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Interventions and Management

1. Augment Altern Commun. 2011 Dec;27(4):245-55.

Using a Life Course Approach to Explore How the Use of AAC Impacts on Adult Sibling Relationships.

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A life-course methodology was used to explore the relationship between four adults with moderate/severe cerebral palsy with complex communication needs who used AAC, and six of their non-disabled siblings. In-depth interview data were analyzed using a constructivist grounded-theory approach. Elder's life-course paradigm illuminated the importance of historical timing, social time, linked lives, and human agency to the development of communication strategies between siblings. Taking a life-course approach to studying issues related to individuals who use AAC assists understanding of how their family experiences and relationships change over time. This understanding is important, given the strong commitment by family members demonstrated in this study to supporting individuals who use AAC.

[PMID: 22136363](#) [PubMed - in process]

2. NeuroRehabilitation. 2011 Jan 1;29(3):233-41.

Changes in gait patterns with rhythmic auditory stimulation in adults with cerebral palsy.

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The objective is to evaluate the changes in gait patterns with rhythmic auditory stimulation (RAS) in adults with cerebral palsy (CP). Fourteen CP with bilateral spasticity participated in this study. A repeated-measures analysis of gait was performed in the presence and absence of RAS. Thirty healthy controls were also recruited. Each subject walked 10 m at their comfortable walking speed. Temporospatial data and kinematic parameters of gait were analyzed without RAS and with RAS. RAS was provided using a combination of a metronome beat set to the individual's cadence and rhythmic cueing from a live keyboard playing. Kinematic parameters, gait deviation index (GDI) as a measure of overall gait pathology, and asymmetry of temporospatial data were assessed. Gait analysis revealed that anterior tilt of pelvis and hip flexion during a gait cycle was significantly changed with RAS ($p < 0.05$),

whereas there were no statistical differences in knee, ankle, and foot kinematic parameters. Additionally, the GDI exhibited a modest, but a statistically significant, improvement with RAS ($p < 0.05$). Based on ambulatory status, household ambulators showed that side-to-side asymmetry of step length as well as the GDI was significantly attenuated with RAS ($p < 0.05$). Walking with RAS resulted in kinematic changes of the pelvic and hip movement in spastic CP. Especially, the application of RAS immediately ameliorated overall gait pathology as well as temporospatial asymmetry in household ambulators. Therefore, RAS may be one of the therapeutic tools for gait training in adults with CP.

[PMID: 22142756](#) [PubMed - in process]

3. Clin Rehabil. 2011 Dec 1. [Epub ahead of print]

A systematic evaluation of the effect of thumb opponens splints on hand function in children with unilateral spastic cerebral palsy.

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OBJECTIVE: To examine the effects of a neoprene thumb opponens splint on hand function during a self-selected activities of daily living task in children with unilateral spastic cerebral palsy with thumb-in-palm position of the affected hand. **DESIGN:** Systematic evaluation of seven cases using a multiple baseline design across individuals. **SETTING:** Outpatient clinic. **SUBJECTS:** Seven children with unilateral cerebral palsy (2-7 years old), Manual Ability Classification System level 2-3 participated in the study. **INTERVENTIONS:** Neoprene thumb opponens splints (McKie splint) were used. Children were followed for about four months. Baseline period ranged from 4 to 9 weeks, intervention period was two months and duration of follow-up one month. **MAIN MEASURES:** Hand function was assessed using goal attainment scaling and visual analogue scales. Data was assessed visually. **RESULTS:** In four children goal attainment scaling and/or visual analogue scale scores increased after introducing the splint. These effects remained when splints were not worn. Two children only benefited from the splint when it was worn. Thumb opponens splints were tolerated well by all children who participated in this study. **CONCLUSIONS:** Thumb opponens splints may have a positive effect on hand function in children with unilateral spastic cerebral palsy.

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4. Indian J Orthop. 2011 Nov;45(6):548-52.

Utility of combined hip abduction angle for hip surveillance in children with cerebral palsy.

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BACKGROUND: Spontaneous hip lateralization complicates the management of non-ambulatory children with cerebral palsy (CP). It can be diagnosed early using radiographs, but it involves standardization of positioning and exposure to radiation. Hence, the aim of this study was to assess the utility of Combined hip abduction angle (CHAA) in the clinical setting to identify those children with CP who were at greater risk to develop spontaneous progressive hip lateralization. **MATERIALS AND METHODS:** One hundred and three children (206 hips) with CP formed our study population. There were 48 boys and 55 girls aged 2-11 years (mean 5.03 years). 61 children were Gross Motor Function Classification System (GMFCS) level 5, while 42 were GMFCS level 4. Clinical measurements of CHAA were statistically correlated with radiographic measurements of Reimer's migration percentage (MP) for bivariate associations using χ^2 and t tests. **RESULTS:** CHAA is evaluated against MP which is considered as a reliable measure of hip subluxation. Thus, for CHAA, sensitivity was 74.07% and specificity was 67.35%. False-positive rate was 32.65% and false-negative rate was 25.93%. **CONCLUSIONS:** Our study shows that correlation exists between CHAA and MP, which has been proved to be useful for hip screening in CP children at risk of hip dislocation. CHAA is an easy, rapid, cost-effective clinical test which can be performed by paraclinical health practitioners (physiotherapists) and orthopedic surgeons.

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Prevention and Cure

6. Dev Med Child Neurol. 2011 Dec 5. doi: 10.1111/j.1469-8749.2010.03903.x. [Epub ahead of print]

Neonatal assessments for the preterm infant up to 4 months corrected age: a systematic review.

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Aim: The aim of this study was to systematically review the clinimetric properties of longitudinal neonatal neurobehavioural and neuromotor assessments for preterm infants. **Method:** Twenty-seven assessment measures were identified. The following eight measures met the study inclusion criteria: Assessment of Preterm Infants' Behaviour (APIB), Neonatal Intensive Care Unit Network Neurobehavioural Scale (NNS), Test of Infant Motor Performance (TIMP), Precht's Assessment of General Movements (GMs), Neurobehavioural Assessment of the Preterm Infant (NAPI), Dubowitz Neurological Assessment of the Preterm and Full-term Infant (Dubowitz), Neuromotor Behavioural Assessment (NMBA), and the Brazelton Neonatal Behavioural Assessment Scale (NBAS). The primary purposes included prediction (TIMP, GMs, Dubowitz), discrimination (all assessments), and evaluation of change (TIMP, NAPI). Measures of assessment were included in the study if they were (1) primarily neurobehavioural or neuromotor assessments that were suitable for use with preterm infants (<37 weeks gestation) up to 4 months corrected age and were discriminative, predictive, or evaluative; (2) standardized procedures designed for serial/longitudinal use; or (3) criterion or norm referenced. However, all assessment tools that were not published in English in a peer-reviewed journal or were primarily neurological assessments, one-time evaluations, screening tools, or not commercially available were not used. **Results:** All of the measures included in the review demonstrated adequate content and construct validity. Concurrent validity was reported for APIB, NNS, Dubowitz, and GMs. Predictive validity was high for GMs with studies reporting up to 100% sensitivity for predicting cerebral palsy at the age of 12 to 24 months. Interrater reliability was strong for the TIMP (intraclass correlation=0.95), GMs (K=0.8), and moderate for the NAPI (r=0.67-0.97). Clinical utility was variable for ease of scoring, interpretability, cost, and access. **Interpretation:** In the absence of a criterion standard for neonatal neuromotor assessments, the NNS and APIB have strong psychometric qualities with better utility for research. Similarly, the GMs, TIMP, and NAPI have strong psychometric qualities but better utility for clinical settings. The GMs has best prediction of future outcome and the TIMP has best evaluative validity.

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6. Exp Neurol. 2011 Nov 27. [Epub ahead of print]

Cerebral blood flow during reperfusion predicts later brain damage in a mouse and a rat model of neonatal hypoxic-ischemic encephalopathy.

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Children with severe neonatal hypoxic-ischemic encephalopathy (HIE) die or develop life-long neurological impairments such as cerebral palsy and mental retardation. Decreased regional cerebral blood flow (CBF) is believed to be the predominant factor that determines the level of tissue injury in the immature brain. However, the spatio-temporal profiles of CBF after neonatal HIE are not well understood. CB17 mouse and Wistar rat pups were exposed to a unilateral hypoxic-ischemic (HI) insult at seven or eight days of age. Laser speckle imaging sequentially measured the cortical surface CBF before the hypoxic exposure and until 24h after the hypoxic exposure. Seven days after the HI insult, brain damage was morphologically assessed by measuring the hemispheric volumes and by semi-quantitative scoring for neuropathologic injury. The mean CBF on the ipsilateral

hemisphere in mice decreased after carotid artery ligation. After the end of hypoxic insult (i.e., the reperfusion phase), the mean CBF level gradually rose and nearly attained its pre-surgery level by 9h of reperfusion. It then decreased. The degree of reduced CBF during reperfusion was well correlated with the degree of later morphological brain damage. The correlation was the strongest when the CBF was measured in the ischemic core region at 24h of reperfusion in mice ($R^2=0.89$). A similar trend in results was found in rats. These results suggest that the CBF level during reperfusion may be a useful predictive factor for later brain damage in immature mice. This may enable optimizing brain damage for detail analyses.

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7. Dev Med Child Neurol. 2011 Dec 5. doi: 10.1111/j.1469-8749.2011.04146.x. [Epub ahead of print]

Cerebral palsy, brain lesions, and thrombophilic genetic factors.

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8. J Cell Mol Med. 2011 Dec 7. doi: 10.1111/j.1582-4934.2011.01489.x. [Epub ahead of print]

Erythropoietin attenuates the sequels of ischemic spinal cord injury with enhanced recruitment of CD34(+) cells in mice.

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Objective: Erythropoietin has been shown to promote tissue regeneration after ischemic injury in various organs. Here, we investigated whether Erythropoietin could ameliorate ischemic spinal cord injury in the mouse and sought an underlying mechanism. Methods: Spinal cord ischemia was developed by cross-clamping the descending thoracic aorta for 7- or 9-min in mice. Erythropoietin (5000IU/kg) or saline was administered 30 min before aortic cross-clamping. Neurologic function was assessed using the paralysis score for 7 days after the operation. Spinal cords were histologically evaluated 2 and 7 days after the operation. Immunohistochemistry was used to detect CD34+ cells and the expression of brain-derived neurotrophic factor and vascular endothelial growth factor. Results: Each mouse exhibited either mildly impaired function or complete paralysis at day 2. Erythropoietin-treated mice with complete paralysis demonstrated significant improvement of neurologic function between day 2 and 7, compared to saline-treated mice with complete paralysis. Motor neurons in Erythropoietin-treated mice were more preserved at day 7 than those in saline-treated mice with complete paralysis. CD34+ cells in the lumbar spinal cord of Erythropoietin-treated mice were more abundant at day 2 than those of saline-treated mice. Brain-derived neurotrophic factor and vascular endothelial growth factor were markedly expressed in lumbar spinal cords in Erythropoietin-treated mice at day 7. Conclusion: Erythropoietin demonstrated neuroprotective effects in the ischemic spinal cord, improving neurologic function and attenuating motor neuron loss. These effects may have been mediated by recruited CD34+ cells, and enhanced expression of brain-derived neurotrophic factor and vascular endothelial growth factor.

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9. J Neurochem. 2011 Dec 6. doi: 10.1111/j.1471-4159.2011.07610.x. [Epub ahead of print]

STAT3 Signaling after Traumatic Brain Injury.

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Astrocytes respond to trauma by stimulating inflammatory signaling. In studies of cerebral ischemia and spinal cord injury, astrocytic signaling is mediated by the cytokine receptor glycoprotein 130 (gp130) and Janus kinase (Jak) which phosphorylates the transcription factor signal transducer and activator of transcription-3 (STAT3). To determine if STAT3 is activated after traumatic brain injury (TBI), adult male Sprague Dawley rats received moderate parasagittal fluid-percussion brain injury or sham surgery, and then the ipsilateral cortex and hippocampus were analyzed at various post-traumatic time periods for up to 7 days. Western blot analyses indicated that STAT3 phosphorylation significantly increased at 30 min and lasted for 24 hr post-TBI. A significant increase in gp130 and Jak2 phosphorylation was also observed. Confocal microscopy revealed that STAT3 was localized primarily within astrocytic nuclei. At 6 and 24 hr post-TBI, there was also an increased expression of STAT3 pathway-related genes: Suppressor of cytokine signaling 3, Nitric oxide synthase 2, Colony stimulating factor 2 receptor β , Oncostatin M, Matrix metalloproteinase 3, Cyclin-dependent kinase inhibitor 1A, CCAAT/enhancer-binding protein β , Interleukin-2 receptor γ , Interleukin-4 receptor α , and α -2-macroglobulin. These results clarify some of the signaling pathways operative in astrocytes after TBI and demonstrate that the gp130-Jak2-STAT3 signaling pathway is activated after TBI in astrocytes.

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