before 39 weeks can be lowered by 70% to 80% through consistently applied measures for quality improvement. If similar results could be achieved in Germany, the iatrogenic complications of delivery would become less common in this country as well.

[PMID: 23181136](#) [PubMed - in process] PMCID: PMC3498472

**16. Eur J Paediatr Neurol. 2012 Nov 26. pii: S1090-3798(12)00231-0. doi: 10.1016/j.ejpn.2012.11.001. [Epub ahead of print]**

**Term neonatal encephalopathy antecedent cerebral palsy: A retrospective population-based study.**

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Division of Pediatric Neurology, Montreal Children's Hospital-McGill University Health Center, Montreal, Quebec, Canada.

**OBJECTIVE:** To compare the clinical profile of term-born cerebral palsy children with or without antecedent moderate to severe neonatal encephalopathy. We hypothesized that antecedent neonatal encephalopathy is associated with a spastic quadriplegia cerebral palsy clinical profile, a higher severity of functional motor impairment, and a greater number of associated comorbidities. **METHODS:** Using the Quebec Cerebral Palsy Registry, neurologic subtype, Gross Motor Function Classification System stratification, and comorbidities were compared in children with cerebral palsy with and without antecedent neonatal encephalopathy. Differences between groups were evaluated using chi square analysis for categorical variables and student t test for continuous variables. **RESULTS:** We identified 132 children with cerebral palsy born full term over a 4 year-interval (1999-2002 inclusive) within the Quebec Cerebral Palsy Registry, of which 44 (33%) had an antecedent neonatal encephalopathy. Spastic quadriplegia subtype of cerebral palsy and Gross Motor Function Classification System Level III-V (non-independent ambulation) were significantly associated with antecedent neonatal encephalopathy. The mean number of comorbidities experienced was not different in the two groups. Of five documented comorbidities, only severe communication difficulties were found to be associated ( $p < 0.05$ ) with antecedent neonatal encephalopathy. **CONCLUSION:** A pattern of increased neuromotor impairment, functional gross motor severity and possible communication difficulties was found in the 33% of children with cerebral palsy born at term and with a history of neonatal encephalopathy.

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**17. J Sleep Res. 2012 Oct;21(5):552-60.**

**Decreased spontaneous arousability in preterm newborns with impaired neurological outcome.**

Thiriez G, Tournoud M, Wermenbol V, Vermeylen D, Ecochard R, Iwaz J, Lin JS, Franco P.

Paediatric Department, Centre Hospitalo-Universitaire de Besançon, Université de Franche-Comté, Besançon, France.

Preterm newborns are at high risk of neurological injury. In this population, we investigated the link between neurological complications and sleep architecture. At term-corrected gestational age, we studied retrospectively the polysomnography of 45 preterm infants born at  $< 28$  weeks or weighting  $< 1$  kg. These infants were followed-up by a neuropaediatrician (median age at last follow-up 50.4 months). Two groups of children were constituted: a group without neurological disorder and a second group with at least one of the following: cerebral palsy, language or mental retardation, visual or hearing disability or attention disorder. A Multiple Indicators and Multiple Causes model assessed the relationship between the neurological outcome and two sleep components: spontaneous arousability [number of awakenings and movements per hour of quiet sleep (QS) and active sleep] and QS characteristics (median duration of QS cycles and percentage of QS over total sleep time). Twenty-six infants had an impaired neurological outcome. There were no statistical differences between the two groups regarding clinical characteristics. Compared to preterm neonates with normal neurological outcome, those with impaired outcomes had a lower spontaneous arousability; i.e. 0.7 (0.5–1) times less awakenings and movements per hour of QS and 0.9 (0.8–1) times less per hour of active sleep than infants with normal outcomes ( $P = 0.05$ ). The differences in QS characteristics did not reach statistical significance. These findings suggested that, in preterm infants, perinatal neurological injuries could be associated with an abnormal sleep architecture characterized by altered spontaneous arousability.

[PMID: 23180489](#) [PubMed - in process]

**14. Acta Paediatr. 2012 Nov 23. doi: 10.1111/apa.12091. [Epub ahead of print]**

**Follow-up study of two-year-olds born at very low gestational age in Estonia.**

Toome L, Varendi H, Männamaa M, Vals MA, Tänavsuu T, Kolk A.

Department of Paediatrics, University of Tartu, Tartu, Estonia; Clinic of Paediatrics, Tallinn Children's Hospital, Tallinn, Estonia.

**AIM:** To study very low gestational age (VLGA, <32 weeks) infants at two years of age and to identify the predictors of adverse outcomes. **METHODS:** A population-based cohort of 155 surviving VLGA infants born in Estonia in 2007 was followed up and compared with a matched full-term control group. A logistic regression model was used to test associations between risk factors and adverse outcomes. **RESULTS:** No impairment was found in 60% of the VLGA infants. Neurodevelopmental impairment was noted in 12% of VLGA infants, with 8% of the infants affected by cerebral palsy without independent walking, 5% with cognitive delay, 10% with language delay, and 1% with hearing impairment. The differences between preterm and full-term infants in terms of the mean Cognitive, Language, and Motor Composite Scores assessed using the Bayley-III scales were in excess of 0.5 SD. Somatic growth delay was a significant problem among preterm infants. The existence of severe neonatal cerebral lesions was the most significant predictor of adverse outcomes. **CONCLUSION:** In all domains studied, adverse conditions were more prevalent among VLGA infants than among the full-term control group. Efforts to reduce neonatal morbidity in preterm infants should be a key priority for health care in Estonia.

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