

Monday 16 August 2010

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".

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Interventions

1. *Pediatr Phys Ther.* 2010 Fall;22(3):322-9.

Power mobility and socialization in preschool: a case study of a child with cerebral palsy.

Ragonesi CB, Chen X, Agrawal S, Galloway JC.

Infant Motor Behavior Laboratory, Department of Physical Therapy (Ms Ragonesi and Dr Galloway); Biomechanics and Movement Sciences Program (Ms Ragonesi and Drs Agrawal and Galloway); and Mechanical Systems Laboratory, Department of Mechanical Engineering (Mr Chen and Dr Agrawal), University of Delaware, Newark.

PURPOSE: Power mobility training for young children and infants appears feasible under controlled conditions. Dynamic, natural environments provide the ultimate test of training. The purpose of this case study was to determine whether it was feasible for Will, a 3-year-old boy with cerebral palsy, to use a power mobility device (UD2) in his preschool classroom and to quantify his classroom mobility and socialization. **METHODS:** Will, 2 peers (typically developing), and 2 teachers were filmed daily in class during a baseline phase without UD2, followed by a mobility phase with UD2. We coded socialization and mobility measures from video recordings. **RESULTS:** Will was more mobile and interactive when driving UD2 than during the baseline phase; however, he remained notably less mobile and interactive than his peers. **CONCLUSIONS:** The use and assessment of power mobility in a preschool classroom appear feasible. Issues important to maximizing children's use of power mobility for classroom participation are discussed.

PMID: 20699785 [PubMed - in process]

2. *Pediatr Phys Ther.* 2010 Fall;22(3):315-20.

The gross motor function classification system: an update on impact and clinical utility.

Gray L, Ng H, Bartlett D.

School of Physical Therapy, Faculty of Health Sciences, The University of Western Ontario, London, Ontario, Canada.

PURPOSE: To examine the impact and utility of the Gross Motor Function Classification System (GMFCS) for children with cerebral palsy (CP) in research and clinical settings through a scoping review of publications from July 2003 to December 2008. **METHODS:** An online literature search was performed to retrieve relevant studies for classification according to GMFCS use. **RESULTS:** There has been a steadily increasing use of the GMFCS over the previous decade. Ongoing research was identified on the GMFCS measurement properties, as well as its use in validation of other tools. Observational and experimental studies continued to be the primary use of the GMFCS. Some studies discussed the GMFCS in clinical practice with respect to examination and evaluation. **CONCLUSIONS:** The GMFCS is clearly established as a principal classification system for children with CP as demon-

strated by excellent uptake in research; however, literature on its clinical use is emerging more slowly over time. More emphasis on the clinical utility of the GMFCS in the published literature would be helpful.

PMID: 20699783 [PubMed - in process]

3. *Pediatr Phys Ther.* 2010 Fall;22(3):296-303.

Growing older with cerebral palsy: insiders' perspectives.

Horsman M, Suto M, Dudgeon B, Harris SR.

Department of Occupational Science & Occupational Therapy, Faculty of Medicine, The University of British Columbia, Vancouver, British Columbia, Canada (Dr Suto); Division of Occupational Therapy, Department of Rehabilitation Medicine, University of Washington, Seattle (Dr Dudgeon); Department of Physical Therapy, Faculty of Medicine, The University of British Columbia, Vancouver, British Columbia, Canada (Dr Harris).

PURPOSE: Research has shown that adults with cerebral palsy (CP) lose functional abilities earlier than persons who are able-bodied. Because CP is a lifespan disability, developmental therapists should be aware of these changes. **METHODS:** We used descriptive phenomenology to understand the unique, lived experiences of adults growing older with CP. Data were gathered through in-depth, semistructured interviews. Open-ended questions asked what it was like to age with CP, how these experiences were understood, how strategies were used to cope with changes, and what are the meanings of these experiences. **RESULTS:** A theme, Awareness, Acceptance, and Action, emerged from the data analysis. Participants were aware that their bodies were deteriorating quicker than those of peers who are able-bodied. They developed acceptance that hastened actions toward improving their quality of life. **CONCLUSIONS:** These findings provide insights for pediatric therapists who work with children with CP about what may be important to their clients as they grow older.

PMID: 20699780 [PubMed - in process]

4. *Pediatr Phys Ther.* 2010 Fall;22(3):259-66.

Severity and characteristics of developmental delay can be assessed using variability measures of sitting posture.

Kyvelidou A, Harbourne RT, Stergiou N.

Nebraska Biomechanics Core Facility, University of Nebraska at Omaha (Ms Kyvelidou and Dr Stergiou); Departments of Pediatrics (Ms Kyvelidou) and Environmental, Agricultural and Occupational Health Sciences, College of Public Health (Dr Stergiou); and Munroe-Meyer Institute (Dr Harbourne), University of Nebraska Medical Center, Omaha, Nebraska.

PURPOSE: We sought to identify measures of variability from sitting postural sway that are significantly different among infants who were developing typically, those who were developmentally delayed or hypotonic, and those who later on had a diagnosis of spastic or athetoid cerebral palsy. **METHODS:** Sixty-five infants were evaluated when they were just developing the ability to sit upright by assessing center of pressure (COP) data, using measures of both amount and temporal organization of COP variability. **RESULTS:** The results indicated that measures of variability of COP could discriminate between infants with developmental delay and infants with cerebral palsy and add to the description of sitting postural behavior. **CONCLUSIONS:** Our method of evaluating sitting postural control could be an objective tool to help describe distinctive features of motor delay in an individual infant and could lead in the design of selective therapeutic interventions for improving postural control of infants with motor delays.

PMID: 20699772 [PubMed - in process]

5. Clin Rehabil. 2010 Aug 11. [Epub ahead of print]

A systematic review of arm activity measures for children with hemiplegic cerebral palsy.

Klingels K, Jaspers E, Van de Winckel A, De Cock P, Molenaers G, Feys H.

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Objective: To identify psychometrically sound and clinically feasible assessments of arm activities in children with hemiplegic cerebral palsy for implementation in research and clinical practice. **Data sources:** PubMed, CINAHL, Cochrane Library, Web of Science and reference lists of relevant articles were searched. **Review methods:** A systematic search was performed based on the following inclusion criteria: (1) evaluative tools at the activity level according to the International Classification of Functioning, Disability and Health; (2) previously used in studies including children with hemiplegic cerebral palsy aged 2-18 years; (3) at least one aspect of reliability and validity in children with cerebral palsy should be established. **Descriptive information, psychometric properties and clinical utility** were reviewed. **Results:** Eighteen assessments were identified of which 11 met the inclusion criteria: eight functional tests and three questionnaires. Five functional tests were condition-specific, three were generic. All functional tests measure different aspects of activity, including unimanual capacity and performance during bimanual tasks. The questionnaires obtain information about the child's abilities at home or school. The reliability and validity have been established, though further use in clinical trials is necessary to determine the responsiveness. **Conclusions:** To obtain a complete view of what the child can do and what the child actually does, we advise a capacity-based test (Melbourne Assessment of Unilateral Upper Limb Function), a performance-based test (Assisting Hand Assessment) and a questionnaire (Abilhand-Kids). This will allow outcome differentiation and treatment guidance for the arm in children with cerebral palsy.

PMID: 20702511 [PubMed - as supplied by publisher]

6. Disabil Rehabil Assist Technol. 2010 Aug 7. [Epub ahead of print]

Measurement of muscle stiffness using robotic assisted gait orthosis in children with cerebral palsy: a proof of concept.

Schmartz AC, Meyer-Heim AD, Müller R, Bolliger M.

Institute of Human Movement Sciences and Sport, ETH Zurich, Zurich, Switzerland.

Purpose. To evaluate the feasibility and reliability of a novel stiffness assessment tool implemented in the driven gait orthosis Paediatric Lokomat; to investigate the influence of single robotic-assisted gait training (RAGT) on muscle stiffness in children with cerebral palsy (CP). **Methods.** Ten children with spastic CP conducted a single standard RAGT session and stiffness was assessed before and after the RAGT. Nine of the ten subjects were tested twice on the same day to investigate test-retest reliability, intraclass correlation coefficients (ICCs), standard error of measurement (SEM), coefficient of variation of the method error (CV(ME)) and resistive torques during passive leg movements (stiffness in Nm/ degrees) were calculated. **Results.** ICCs showed high reliability (0.83-0.97) for hip and knee movements. SEM and CV(ME) indicated 0.028-0.085 Nm/ degrees , 9.5-23.0% of test-retest variability in hip and 0.018-0.064 Nm/ degrees , 13.3-43.5% in knee measures. Using the assessment tool, a significant decrease in muscle stiffness in participants, especially in children with high levels of muscle tone, could be shown after a single session of RAGT. **Conclusions.** The assessment tool L-STIFF is a feasible tool for automated measurement of stiffness in children with CP, but it is not sensitive enough to record small changes in muscle tone.

PMID: 20690863 [PubMed - as supplied by publisher]

7. Res Dev Disabil. 2010 Aug 4. [Epub ahead of print]**Compromised motor planning and Motor Imagery in right Hemiparetic Cerebral Palsy.**

Crajé C, van Elk M, Beeren M, van Schie HT, Bekkering H, Steenbergen B.

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We investigated whether motor planning problems in people with Hemiparetic Cerebral Palsy (HCP) are paralleled by impaired ability to use Motor Imagery (MI). While some studies have shown that individuals with HCP can solve a mental rotation task, it was not clear if they used MI or Visual Imagery (VI). In the present study, motor planning and MI were examined in individuals with right HCP (n=10) and controls. Motor planning was measured using an object manipulation task, where participants had to anticipate the end of the motor action. MI was measured using a mental rotation paradigm, where participants judged laterality of hands presented from a back view and a palm view. To test if participants used MI or VI we compared reaction times of lateral versus medial rotations, under the assumption that MI is subject to biomechanical constraints of rotated hands, but VI is not. Individuals with HCP had a higher proportion of task failures due to inappropriate grip choice, exemplifying impaired planning. Second, individuals with HCP did not show a reaction time difference between lateral and medial rotations, indicating an impaired ability to use MI. These findings show that compromised motor planning in HCP is paralleled by an impairment in the ability to use MI. Training of MI may be a useful entry-point for rehabilitation of motor planning problems. Copyright © 2010 Elsevier Ltd. All rights reserved.

PMID: 20691568 [PubMed - as supplied by publisher]

8. Clin Rehabil. 2010 Aug;24(8):766.**Letter to the editor: Re: Safety of botulinum toxin type A among children with spasticity secondary to cerebral palsy: a systematic review of randomized clinical trials.**

Dubinsky RM.

Department of Neurology University of Kansas Medical Center Kansas City, Kansas, USA. rdubinsk@kumc.edu.

PMID: 20702516 [PubMed - in process]

9. Nutr Clin Pract. 2010 Aug;25(4):357-61.**Growth in cerebral palsy.**

Andrew MJ, Sullivan PB.

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Cerebral palsy is often accompanied by abnormalities of growth and nutrition; children with severe motor impairments are most at risk. Nutrition, neurological, and endocrine factors all contribute to suboptimal growth. Poor growth and nutrition are associated with poor general health outcomes and reduced levels of participation, and therefore warrant careful evaluation and appropriate intervention. The lack of normative data combined with the complex interaction of nutrition and nonnutrition factors contributing to growth in this population present real difficulties in management. Particular care is needed to avoid overfeeding and the resultant increase in fat mass and associated morbidity.

PMID: 20702841 [PubMed - in process]

10. Chir Narzadow Ruchu Ortop Pol. 2010 Mar-Apr;75(2):108-13.**The shape of the spine among children with cerebral palsy [Article in Polish]**

Malak R, Gajewska E, Samborski W, Sobieska M.

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AIM: The objective of the study was to determine the posture among children with cerebral palsy referring to type of paralysis. **METHODOLOGY:** The research was performed out of 33 children with Cerebral Palsy (aged 1-18 years) who attend Zespół Szkół Specjalnych number 103, Accident-Orthopaedic Department in Hospital nr 4 in Poznan and Rehabilitation Center "Bartek" in Poznań. The questionnaire was used in order to check whether there is any failure curvature in cervical, thoracic and lumbar spine in plantar and frontal plane. The study was performed by visual analysis of the spine in November and December in 2007. **RESULTS:** (1) The visual analysis of the vertebral column showed that the cervical spine is asymmetric among two children with hemiplegia bilateralis, three with hemiplegia spastica and one with atetosis. (2) Among group of patients with lumbar hyperlordosis there are eight who are diagnosed with hemiplegia bilateralis. (3) These are seven patients who have the proper position of pelvis in frontal plane and can stand by oneself (referring to Levene's Test for Equality of Variances $p = 0.039820$). **CONCLUSIONS:** (1) The failure posture is common among children with cerebral palsy. (2) Vertebral column is asymmetrical in frontal plane among many patients with cerebralpalsy, especially with hemiplegia spastica. (3) The position of pelvis in frontal plane influence on the ability of standing by oneself.

PMID: 20695183 [PubMed - in process]

11. Chir Narzadow Ruchu Ortop Pol. 2010 Mar-Apr;75(2):92-7.**Assessment of absolute knee joint linear and angular velocity in patients with spastic cerebral palsy after operative treatment of lever arm disfunction deformities--prospective study [Article in Polish]**

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INTRODUCTION: Lever arm dysfunction (LAD) deformities in patients with CP are based on imbalanced forces acting in lower limbs during gait. Muscle imbalance results in bone axial deformities, simultaneously magnifying bio-mechanical disturbances. Goal. Analysis of knee joint velocity in patients with spastic dipegia treated with use of single event multi level surgery (SEMLS). **MATERIAL:** 15 patients (21 limbs), mean age--15 years (12-23) at operation, with spastic CP treated with use of SEMLS were included. In all ceases the distal derotational femoral osteotomy, combined with various additional operative correction were performed. Patients were divided into two groups depending on distal RF transfer as a single criteria. **METHOD:** Patients were examined with use of VICON 460 motion analysis system: before and 12 months after operative treatment. Lower limb joints ROM, with changed parameters of coronal and sagittal plane moments, was subjected to detailed analysis, with assessment of influence of mentioned moments on knee joint absolute LV and AV during terminal stance (TS), toe off (TO) and initial swing (IS). **RESULTS:** The statistically significant increase in knee joint LV in TS, TO, IS, $p < 0,001$, before (mean: TS--536.3 mm/s; TO--668.7 mm/s; 826.1 mm/s) and after (mean: TS--828 mm/s; TO--1007.5 mm/s; 174.5 mm/s) treatment was observed and compared to normal healthy adults. The difference in knee joint AV was statistically significant in TS $p = 0.018$ (mean: before: 82.2 deg/s; after: 81.2 deg/s) and IS $p = 0.023$ (mean: before: 53 deg/s; after: 20.2 deg/s). **CONCLUSIONS:** Joints moments improvement, as an outcome of operative treatment, resulted in increase of absolute LV and AV of knee joint towards values of healthy adults, consequently improving CP patients gait.

PMID: 20695180 [PubMed - in process]

12. J Physiother. 2010;56(2):136.

10-metre shuttle run test.

Verschuren O, Takken T.

Rehabilitation Centre De Hoogstraat, Utrecht, The Netherlands.

PMID: 20482484 [PubMed - indexed for MEDLINE]

Epidemiology / Aetiology / Diagnosis & Early Treatment

Please note: This is not yet a comprehensive outline of cerebral palsy prevention literature. It is expected that more research will be included when the search terms are expanded to include key terms other than "cerebral palsy". It is a work-in-progress and it will be expanded in coming months.

13. Child Care Health Dev. 2010 Sep;36(5):749.

Mortality from 1 to 16-18 years in bilateral cerebral palsy.

Reading R.

PMID: 20704582 [PubMed - in process]

14. Arch Dis Child. 2010 Aug 12. [Epub ahead of print]

The association between birth condition and neuropsychological functioning and educational attainment at school age: a cohort study.

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Objective: Poor condition at birth may impact on IQ, although its effect on other measures of neurodevelopment is unclear. The authors' aim was to determine whether infants receiving resuscitation after birth have reduced scores in measures of attention, memory and language skills or the need for educational support at school even in the absence of clinical encephalopathy. Methods: Three groups of term infants were identified from the Avon longitudinal study of parents and children: infants resuscitated at birth but asymptomatic for encephalopathy (n=612), infants resuscitated who developed symptoms of encephalopathy (n=40) and the reference infants who were not resuscitated and had no further neonatal care (n=8080). Measures of attention, language, memory and the need for educational support were obtained for children between 8 years and 11 years. Test results (standardised to a mean of 100 and SD of 15) were adjusted for clinical and social covariates. Missing covariate data were imputed using chained equations. Results Infants asymptomatic after resuscitation had similar scores to those not requiring resuscitation for all measures while infants who developed encephalopathy had lower working memory (-6.65 (-12.34 to -0.96)), reading accuracy (-7.95 (-13.28 to -2.63)) and comprehension (-9.32 (-14.47 to -4.17)) scores and increased risk of receiving educational support (OR 6.24 (1.52 to 26.43)) than infants thought to be well at birth, although there was little evidence for an association after excluding infants who developed cerebral palsy. Conclusions: The authors found no evidence that infants who were resuscitated but remained well afterwards differed from those not requiring resuscitation in the aspects of neuropsychological functioning assessed in this study. Infants who developed neonatal encephalopathy had evidence of worse functioning, particularly in language skills and were more likely to receive educational support at school.

PMID: 20705720 [PubMed - as supplied by publisher]

15. J Comp Pathol. 2010 Aug 10. [Epub ahead of print]**Periventricular Leucomalacia (PVL)-like Lesions in Two Neonatal Cynomolgus Monkeys (*Macaca fascicularis*).**

Okabayashi S, Uchida K, Nakayama H, Ohno C, Hanari K, Goto I, Yasutomi Y.

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Periventricular leucomalacia (PVL) is a lesion of immature cerebral white matter that occurs in the perinatal period. In man, PVL is the predominant form of brain injury and a cause of cerebral palsy and cognitive deficits in premature infants. PVL affects fetuses and newborns, particularly those who have undergone oxygen deprivation as may occur in premature birth. Many clinical and pathological studies of PVL have been performed in man, but there is no clear definition of PVL in animals. A few spontaneous PVL-like cases in puppies or experimental cases in other animal species have been reported. The present study reports the histopathological and immunohistochemical features of PVL-like lesions in two neonatal cynomolgus monkeys. In both cases, there was cerebral white matter necrosis with marked infiltration of lipid-laden phagocytes and a reduction of neurons in the cerebral cortex. In case 1 there was extensive cavitation of the cerebral white matter. In case 2 there was reactive astrocytosis associated with a decrease in oligodendroglial cells and a decrease in cerebral white matter myelin. To our knowledge, this is the first report of PVL-like leucoencephalomalacia in non-human primates. Copyright © 2010 Elsevier Ltd. All rights reserved.

PMID: 20705303 [PubMed - as supplied by publisher]

16. Ann Neurol. 2010 Aug;68(2):204-12.**Altered inflammatory responses in preterm children with cerebral palsy.**

Lin CY, Chang YC, Wang ST, Lee TY, Lin CF, Huang CC.

Institute of Basic Medical Sciences, National Cheng Kung University College of Medicine, Tainan, Taiwan.

OBJECTIVE: Perinatal inflammatory responses contribute to periventricular leukomalacia (PVL) and cerebral palsy (CP) in preterm infants. Here, we examined whether preterm children with CP had altered inflammatory responses when school-aged. **METHODS:** Thirty-two preterm children with PVL-induced CP (mean \pm standard deviation age, 7.2 \pm 3.6 years) and 32 control preterm children with normal neurodevelopment (6.2 \pm 2.2 years) and matched for gestational age were recruited. We measured tumor necrosis factor (TNF)-alpha levels in the plasma and the supernatants of peripheral blood mononuclear cells (PBMCs) before and after lipopolysaccharide (LPS) stimulation, and proinflammatory gene expression in the PBMCs. **RESULTS:** TNF-alpha expression was significantly higher in the plasma ($p < 0.001$) and supernatants of LPS-stimulated PBMCs ($p = 0.003$) in the CP group than in the control group. After LPS stimulation, the intracellular TNF-alpha level in the PBMCs was significantly lower in the control group ($p = 0.016$) and significantly higher in the CP group ($p = 0.01$). The CP group also had, in their nonstimulated PBMCs, significantly higher mRNA levels of inflammatory molecules: toll-like receptor 4 (TLR-4) ($p = 0.0023$), TNF-alpha ($p = 0.0016$), transforming growth factor-beta-activated kinase 1 ($p = 0.038$), I kappa B kinase-gamma ($p = 0.029$), and c-Jun N-terminal kinase ($p = 0.045$). The TLR-4 mRNA levels in the PBMCs were highly correlated with TNF-alpha levels in LPS-stimulated PBMCs (Spearman rank correlation = 0.38, $p = 0.03$). **INTERPRETATION:** The finding that preterm children with PVL-induced CP have altered inflammatory responses indicates the possibility of programming effect of PVL or inflammation-related events during early life. *ANN NEUROL* 2010;68:204-212.

PMID: 20695013 [PubMed - in process]

