

Monday 31 January 2011

This free weekly bulletin lists the latest research on cerebral palsy (CP), as indexed in the NCBI, PubMed (Medline) and Entrez (GenBank) databases. These articles were identified by a search using the key term "cerebral palsy" and cover the period 20 December 2010 to 9 January 2011.

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## Interventions

### 1. *Am J Phys Med Rehabil.* 2011 Jan 5. [Epub ahead of print]

#### **Survey Results of Pain Treatments in Adults with Cerebral Palsy.**

Hirsh AT, Kratz AL, Engel JM, Jensen MP.

From the Department of Psychology, Indiana University-Purdue University Indianapolis, Indiana (ATH); Department of Rehabilitation Medicine, University of Washington School of Medicine, Seattle, Washington (ALK, MPJ); and Department of Occupational Therapy, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin (JME).

**OBJECTIVE:** The aims of this study were to identify the types and frequencies of pain treatments used by individuals with cerebral palsy, examine the perceived effectiveness of these treatments, and identify the types of health-care providers that were accessed for pain-related services. **DESIGN:** A cross-sectional survey design was used. A total of 83 adults (mean [SD] age, 40.3 [13.6] yrs) with cerebral palsy indicated their pain location and intensity during the past 3 mos. Next, they indicated their use of 24 different pain treatments and the effectiveness of each. Finally, participants indicated the frequency of pain-related healthcare visits to specific providers over the past 6 mos. **RESULTS:** Of the participants, 63% reported experiencing chronic pain and rated their pain intensity over the past week as 5.1 of 10, on average. The most common pain locations were the lower back, hips, and legs. Physical interventions (e.g., physical therapy, strengthening) were the most common pain treatments reportedly used and were rated as moderately effective. Many other treatments were also used, and participants sought pain-related care from a variety of providers. **CONCLUSIONS:** Although participants reportedly accessed pain care from a variety of providers and perceived that several types of treatments were effective, many of the treatments rated as effective were rarely used or provided. Future research using clinical trial methods would further elucidate the specific pain treatments that are most beneficial for adults with cerebral palsy.

PMID: 21273894 [PubMed - as supplied by publisher]

### 2. *Disabil Rehabil.* 2011 Jan 25. [Epub ahead of print]

#### **Seeing the gaps: a systematic review of visual perception tools for children with hemiplegia.**

Auld M, Boyd R, Moseley GL, Johnston L.

Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane, Australia.

**Purpose.** Visual perception difficulties are common in children with cerebral palsy - hemiplegia, however it is not known which assessment tool is the best for this population. This systematic review evaluates the clinimetric properties of visual perception assessments for children with hemiplegia. **Method.** Databases were searched for assessments that: (i) measured visual perception; (ii) were reported in studies with children with hemiplegia and (iii)

had clinimetric data available to assessors. Results. Three assessments met criteria: the Test of Visual Perceptual Skills (TVPS), Motor-Free Visual Perceptual Test (MVPT) and Developmental Test of Visual Perception (DTVP). Factor analysis has been completed for the TVPS and DTVP, with both assessments and especially the TVPS, demonstrating some subtests that do not load significantly for the first factor of motor-free visual perception. All three assessments demonstrate variable construct and criterion validity with other clinical assessments. The DTVP, MVPT and TVPS demonstrate high test-retest reliability for total scores, but individual TVPS subtests are less reliable. Conclusions. The MVPT and DTVP show the best clinimetric data, however, less research has been completed on these tests than the TVPS. Further research is required to confirm the validity and reliability of the MVPT and DTVP for children with hemiplegia.

PMID: 21265609 [PubMed - as supplied by publisher]

### 3. Eur J Paediatr Neurol. 2011 Jan 25. [Epub ahead of print]

#### **Determining the technical and clinical factors associated with pain for children undergoing botulinum toxin injections under nitrous oxide and anesthetic cream.**

Brochard S, Blajan V, Lempereur M, Garlantezec R, Houx L, Le Moine P, Peudenier S, Lefranc J, Rémy-Néris O.

Service de médecine physique et de réadaptation, Centre Hospitalo-Universitaire Morvan, 5 avenue Foch, 29200 Brest, France; Centre de rééducation fonctionnelle pour enfant, 27 rue Mathieu Donnart, 29200 Brest, France; Laboratoire de Traitement de l'Information Médicale INSERM U650, Brest, France.

**AIMS:** To determine technical and clinical factors associated with pain when using an analgesic protocol with 50% nitrous oxide/oxygen and anesthetic cream (lidocaine and prilocaine, Emla®) for children with cerebral palsy undergoing botulinum toxin injections.

**METHODS:** Monocentric prospective study including 50 children newly injected with a mean age of 6.6 years ( $\pm 4.32$ , range 1-18) and 199 injected muscles. Pain was evaluated using the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS). The following variables were noted: gender, age, weight, Gross Motor Function Classification System, type of cerebral palsy (hemiplegic, diplegic, tetraplegic), muscles injected and severe cognitive impairment. The procedure was broken down into three phases for the purpose of pain evaluation: puncture, muscle localization using electrostimulation and injection of botulinum toxin. **RESULTS:** The mean CHEOPS score was 8.16 ( $\pm 3.5$ ) and 38% of scores were above the therapeutic threshold of 9. The injection phase was significantly more painful ( $6.77 \pm 3.30$ ) than the puncture ( $4.88 \pm 2.03$ ) and localization ( $5.46 \pm 2.68$ ) phases. The adductor muscles were less painful than other muscles. Children with more severe cognitive impairment seemed to perceive higher levels of pain than the others. Other clinical factors were not associated with pain score. **CONCLUSION:** Clinical characteristics seem not strongly correlated to the success or failure of the 50% nitrous oxide/oxygen-Emla® protocol and this pain treatment protocol does not prevent equally all phases of botulinum toxin injections. Future research on the products and its dilution might help to reduce pain level.

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PMID: 21273098 [PubMed - as supplied by publisher]

### 4. Arch Phys Med Rehabil. 2011 Feb;92(2):265-270.

#### **Relationship Between Walk Tests and Parental Reports of Walking Abilities in Children With Cerebral Palsy.**

Chong J, Mackey AH, Broadbent E, Stott NS.

Faculty of Medical & Health Sciences, University of Auckland, Auckland, New Zealand.

Chong J, Mackey AH, Broadbent E, Stott NS. Relationship between walk tests and parental reports of walking abilities in children with cerebral palsy.

**OBJECTIVES:** To test the strength of association between 2 clinic-based measures of walking ability, the 1-minute walk test (1MWT) and the six-minute walk test (6MWT), and the parental report of usual walking performance,

measured by the ABILOCO-Kids logit score, in children with cerebral palsy (CP). DESIGN: Observational study. SETTING: Tertiary level outpatient clinics. PARTICIPANTS: Children and youth with CP (N=60; 32 boys, 28 girls; mean age, 11.2y [range, 5-18y]), Gross Motor Function Classification System (GMFCS) level I to IV. INTERVENTIONS: Not applicable. MAIN OUTCOME MEASURES: The 10-item ABILOCO-Kids questionnaire, the 1MWT, and the 6MWT. RESULTS: ABILOCO-Kids logit scores were significantly correlated with the 1MWT ( $\rho=.70$ ,  $P<.01$ ) and the 6MWT ( $\rho=.70$ ,  $P<.01$ ) but not with age or sex. Linear models revealed a possibly significant difference in the strength of the relationship of the ABILOCO-Kids logit score with walking distance, depending on GMFCS level ( $P=.06$  1MWT;  $P=.14$  6MWT). The strongest relationship was observed at GMFCS level II, where ABILOCO-Kids score predicted 33% of variance in 1MWT ( $P=.003$ ) and 31% of 6MWT ( $P=.003$ ). The weakest relationship was at GMFCS level I, where ABILOCO-Kids score predicted only 5% of the variance in 1MWT ( $P=.33$ ) and 16% of the variance in 6MWT ( $P=.08$ ). CONCLUSIONS: Parental perceptions of their child's walking ability in the community correlate with clinic-based walking tests in ambulatory children with CP, providing evidence of convergent validity for the 1MWT and 6MWT. However, parents report a much wider range of walking abilities in children who function at a high level (GMFCS I) than is reflected by their walk test results.

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PMID: 21272723 [PubMed - as supplied by publisher]

### 5. J Child Neurol. 2011 Jan 26. [Epub ahead of print]

#### Functional Outcomes of Multilevel Botulinum Toxin and Comprehensive Rehabilitation in Cerebral Palsy.

Balbaloglu O, Basaran A, Ayoglu H.

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The objective of this study was to measure the effect of lower extremity multilevel botulinum toxin A injections and comprehensive rehabilitation on spasticity and to determine the functional gains in ambulatory children with cerebral palsy. Sixteen ambulatory children with spastic cerebral palsy (9 hemiplegic, 7 diplegic), aged between 3 and 8 years, who were able to walk with or without assistance (Gross Motor Functional Classification System I-III) were recruited to the study. Botulinum toxin A injections were applied to a total of 23 extremities, followed by a comprehensive rehabilitation program. Walking distance and walking speed (evaluated by the Six-Minute Walk Test) were significantly improved after treatment. Similarly, scores on the Observational Gait Scale (assessed by video gait analysis) increased significantly. Improvements in muscle length, spasticity, and selectivity were recorded. Reduced muscle spasticity after botulinum toxin A injections in children with cerebral palsy, with a comprehensive rehabilitation program, enabled clinically relevant improvements in functional ability.

PMID: 21270468 [PubMed - as supplied by publisher]

### 6. J Neuroeng Rehabil. 2011 Jan 23;8(1):4. [Epub ahead of print]

#### Validity of gait parameters for hip flexor contracture in patients with cerebral palsy.

Choi SJ, Chung CY, Lee KM, Kwon DG, Lee SH, Park MS.

BACKGROUND: Psoas contracture is known to cause abnormal hip motion in patients with cerebral palsy. The authors investigated the clinical relevance of hip kinematic and kinetic parameters, and 3D modeled psoas length in terms of discriminatory validity, convergent validity, and responsiveness. METHODS: Twenty-four patients with cerebral palsy (mean age 6.9 years) and 28 normal children (mean age 7.6 years) were included. Kinematic and kinetic data were obtained by three dimensional gait analysis, and psoas lengths were determined using a musculoskeletal modeling technique. Validity of the hip parameters were evaluated. RESULTS: In discriminatory validity, maximum psoas length (effect size  $r=0.773$ ), maximum pelvic tilt (0.712), maximum (0.681) and minimum hip flexion in stance (0.695), and hip flexor index (0.763) showed favorable discriminatory ability between the normal controls and the patients. In convergent validity, maximum psoas length was not significantly correlated with minimum hip flexion in stance in control group whereas that was correlated with minimum hip flexion in stance ( $r=-0.933$ ,  $p<0.001$ ) in the patients group. In responsiveness, maximum pelvic tilt ( $p<0.001$ ), minimum hip flexion in stance

( $p < 0.001$ ), maximum psoas length ( $p < 0.001$ ), and hip flexor index ( $p < 0.001$ ) showed significant improvement post-operatively. **CONCLUSIONS:** Maximum pelvic tilt, maximum psoas length, hip flexor index, and minimum hip flexion in stance were found to be clinically relevant parameters in evaluating hip flexor contracture.

PMID: 21255458 [PubMed - as supplied by publisher]

## 7. PM R. 2011 Jan;3(1):27-32.

### **Natural history of scoliosis in nonambulatory spastic tetraplegic cerebral palsy.**

Gu Y, Shelton JE, Ketchum JM, Cifu DX, Palmer D, Sparkman A, Jermer-Gu MK, Mendigorin M.

VCU Spine Center, Virginia Commonwealth University, 8700 Stony Point Parkway, Suite 260, Richmond, VA 23235 (□).

**OBJECTIVE:** To analyze the development and progression of scoliosis in children and adolescents with nonambulatory spastic tetraplegic cerebral palsy. **DESIGN:** Retrospective longitudinal review. **SETTING:** Pediatric nursing home. **PARTICIPANTS:** A total of 110 children and adolescents <18 years of age, with scoliosis. **INTERVENTIONS:** N/A. **MAIN OUTCOME MEASURES:** Cobb angle, age, weight, height, history of hip dislocation, tracheostomy. **RESULTS:** The Cobb angle increased with age, weight, and height in a nonlinear fashion. A square root transformation of the Cobb angle was chosen to model the nonlinear relationship between the Cobb angle and predictors. Age, height, and weight were significant univariate predictors of the square root of the Cobb angle (slopes = 0.377, 0.067, and 0.06, respectively). In the multivariate mixed model, age remained a significant predictor of the Cobb angle (slope = 0.456), but height and weight did not. If the Cobb angle was  $>40^\circ$  by age 12 years, scoliosis was more likely to progress than if the Cobb angle was  $\leq 40^\circ$ . The effect of age was stronger for those with history of tracheostomy (age slope = 0.631 vs 0.281) than those without. The relationship of age and Cobb angle did not differ significantly between hip dislocated and non-hip-dislocated groups. **CONCLUSIONS:** Age was found to be the most significant predictor of Cobb angle, and the effect of age was greater in the tracheostomy group than in the nontracheostomy group. After adjustment for age, the weight and height were not significant predictors of Cobb angle. Cobb angles of  $>40^\circ$  by the age of 12 years were associated with greater increases in Cobb angle with age.

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PMID: 21257130 [PubMed - in process]

## 8. Res Dev Disabil. 2011 Jan 25. [Epub ahead of print]

### **Prevalence and functioning of children with cerebral palsy in four areas of the United States in 2006: A report from the Autism and Developmental Disabilities Monitoring Network.**

Kirby RS, Wingate MS, Van Naarden Braun K, Doernberg NS, Arneson CL, Benedict RE, Mulvihill B, Durkin MS, Fitzgerald RT, Maenner MJ, Patz JA, Yeargin-Allsopp M.

Department of Community and Family Health, College of Public Health, University of South Florida, 13201 Bruce B. Downs Blvd, MDC56, Tampa, FL 33612, United States.

**AIM:** To estimate the prevalence of cerebral palsy (CP) and the frequency of co-occurring developmental disabilities (DDs), gross motor function (GMF), and walking ability using the largest surveillance DD database in the US. **METHODS:** We conducted population-based surveillance of 8-year-old children in 2006 (N=142,338), in areas of Alabama, Georgia, Wisconsin, and Missouri. This multi-site collaboration involved retrospective record review at multiple sources. We reported CP subtype, co-occurring DDs, Gross Motor Function Classification System (GMFCS) level, and walking ability as well as CP period prevalence by race/ethnicity and sex. **RESULTS:** CP prevalence was 3.3 (95% confidence interval [CI]: 3.1-3.7) per 1000 and varied by site, ranging from 2.9 (Wisconsin) to 3.8 (Georgia) per 1000, 8-year olds ( $p < 0.02$ ). Approximately 81% had spastic CP. Among children with CP, 8% had an autism spectrum disorder and 35% had epilepsy. Using the GMFCS, 38.1% functioned at the highest level (I), with 17.1% at the lowest level (V). Fifty-six percent were able to walk independently and 33% had limited or no walking ability. **INTERPRETATION:** Surveillance data are enhanced when factors such as functioning

and co-occurring conditions known to affect clinical service needs, quality of life, and health care are also considered.

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## 9. Neuroimage. 2011 Jan 19. [Epub ahead of print]

### Neural mechanisms of brain-computer interface control.

Halder S, Agorastos D, Veit R, Hammer EM, Lee S, Varkuti B, Bogdan M, Rosenstiel W, Birbaumer N, Kübler A.

Institute of Medical Psychology and Behavioral Neurobiology, University of Tübingen, Gartenstr. 29, 72074 Tübingen, Germany; Wilhelm-Schickard Institute for Computer Engineering, University of Tübingen, Sand 13, 72076 Tübingen, Germany.

Brain-Computer Interfaces (BCIs) enable people with paralysis to communicate with their environment. Motor imagery can be used to generate distinct patterns of cortical activation in the electroencephalogram (EEG) and thus control a BCI. To elucidate the cortical correlates of BCI control, users of a sensory motor rhythm (SMR)-BCI were classified according to their BCI control performance. In a second session these participants performed a motor imagery, motor observation and motor execution task in a functional magnetic resonance imaging (fMRI) scanner. Group difference analysis between high and low aptitude BCI-users revealed significantly higher activation of the supplementary motor areas (SMA) for the motor imagery and the motor observation tasks in high aptitude users. Low aptitude users showed no activation when observing movement. The number of activated voxels during motor observation was significantly correlated with accuracy in the EEG-BCI task ( $r=0.53$ ). Furthermore, the number of activated voxels in the right middle frontal gyrus, an area responsible for processing of movement observation, correlated ( $r=0.72$ ) with BCI-performance. This strong correlation highlights the importance of these areas for task monitoring and working memory as task goals have to be activated throughout the BCI session. The ability to regulate behavior and the brain through learning mechanisms involving imagery such as a BCI constitutes the consequence of ideo-motor co-activation of motor brain systems during observation of movements. The results demonstrate that acquisition of a sensorimotor program reflected in SMR-BCI-control is tightly related to the recall of such sensorimotor programs during observation of movements and unrelated to the actual execution of these movement sequences. **RESEARCH HIGHLIGHTS:** Brain processes during observation of movement predict SMR-BCI aptitude. BCI aptitude is unrelated to brain processes during execution of movement. Higher activation in SMA of high aptitude users during imagery and observation tasks. Higher activation in middle frontal gyrus of high aptitude users during observation.

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## Epidemiology / Aetiology / Diagnosis & Early Treatment

### 10. *J Child Neurol*. 2011 Jan 26. [Epub ahead of print]

#### **Predictors of Outcome in Term Infants With Neonatal Seizures Subsequent to Intrapartum Asphyxia.**

Garfinkle J, Shevell MI.

Depts of Neurology/Neurosurgery & Pediatrics, McGill Univ, & Div of Pediatric Neurology, Montreal Children's Hospital-McGill University Health Center, Montreal.

The objective of this study was to define potential clinical prognostic factors for term infants with neonatal seizures subsequent to intrapartum asphyxia. The authors completed a retrospective analysis of 62 term infants with clinical neonatal seizures subsequent to intrapartum asphyxia. Logistic regression analysis was applied to determine the independent prognostic indicators of an adverse outcome. A total of 23 (37%) infants had a normal outcome, 34 (55%) survived with 1 or more neurodevelopmental impairments (23 cerebral palsy, 28 global developmental delay, 15 epilepsy, with 18 combination of two, and 9 all three), and 5 (8%) died. Six variables were associated with an adverse outcome, but only the presence of meconium aspiration, a low ( $\leq 3$ ) 1-minute Apgar score, seizure type other than focal clonic, and moderately severely abnormal electroencephalography (EEG) background findings were independently associated with an adverse outcome. Signs of acute distress are predictors of adverse outcome, alongside seizure semiology and moderate to severe EEG background abnormalities.

PMID: 21270469 [PubMed - as supplied by publisher]

### 11. *J Perinatol*. 2011 Jan 27. [Epub ahead of print]

#### **Early postnatal hypotension is not associated with indicators of white matter damage or cerebral palsy in extremely low gestational age newborns.**

Logan JW, O'Shea TM, Allred EN, Laughon MM, Bose CL, Dammann O, Batton DG, Kuban KC, Paneth N, Leviton A.

Division of Neonatal-Perinatal Medicine, Betty H Cameron Women's and Children's Hospital, New Hanover Regional Medical Center, Wilmington, NC, USA.

**Objective:** To evaluate, in extremely low gestational age newborns (ELGANs), relationships between indicators of early postnatal hypotension and cranial ultrasound indicators of cerebral white matter damage imaged in the nursery and cerebral palsy diagnoses at 24 months follow-up. **Study Design:** The 1041 infants in this prospective study were born at <28 weeks gestation, were assessed for three indicators of hypotension in the first 24 postnatal hours, had at least one set of protocol cranial ultrasound scans and were evaluated with a structured neurological exam at 24 months corrected age. Indicators of hypotension included: (1) lowest mean arterial pressure (MAP) in the lowest quartile for gestational age; (2) treatment with a vasopressor; and (3) blood pressure lability, defined as the upper quartile of the difference between each infant's lowest and highest MAP. Outcomes included indicators of cerebral white matter damage, that is, moderate/severe ventriculomegaly or an echolucent lesion on cranial ultrasound and cerebral palsy diagnoses at 24 months gestation. Logistic regression was used to evaluate relationships among hypotension indicators and outcomes, adjusting for potential confounders. **Result:** Twenty-one percent of surviving infants had a lowest blood pressure in the lowest quartile for gestational age, 24% were treated with vasopressors and 24% had labile blood pressure. Among infants with these hypotension indicators, 10% percent developed ventriculomegaly and 7% developed an echolucent lesion. At 24 months follow-up, 6% had developed quadriplegia, 4% diplegia and 2% hemiplegia. After adjusting for confounders, we found no association between indicators of hypotension, and indicators of cerebral white matter damage or a cerebral palsy diagnosis. **Conclusion:** The absence of an association between indicators of hypotension and cerebral white matter damage and or cerebral palsy suggests that early hypotension may not be important in the pathogenesis of brain injury in ELGANs. *Journal of Perinatology* advance online publication, 27 January 2011; doi:10.1038/jp.2010.201.

PMID: 21273984 [PubMed - as supplied by publisher]

**12. Arch Pediatr. 2011 Jan 21. [Epub ahead of print]****Prevention of cerebral palsy using magnesium sulfate in pre-term newborns. [Article in French]**

Marret S, Chollat C, Levèque C, Marpeau L.

Service de pédiatrie néonatale et réanimation, centre d'éducation fonctionnelle de l'Enfant, hôpital Charles-Nicolle, CHU de Rouen, 1, rue de Germont, 76031 Rouen cedex, France; Équipe EA 4309, handicap périnatal, institut de recherche biomédicale et d'innovation, université de Rouen, 76031 Rouen cedex, France.

This review concentrates on the best evidence emerging in recent years on cerebral palsy prevention by administration of magnesium sulfate in mothers at risk of pre-term birth before 33-34weeks' gestation. It was shown in the Cochrane database and in 3 meta-analyses of 5 randomized trials (Magpie Trial [neuroprotection of the pre-eclamptic mother], MagNet [neuroprotection/other intent: tocolysis], ActoMgSO(4) [neuroprotection], PreMag [neuroprotection], and Beam [neuroprotection]) that prenatal low-dose magnesium sulfate given to mothers at risk of pre-term birth has no severe deleterious effects in mothers and does not increase pediatric mortality in very pre-term infants. Moreover, it has significant neuroprotective effects on the occurrence of cerebral palsy at 2years of age (relative risk, 0.69; 95% confidence interval, 0.54-0.87) and, in the neuroprotection subgroup, on the combined outcome of pediatric mortality or cerebral palsy (relative risk: 0.85; 95% confidence interval: 0.74-0.98). The number needed to treat (NTT) to prevent 1 case of cerebral palsy was 63 (95% CI, 39-172) and the NTT for an extra survivor free of cerebral palsy in the neuroprotection subgroup was 42 (95% CI, 22-357), justifying that magnesium sulfate should be discussed as a stand-alone treatment or as part of a combination treatment.

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