

Monday 22 November 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. **Child Care Health Dev. 2010 Nov 18. doi: 10.1111/j.1365-2214.2010.01160.x. [Epub ahead of print]**

Are family-centred principles, functional goal setting and transition planning evident in therapy services for children with cerebral palsy?

Darrah J, Wiart L, Magill-Evans J, Ray L, Andersen J.

Department of Physical Therapy, Faculty of Rehabilitation Medicine, University of Alberta Alberta Centre for Child, Family Community Research and Faculty of Nursing, University of Alberta Department of Occupational Therapy, Faculty of Rehabilitation Medicine, University of Alberta Faculty of Nursing, University of Alberta Department of Pediatrics, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, AB, Canada.

Background: Family-centred service, functional goal setting and co-ordination of a child's move between programmes are important concepts of rehabilitation services for children with cerebral palsy identified in the literature. We examined whether these three concepts could be objectively identified in programmes providing services to children with cerebral palsy in Alberta, Canada. **Methods:** Programme managers (n= 37) and occupational and physical therapists (n= 54) representing 59 programmes participated in individual 1-h semi-structured interviews. Thirty-nine parents participated in eleven focus groups or two individual interviews. Evidence of family-centred values in mission statements and advisory boards was evaluated. Therapists were asked to identify three concepts of family-centred service and to complete the Measures of Process of Care for Service Providers. Therapists also identified therapy goals for children based on clinical case scenarios. The goals were coded using the components of the International Classification of Functioning Disability and Health. Programme managers and therapists discussed the processes in their programmes for goal setting and for preparing children and their families for their transition to other programmes. Parents reflected on their experiences with their child's rehabilitation related to family-centredness, goal setting and co-ordination between programmes. **Results:** All respondents expressed commitment to the three concepts, but objective indicators of family-centred processes were lacking in many programmes. In most programmes, the processes to implement the three concepts were informal rather than standardized. Both families and therapists reported limited access to general information regarding community supports. **Conclusion:** Lack of formal processes for delivery of family-centred service, goal-setting and co-ordination between children's programmes may result in inequitable opportunities for families to participate in their children's rehabilitation despite attending the same programme. Standardized programme processes and policies may provide a starting point to ensure that all families have equitable opportunities to participate in their child's rehabilitation programme.

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PMID: 21083684 [PubMed - as supplied by publisher]

2. Child Care Health Dev. 2010 Nov 18. doi: 10.1111/j.1365-2214.2010.01170.x. [Epub ahead of print]**Rehabilitation for children with cerebral palsy in rural Cambodia: parental perceptions of family-centred practices.**

Morgan F, Tan BK.

Service Fellowship International, Phnom Penh, Cambodia Centre for International Health, Curtin Health Innovation Research Institute, Curtin University, Perth, WA, Australia.

Background: Rehabilitation service providers in Cambodia are increasingly adopting family-centred practices when working with children with cerebral palsy and their families. This study examined the perceptions of parents living in rural Cambodia regarding family-centred rehabilitation practices. Methods: This qualitative study used in-depth semi-structured individual and small group interviews with a convenience sample of 24 parents of children with cerebral palsy from three rural provinces. Participants were drawn from Cambodia Trust's client database and had been involved in a rehabilitation planning process which incorporated family-centred practices. Results: Twenty-four parents and carers of children with cerebral palsy aged 3-12 years were interviewed. Almost all parents valued family-centred practices in rehabilitation, with many of the needs and preferences of parents living in rural Cambodia similar to those of parents in Western contexts. Conclusions: Family-centred approaches to paediatric rehabilitation were found to be valued in and appropriate for a rural Cambodian context. Social and cultural mechanisms to be considered when adapting a Western, family-centred model of rehabilitation planning to the rural Cambodian context include the hierarchical nature of Cambodian culture, the emphasis on group relational patterns rather than individual needs and the context of chronic poverty.

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3. Clin Rehabil. 2010 Nov 15. [Epub ahead of print]**Habitual physical activity can be increased in people with cerebral palsy: a systematic review.**

Bania T, Dodd KJ, Taylor N.

Physiotherapist and Doctoral Candidate, La Trobe University, Bundoora, Australia.

OBJECTIVE: To determine if habitual physical activity could be increased in people with cerebral palsy. Data sources: We searched electronic databases until February 2010 using key words related to concepts of cerebral palsy and physical activity. This search was supplemented with citation tracking. METHODS: Studies had to include participants with cerebral palsy who have habitual physical activity measured over at least one day after a therapy intervention. Two reviewers independently assessed study quality with the PEDro scale (quantitative studies) and Critical Appraisal Checklist for Qualitative Research (qualitative studies). For quantitative studies standardized mean differences were calculated and meta-analysis conducted. Qualitative data were synthesized thematically. RESULTS: Three randomized controlled trials (96 participants) and two qualitative studies (21 participants) were reviewed. Four studies evaluated exercise programmes, and one study an online educational and support programme. Meta-analysis showed that exercise programmes could increase habitual physical activity ($\delta = 1.0$; 95% confidence interval (CI) 0.28 to 1.72). This result was reinforced by reports of increased daily activity in two qualitative studies. The online programme increased weekly minutes of moderate to vigorous physical activity ($d = 0.81$; 95% CI 0.17 to 1.45), and weekly step counts ($d = 0.62$; 95% CI 0.0 to 1.25). Positive effects were not maintained after programmes stopped. There was insufficient evidence to determine if demographic factors or programme characteristics, such as intensity and setting, were associated with outcomes. CONCLUSION: Preliminary evidence suggests that exercise programmes and online support programmes can increase habitual physical activity in people with cerebral palsy, but effects are not maintained when programmes stop.

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4. Dev Med Child Neurol. 2010 Nov 18. doi: 10.1111/j.1469-8749.2010.03830.x. [Epub ahead of print]

Neuronox versus BOTOX for spastic equinus gait in children with cerebral palsy: a randomized, double-blinded, controlled multicentre clinical trial.

Kim K, Shin HI, Kwon BS, Kim SJ, Jung IY, Bang MS.

1: Department of Rehabilitation Medicine, Seoul National University College of Medicine, Seoul, Korea . 2: Department of Rehabilitation Medicine, Seoul National University Bundang Hospital, Seongnam, Korea . 3: Department of Rehabilitation Medicine, Dongguk University Ilsan Hospital, Goyang, Korea.

Aim: The aim of this study was to evaluate the efficacy and safety of a newly manufactured botulinum toxin, Neuronox, compared with BOTOX for the treatment of the spastic equinus gait in children with cerebral palsy. **Method:** A total of 127 children with cerebral palsy, aged 2 to 10 years, who presented at three university hospitals with spastic equinus gait were assessed for eligibility to participate in this double-blinded, randomized, controlled trial. Of the 119 eligible participants (mean age 4.33y; SD 2.07; 76 males and 43 females; 79 with diplegia and 40 with hemiplegia), 57 were classified as Gross Motor Function Classification System level I, 29 as level II, and 33 as level III. Participants were randomly assigned to receive an injection of Neuronox (n=60) or BOTOX (n=59) to the calf muscles at a dose of 4U/kg for those with hemiplegia and 6U/kg for those with diplegia. Assessments were performed at baseline (V1) and at 4 (V2), 12 (V3), and 24 (V4) weeks after the intervention. The primary outcome measure was response rate at V3, with a positive response being defined as at least a 2-point increase in the Physicians' Rating Scale (PRS) score. The non-inferiority margin was set as -20% for the difference in the response rate. The secondary outcome measures included PRS score, passive range of motion (PROM) of the ankle and knee, and Gross Motor Function Measure 88 (GMFM-88). Any adverse events were investigated for safety implications. **Results:** The response rate of the Neuronox group at V3 was not inferior to that of the BOTOX group (90% lower limit=-11.58%). There were significant improvements in PRS, PROM of ankle dorsiflexion, and GMFM scores at V2, V3, and V4 in both groups. The changes in PRS score were not statistically different between the two groups in serial evaluation (p=0.96). PROM of the ankle dorsiflexion increased without any significant difference between the two groups, either overall (p=0.56) or at each visit (V2, p=0.32; V3, p=0.66; V4, p=0.90). The increase in GMFM score in serial measurements were not significantly different between the two groups (p=0.16), whereas it was larger in the BOTOX group than in the Neuronox group at V2 and V4 (p=0.03 and 0.05 respectively). The frequency of adverse events was not significantly different between the two groups (p=0.97), and drug-related complications of Neuronox treatment were not addressed. **Interpretation:** The outcomes of Neuronox, based on PRS, proved to be as effective and safe as those of BOTOX for the treatment of spasticity in individuals with cerebral palsy.

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5. Dev Med Child Neurol. 2010 Nov 18. doi: 10.1111/j.1469-8749.2010.03829.x. [Epub ahead of print]

The clinical relevance of selecting resting data at different points in an energy cost of walking test in cerebral palsy.

Plasschaert F, Jones K, Forward M.

Department of Orthopaedic Surgery, University Hospital, Ghent, Belgium, Ghent Gait Laboratory, University Hospital, Ghent, Belgium. Institute of Biomedical Technology, Faculty of Engineering, University of Ghent, Belgium.

Aim: Energy cost of walking (ECOW) is defined as 'walking oxygen consumption minus resting oxygen consumption divided by speed', where 'resting' data can be obtained either at the start or cessation of a test. This study aimed to ascertain when resting data should be taken during an ECOW test in children with cerebral palsy (CP). **Method:** Resting oxygen consumption per unit mass (VO(2)) and heart rate were recorded in children without physical impairment (18 males, 13 females; mean age 11y [SD 2y 1mo]) and children with diplegic CP (18 males, 13 females; mean age 11y [SD 2y 6mo, Gross Motor Function Classification System levels I and II]) at three stages, namely pre- and posttest sitting and pretest standing before and after an 8-minute ECOW test using the Cosmed K4b. **Results:** Heart rate and VO(2) differed significantly between groups and stages (p≤0.05) except for heart rate in standing and posttest sitting in the unimpaired children and for VO(2) during pretest sitting between groups. These differences impacted on the calculation of non-dimensional net oxygen cost (NDNOC) and physiological cost index (PCI)

in CP but not in the unimpaired group. PCI was correlated with NDNOC in CP but not in the unimpaired cohort. Interpretation: Pretest sitting resting data appear to be the most appropriate for use in the calculation of NDNOC and PCI. PCI may still have relevance in pathology where walking efficiency is compromised.

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6. Disabil Rehabil. 2010 Nov 13. [Epub ahead of print]

Physical strain of comfortable walking in children with mild cerebral palsy.

Dallmeijer AJ, Brehm MA.

Department of Rehabilitation Medicine, EMGO Institute for Health and Care Research and Research Institute MOVE, VU University Medical Center, Amsterdam, The Netherlands.

Purpose: To evaluate the physical strain of comfortable walking in children with mild cerebral palsy (CP) in comparison to typically developing (TD) children. Physical strain was defined as the oxygen uptake during walking ($VO_{2\text{walk}}$) expressed as a percentage of their maximal aerobic capacity ($VO_{2\text{peak}}$). **Method:** Eighteen children (aged 8-16 years) participated, including eight ambulant children (four girls, four boys) with mild spastic CP (three hemiplegia, five diplegia, GMFCS I: $n = 7$ and II: $n = 1$) and 10 TD children. $VO_{2\text{walk}}$ was measured during 5 min of walking on an indoor track at comfortable walking speed. $VO_{2\text{peak}}$ was measured in a shuttle run test. **Results:** $VO_{2\text{walk}}$ was significantly higher in CP (19.7 (2.8) ml/kg/min) compared to TD (16.8 (3.6) ml/kg/min, $p = 0.033$), while walking speed did not differ significantly between groups. $VO_{2\text{peak}}$ was significantly lower in CP (37.2 (2.2) ml/kg/min) compared to TD (45.0 (5.3) ml/kg/min, $p = 0.001$). Consequently, the physical strain during walking was significantly higher in CP (52 (7.7) %) compared to TD (36 (8.4) %, $p = 0.001$). **Conclusions:** The higher physical strain during comfortable walking of children with mild CP compared to TD children may be related to reported problems with fatigue in this population, and suggest a need for physical aerobic training programmes.

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7. Neuroepidemiology. 2010 Nov 17;36(1):2-18. [Epub ahead of print]

Virtual Reality in Pediatric Neurorehabilitation: Attention Deficit Hyperactivity Disorder, Autism and Cerebral Palsy.

Wang M, Reid D.

Virtual Reality and Neurorehabilitation Laboratory, Department of Rehabilitation Science, University of Toronto, Toronto, Ont., Canada.

This paper presents the current status and use of virtual reality (VR) for children with attention deficit hyperactivity disorder (ADHD), autism and cerebral palsy. This literature review explores how VR systems have been used as treatment tools to address the primary impairments of these disorders. Three major classes of VR display systems are identified that can be characterized by the type of human-computer interaction provided: (1) feedback-focused interaction, (2) gesture-based interaction, and (3) haptic-based interaction. The demonstrated effectiveness and potential effectiveness of each class are discussed in the context of remediating the primary impairments of children with ADHD, autism and cerebral palsy. Three major themes for future research are discussed to support continued research interest in using VR in pediatric neurorehabilitation.

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8. Phys Occup Ther Pediatr. 2010 Nov 16. [Epub ahead of print]

The Impact of Early Powered Mobility on Parental Stress, Negative Emotions, and Family Social Interactions.

Tefft D, Guerette P, Furumasu J.

1. Communication Sciences and Disorders Department, Oklahoma State University, Stillwater, OK, USA.

Powered mobility has been found to have positive effects on young children with severe physical disabilities, but the impact on the family has been less well documented. We evaluated the impact of early powered mobility on parental stress, negative emotions, perceived social interactions, and parental satisfaction with wheelchair characteristics such as size and durability. The participants were parents of 23 children with disabilities-10 with orthopedic disabilities (average age 30.1 months) and 13 with cerebral palsy (average age 47.0 months). Pretest assessments were completed two times: at initial wheelchair evaluation and at wheelchair delivery. A posttest assessment was completed after each child had used the wheelchair for 4-6 months. Parents reported a lower perceived level of stress at the time of wheelchair delivery, although the magnitude of this effect was fairly small, standardized mean difference (δ) = .27. They also reported an increased satisfaction with their child's social and play skills (δ = .38), ability to go where desired (δ = .86), sleep/wake pattern (δ = .61), and belief that the general public accepts their child (δ = .39) after several months using the wheelchair. Parents reported an increase in interactions within the family at the time of wheelchair delivery (δ = .66). There was no decrease in negative emotions. Parents were satisfied with most factors relating to the wheelchair itself, with areas of concern being wheelchair size and difficulty adjusting the wheelchair. The findings suggest that self-initiated powered mobility for a young child had a positive impact on the family.

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9. Res Dev Disabil. 2010 Nov 12. [Epub ahead of print]

Use of the Gait Deviation Index for the assessment of gastrocnemius fascia lengthening in children with Cerebral Palsy.

Cimolin V, Galli M, Vimercati SL, Albertini G.

Bioeng. Dept., Politecnico di Milano, p.zza Leonardo Da Vinci 32, 20133 Milano, Italy.

Gait analysis (GA) is widely used for clinical evaluations and it is recognized as a central element in the quantitative evaluation of gait, in the planning of treatments and in the pre vs. post intervention evaluations in children with Cerebral Palsy (CP). Otherwise, GA produces a large volume of data and there is the clinical need to provide also a quantitative measure of the patient's overall gait. Starting from this aim some global indexes were proposed by literature as a summary measure of the patient's gait, such as the Gait Deviation Index (GDI). While validity of the GDI is demonstrated for the evaluation of the functional limitation of CP patients, no studies have evaluated with the GDI the pre vs. post surgery gait condition in children with CP. The aim of our study was therefore to investigate the effectiveness of the GDI in the quantification of gait changes occurring after surgical intervention (gastrocnemius fascia lengthening for the correction of equinus foot deformity) in patients with CP. 19 children with CP were evaluated pre-operatively (PRE session) and about 1 year (POST: mean 13.1±5.1 months) after gastrocnemius fascia lengthening using 3D GA. From GA data the GDI was computed. The results evidenced that the GDI value in the PRE session was 70.4±14.8, showing a moderate global disturbance of the gait patterns of the patients. After the surgical treatment a significant improvement of the GDI mean value was found (82.9±7.4; $p < 0.05$; $CG \geq 100$) with an improvement of 18% respect to the PRE session. A strong correlation ($\rho = 0.83$; $p < 0.05$) existed between the GDI value in the PRE session and the percentage of improvement. Our results demonstrated that GDI seems to be an appropriate outcome measure for the evaluation of the effects of surgical treatment in CP.

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10. Dev Med Child Neurol. 2010 Nov 18. doi: 10.1111/j.1469-8749.2010.03834.x. [Epub ahead of print]**Early numeracy in cerebral palsy: review and future research.**

VAN Rooijen M, Verhoeven L, Steenberg B.

Radboud University Nijmegen, Behavioural Science Institute, Nijmegen, the Netherlands.

Children with cerebral palsy (CP) often have problems with arithmetic, but the development of numerical abilities in these children has received only minor attention. In comparison, detailed accounts have been written on the arithmetic abilities of typically developing children, but a theoretical framework is still lacking. A promising perspective is the embodied cognition framework, which focuses on the influence of perception and action behaviours on cognition. We searched the literature to find the available studies on the early numeracy capacities of children with CP. We reviewed eight studies in which primary school-aged children with CP with a verbal IQ of at least 70 participated. The selected studies showed that these children are regularly delayed in performing simple arithmetic operations compared with their typically developing peers. However, owing to the limited number of studies no definite conclusions can be drawn regarding the precursors and developmental trajectories of arithmetic abilities in children with CP. We argue that the embodied cognition framework is well suited to scrutinize the arithmetic abilities of children with CP and provide future directions for research.

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11. Dev Med Child Neurol. 2010 Nov 18. doi: 10.1111/j.1469-8749.2010.03832.x. [Epub ahead of print]**Gillette Functional Assessment Questionnaire 22-item skill set: factor and Rasch analyses.**

Gorton Iii GE, Stout JL, Bagley AM, Bevans K, Novacheck TF, Tucker CA.

Shriners Hospitals for Children, Springfield, MA, USA, Gillette Children's Specialty Healthcare, St Paul, MN, USA, Shriners Hospitals for Children, Northern California, CA, USA, Children's Hospital of Philadelphia, Philadelphia, PA, USA, Department of Orthopaedics, University of Minnesota, Minneapolis, MN, USA, Temple University, Philadelphia, PA, USA.

Aim: To determine dimensionality and item-level properties of the Gillette Functional Assessment Questionnaire (FAQ) 22-item skill set using factor and Rasch analyses. **Method:** A retrospective review of parent-reported FAQ 22-item skill set data was conducted of 485 individuals (273 males, 212 females; mean age 9y 10mo, SD 3y 10mo), including 289 with cerebral palsy and 196 with a variety of other neuromusculoskeletal conditions with orthopedic impairments. Factor analyses to validate unidimensionality of the skill set and Rasch analyses to determine relative item difficulty, item and test level information, and content coverage of the item set were performed. Differential item functioning analysis of sub-groups based on sex, diagnosis grouping, and age was conducted. Precision of score estimates for the item set was analyzed. **Results:** The FAQ 22-item skill set demonstrates unidimensional structure and good item fit statistics. No floor or ceiling effects were noted. Differential item functioning (DIF) based on age was noted for seven items, four items showed diagnosis group-related DIF, and one item sex-related DIF. Precision was adequate in the mid-range range of abilities. **Interpretation:** Based on this analysis, the FAQ 22-item skill set is a hierarchical set of interval scaled items suitable for measuring locomotor skill ability in children.

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12. Neuropediatrics. 2010 Aug;41(4):182-185. Epub 2010 Nov 17.**Gastric Dysmotility Following Orthopaedic Scoliosis Surgery in Patients with Cerebral Palsy: A Case Series.**

Vande Velde S, Biervliet SV, De Bruyne R, Van Renterghem K, Plasschaert F, Van Winckel M.

Department of Paediatric Gastroenterology, University Hospital Ghent, Belgium.

Scoliosis is a common complication in children with cerebral palsy (CP). In these patients, surgical correction carries a high risk of complications. CP is also associated with gastrointestinal dysmotility such as delayed gastric emptying and gastro-oesophageal reflux. We describe 5 patients with CP in whom symptoms of gastric dysmotility clearly exacerbated after orthopaedic scoliosis surgery. They all showed persisting vomiting, nausea, bloating, weight loss, and anorexia necessitating total parental nutrition and/or jejunal feeding. This intensified nutritional support resulted in weight gain. Symptoms, however, persisted in half of the patients. The aetiology of these gastrointestinal motility problems following scoliosis surgery remains unclear. Mechanical obstruction needs to be ruled out. Delayed gastric emptying may be due to postprandial antral hypomotility as a consequence of sympathetic stimulation. Malnutrition could further aggravate gastrointestinal dysmotility. This complication should be taken into account when surgery for spinal deformities in CP patients is planned, especially in patients with pre-existing gastrointestinal motility problems.

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13. Child Care Health Dev. 2010 Nov 18. doi: 10.1111/j.1365-2214.2010.01176.x. [Epub ahead of print]**Salivary parameters in Brazilian individuals with cerebral palsy who drool.**

Santos MT, Ferreira MC, Leite MF, Guaré RO.

Discipline of Dentistry, Persons with Disabilities Division, Universidade Cruzeiro do Sul Pediatric Dentistry Ph.D. Program, Centro de Ciências Biológicas e da Saúde, Universidade Cruzeiro do Sul, São Paulo, Brazil.

Background: Although drooling of saliva is considered abnormal in a child over 4 years of age, it has been estimated to occur in approximately in 10-37% of children with cerebral palsy. **Aim:** The aim of this study was to evaluate the flow rate, pH and buffering capacity in saliva of Brazilian individuals with cerebral palsy who drool. **Methods:** Cross-sectional assessment of saliva from 139 individuals with cerebral palsy (3-16 years old) enrolled in a specialized rehabilitation centre in Sao Paulo, Brazil, divided into two groups, according to the presence (G1) or absence (G2) of drooling and controls (G3): G1 consisted of 63 individuals who drool; G2 consisted of 76 who do not drool; and G3 consisted of 47 individuals with no neurological damage of similar age and sex. Unstimulated whole saliva was collected and salivary flow rate (mL/min), initial pH and buffering capacity, by titration of saliva with a constant amount of 0.01:N HCl, were evaluated. The results from G1, G2 and G3 were compared by one-way anova and the χ^2 -test. **Results:** A higher percentage of severe drooling (60.3%) was observed compared with moderate (27.0%) and mild (12.7%) in the cerebral palsy individuals who drool and the prevalence of drooling was highest among children and adolescents with spastic quadriplegia. Significant reductions in salivary flow rate, initial pH, buffering capacity of whole saliva in pH range 6.0-6.9 and total buffering capacity occurred in G1 and G2 compared with G3. **Conclusion:** All individuals with cerebral palsy present lower flow rate, pH and buffering capacity of saliva, which increases the risk of oral diseases.

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14. Vopr Kurortol Fizioter Lech Fiz Kult. 2010 Mar-Apr;(2):18-21.**Myographic biofeedback training in combination with post-isometric relaxation of spastic muscles in patients with infantile cerebral paralysis [Article in Russian]**

[No authors listed]

Neurodynamic mechanisms underlying regulation of muscular tone are considered in the context of the integral systemic approach to the analysis of efficiency of adaptive preparation of spastic muscles to kinesitherapeutic procedures exemplified by myographic biological feedback (BFB) training of the affected muscles in children suffering cerebral paralysis. It is shown that the application of the post-isometric relaxation method immediately before biofeedback training seances increases effectiveness of these procedures and combined therapy of locomotor disorders at large.

PMID: 21086601 [PubMed - in process]

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.

15. Neuroscience. 2010 Nov 9. [Epub ahead of print]**Neuroprotective effects of NAP against excitotoxic brain damage in the newborn mice: Implications for cerebral palsy.**

Sokolowska P, Passemard S, Mok A, Schwendimann L, Gozes I, Gressens P.

Inserm, U676, Paris, France; Université Paris 7, Faculté de Médecine Denis Diderot, Paris, France; PremUP, Paris, France.

Activity-dependent neuroprotective protein (ADNP) was shown to be essential for embryogenesis and brain development while NAP, an active motif of ADNP, is neuroprotective in a broad range of neurodegenerative disorders. In the present study, we examined the protective potential of ADNP/NAP in a mouse model of excitotoxic brain lesion mimicking brain damage associated with cerebral palsy. We demonstrated that NAP had a potent neuroprotective effect against ibotenate-induced excitotoxic damage in the cortical plate and the white matter of P5 mice, and moderate against brain lesions of P0 mice. In contrast, endogenous ADNP appears not to be involved in the response to excitotoxic challenge in the studied model. Our findings further show that NAP reduced the number of apoptotic neurons through activation of PI-3K/Akt pathway in the cortical plate or both PI-3K/Akt and MAPK/MEK1 kinases in the white matter. In addition, NAP prevented ibotenate-induced loss of pre-oligodendrocytes without affecting the number of astrocytes or activated microglia around the site of injection. These findings indicate that protective actions of NAP are mediated by triggering transduction pathways that are crucial for neuronal and oligodendroglial survival, thus, NAP might be a promising therapeutic agent for treating developing brain damage.

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16. Semin Perinatol. 2010 Aug;34(4):281-92.**Delivery after previous cesarean: long-term outcomes in the child.**

O'Shea TM, Klebanoff MA, Signore C.

Department of Pediatrics (Neonatology), Wake Forest University, Health Sciences, Winston-Salem, NC 27157,

USA. moshea@wfubmc.edu

In subsequent pregnancies after a cesarean delivery, women must choose between attempting to deliver vaginally or undergoing another cesarean delivery. Information relevant to this choice includes the long-term benefits and harms to the baby. In this article we discuss the relationship of mode of delivery (planned trial of labor, either with or without vaginal delivery, or elective repeat cesarean delivery) and long-term outcomes, including brachial plexus palsy, neurodevelopmental impairment, and asthma. No randomized trials are available that relate directly to the choice of delivery method after previous cesarean. Observational studies suggest that cesarean delivery might be associated with a greater risk of asthma, caused perhaps by altered gut colonization, increased risk of neonatal respiratory disease, decreased gestational age at birth or decreased likelihood of breastfeeding. By contrast, vaginal delivery after a previous cesarean delivery is associated with greater risks of neurodevelopmental impairment and upper-extremity motor impairment, caused, respectively, by greater risks of perinatal hypoxic-ischemic encephalopathy and brachial plexus injury. Available information does not provide a precise estimate of the relative risks for infants delivered after a trial of labor versus elective cesarean delivery.

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