Cerebral Palsy ALLIANCE

NEWS
Cerebral Palsy Research

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Interventions and Management

Please note: The results this week may be limited due to the US government shutdown, which has affected the operations of the National Center for Biotechnology Information (NCBI).

1. Dev Neurorehabil. 2013 Oct 2. [Epub ahead of print]

Neuromuscular taping for the upper limb in Cerebral Palsy: A case study in a patient with hemiplegia.

Camerota F, Galli M, Cimolin V, Celletti C, Ancillao A, Blow D, Albertini G.

Physical Medicine and Rehabilitation Division, Orthopaedic Department, Umberto I Hospital, Sapienza University, Rome, Italy.

Objective: To assess quantitatively the effects of Neuromuscular Taping (NMT) on the upper limb in a female child with left hemiplegia, due to Cerebral Palsy (CP). Methods: The patient underwent NMT on cervical level, shoulder and hand only of the plegic upper limb, followed by physical therapy. Kinematic data of upper limbs during reaching task were collected before (PRE) and after 2 weeks of treatment (POST). Results: After the intervention, the affected limb improved in terms of movement duration, Average Jerk and Number of Unit Movements indices, indicating a faster, smoother and less segmented movement. Improvements appeared at the ranges of motion of the upper limb joints, both at shoulder and elbow joints. No significant changes were globally displayed for the unaffected arm. Conclusion: NMT seems to be a promising intervention for improving upper limb movement in patients with CP. Further investigations are certainly needed to assess effectively the effects of the intervention in this pathological state.

PMID: 24087981 [PubMed - as supplied by publisher]

2. Dev Neurorehabil. 2013 Oct 2. [Epub ahead of print]

Development and validity of the early clinical assessment of balance for young children with cerebral palsy.

McCoy SW, Bartlett DJ, Yocum A, Jeffries L, Fiss AL, Chiarello L, Palisano RJ.

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Objectives: Validity of the Early Clinical Assessment of Balance (ECAB), to monitor postural stability in children with cerebral palsy (CP), was evaluated. Methods: 410 children with CP, 1.5 to 5 years old, participated. Physical therapists scored children on the Movement Assessment of Infants Automatic Reactions section and Pediatric Balance Scale. Through consensus, researchers selected items from both measures to create the ECAB. Content and construct validity were examined through item correlations, comparison of ECAB scores among motor ability, age and gender groups and correlations with the Gross Motor Function Measure 66 basal and ceiling (GMFM-66-B&C). Results: Internal consistency was high (Cronbach's alpha = 0.92). ECAB differed significantly among motor ability, children <31 months old scored lower than older children, but there was no difference between boys and girls. ECAB and GMFM-66-B&C scores correlated strongly (r = 0.97). Conclusion: Validity of the ECAB was supported. Reliability and responsiveness need study.

PMID: 24087912 [PubMed - as supplied by publisher]

3. Clin Neurophysiol. 2013 Sep 27. pii: S1388-2457(13)01012-2. doi: 10.1016/j.clinph.2013.08.022. [Epub ahead of print]

Interlimb coordination during forward walking is largely preserved in backward walking in children with cerebral palsy.

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OBJECTIVE: Limb kinematics in backward walking (BW) are essentially those of forward walking (FW) in reverse. It has been argued that subcortical mechanisms could underlie both walking modes. METHODS: Therefore, we tested whether participants with supraspinal/cortical deficits (i.e. cerebral palsy) show the kinematic reversal from FW to BW. 3D gait analysis was performed in 15 children with diplegia and 11 children with hemiplegia to record elevation angles of upper arm, lower arm, upper leg, lower leg, and foot, and were compared to those of 23 control subjects. Coordination patterns were compared between FW and BW, and elevation angle traces of BW were reversed in time (revBW) and correlated to FW traces. RESULTS: The interlimb coordination pattern during BW was largely preserved for all groups. The kinematic reversal of the limbs was also present in children with cerebral palsy (represented by high correlation coefficients between FW and revBW kinematics). CONCLUSIONS: The neural control mechanism of FW leading to BW, is preserved in persons with cortical deficits (as in cerebral palsy). SIGNIFICANCE: The current results support previous evidence suggesting that interlimb locomotor coordination depends mostly on the coupling between spinal pattern generators, coordinated by brainstem mechanisms, rather than primarily on cortical structures.

PMID: 24079947 [PubMed - as supplied by publisher]

4. Gait Posture. 2013 Sep 11. pii: S0966-6362(13)00456-6. doi: 10.1016/j.gaitpost.2013.08.001. [Epub ahead of print]

Repeatability and validation of Gait Deviation Index in children: Typically developing and cerebral palsy.

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The Gait Deviation Index (GDI) is a dimensionless parameter that evaluates the deviation of kinematic gait from a control database. The GDI can be used to stratify gait pathology in children with cerebral palsy (CP). In this paper the repeatability and uncertainty of the GDI were evaluated. The Correlation between the GDI and the Gross Motor Function Classification System (GMFCS) was studied for different groups of children with CP (hemiplegia, diplegia, triplegia and quadriplegia). Forty-nine, typically developing children (TD) formed our database. A retrospective study was conducted on our 3D gait data and clinical exams and 134 spastic children were included. Sixteen TD

children completed the gait analysis twice to evaluate the repeatability of the GDI (test-retest evaluation). Monte Carlo simulations were applied for all groups (TD and children with CP) in order to evaluate the propagation of errors stemming from kinematics. The repeatability coefficient (2SD of test-retest differences), obtained on the GDI for the 16 TD children (32 lower limbs) was ±10. Monte Carlo simulations showed an uncertainty ranging between 0.8 and 1.3 for TD children and all groups with CP. The Spearman Rank correlation showed a moderate correlation between the GDI and the GMFCS ($r=-0.44$, $p<0.0001$).

PMID: 24079975 [PubMed - as supplied by publisher]

5. Oper Orthop Traumatol. 2013 Oct;25(5):439-456.

Combined Salter-Pemberton pelvic osteotomy [Article in German]

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OBJECTIVE: In simple pelvic osteotomy in childhood the aim is for better lateral roofing, a safe centering of the femoral head and tuning between the volumes of the acetabulum and the femoral head. By the combination of anterior modified Pemberton osteotomy with dorsal osteotomy according to Salter these objectives can be achieved. INDICATIONS: Dysplasia of the acetabulum in patients between 2 years old and adolescence, subluxation and dislocation of the femoral head, also in neurological diseases as cerebral palsy and hypercontainment in Legg-Calvé-Perthes disease. CONTRAINDICATIONS: Critically small pelvic bones in toddlers younger than 18 months, children with a delay in skeletal formation. In patients aged more than 15 years if the symphysis is too taut for an effectual pivoting of the acetabulum and the acetabulum has no potential for future maturing. SURGICAL TECHNIQUE: Surgery is carried out by making a skin incision by the iliac crest ending in the middle of the groin, the cartilaginous iliac apophysis is split and the periosteum is elevated from the medial and lateral wall of the ilium to the inner pelvic ring. A K-wire is used to mark the level and the center of the osteotomy and dorsal to the K-wire a straight osteotomy is performed with a Gigli saw and anteriorly an arc-shaped and tilted cut is made with a chisel. The distal iliac fragment is rotated widely outwards and forwards and a triangular bone graft is removed from the anterior part of the iliac crest. The graft is inserted into the opened up osteotomy, three K-wires are used to fix the desired position of the iliac fragments and the two halves of the iliac apophysis are sutured together. POSTOPERATIVE MANAGEMENT: After the operation uncooperative children receive a scotch cast for 4 weeks. Cooperative children are mobilized after 3 weeks of bed rest. Partial weight-bearing is allowed after 6 weeks and full weight-bearing after 8-10 weeks. RESULTS: A total of 56 combined Salter-Pemberton pelvic osteotomies were performed in 49 patients from 1999 to 2008. The results of these studies demonstrate that this osteotomy is a safe and effective procedure which enables not only sufficient correction in classical dysplasia of the hip joint but also in high grade dislocation of the hip joint caused by cerebral palsy.

PMID: 24085350 [PubMed - as supplied by publisher]

6. Phys Ther. 2013 Oct 3. [Epub ahead of print]

Health-Enhancing Physical Activity in Children With Cerebral Palsy: More of the Same Is Not Enough.

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Physical activity is important for young people's health. The emphasis over the last two decades has been on moderate to vigorous exercise when designing activity and exercise programs for children and adolescents with cerebral palsy (CP). Emerging evidence suggests that sedentary behaviour is distinctly different from a lack of moderate to vigorous physical activity, and has independent and different physiological mechanisms. The concept

of concurrently increasing moderate to vigorous physical activity and replacing sedentary behaviour with light physical activity may be beneficial for children and adolescents with CP. This article is a summary of the evidence for what works and what doesn't work for improving the physical activity of children and adolescents with CP. It also discusses what we know about sedentary behaviour of children and adolescents with CP, and what research directions are needed to build foundational knowledge in this area with this population.

PMID: 24092902 [PubMed - as supplied by publisher]

7. Res Dev Disabil. 2013 Sep 25;34(11):4154-4160. doi: 10.1016/j.ridd.2013.08.044. [Epub ahead of print]

Assessment of motor imagery in cerebral palsy via mental chronometry: The case of walking.

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Recent studies show varying results on whether motor imagery capacity is compromised in individuals with cerebral palsy (CP). Motor imagery studies in children predominantly used the implicit hand laterality task. In this task participants judge the laterality of displayed hand stimuli. A more explicit way of studying motor imagery is mental chronometry. This paradigm is based on the comparison between the movement durations of actually performing a task and imagining the same task. The current study explored motor imagery capacity in CP by means of mental chronometry of a whole body task. Movement durations of 20 individuals with CP (mean age=13 years, SD=3.6) were recorded in two conditions: actual walking and imagined walking. Six unique trajectories were used that varied in difficulty via manipulation of walking distance and path width. We found no main effect of condition (actual walking versus imagining) on movement durations. Difficulty of the walking trajectory did affect movement durations. In general, this was expressed by an increase in movement durations with increasing difficulty of the task. No interaction between task difficulty and movement condition was found. Our results show that task difficulty has similar effects on movement durations for both actual walking and imagined walking. These results exemplify that the tested individuals were able to use motor imagery in an explicit task involving walking. Previous studies using the implicit hand laterality task showed varying results on motor imagery capacity in CP. We therefore conclude that motor imagery capacity is task dependent and that an explicit paradigm as the one used in this study may reveal the true motor imagery capacity. The implications of these findings for the use of motor imagery training are discussed.

PMID: 24076980 [PubMed - as supplied by publisher]

8. Zh Nevrol Psikhiatr Im S S Korsakova. 2013;113(8):26-32.

The effectiveness of dynamic proprioceptive correction in patients with cerebral palsy with cognitive impairment [Article in Russian]

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One hundred and sixty-seven patients with cerebral palsy (CP), aged 11-16 years, with spastic diplegia (n=87) and hemiparetic forms (n=80), with subgroups of mental retardation (MR) or intellectual delay (ID) have been studied. Standard treatment and application of a method of dynamic proprioceptive correction (MDPC) in the complex rehabilitation with the use of a medical and loading Adeli suit were used. Cognitive deficit in patients was characterized by the relative integrity of short-term nonverbal memory and marked impairment of verbal memory, verbal and nonverbal intellect. CP patients with intellectual delay demonstrated the predominant impairment of verbal functions. CP patients with mental retardation have the deficiency of both verbal and non-verbal cognitive functions. An individual profile of brain functional asymmetry in patients with CP was more lateralized than in healthy peers that can represent a mechanism for irregular development of cognitive functions in CP. Implementing

the MDPC into comprehensive rehabilitation promotes the improvement of postural regulation and cognitive functions in children with CP compared to traditional methods of treatment. This is accompanied by the changes in functioning of the associative brain areas and hemispheric interaction.

PMID: 24077547 [PubMed - as supplied by publisher]

9. Artif Intell Med. 2013 Sep 13. pii: S0933-3657(13)00120-6. doi: 10.1016/j.artmed.2013.08.003. [Epub ahead of print]

Brain Painting: Usability testing according to the user-centered design in end users with severe motor paralysis.

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BACKGROUND: For many years the reestablishment of communication for people with severe motor paralysis has been in the focus of brain-computer interface (BCI) research. Recently applications for entertainment have also been developed. Brain Painting allows the user creative expression through painting pictures. OBJECTIVE: The second, revised prototype of the BCI Brain Painting application was evaluated in its target function - free painting - and compared to the P300 spelling application by four end users with severe disabilities. METHODS: According to the International Organization for Standardization (ISO), usability was evaluated in terms of effectiveness (accuracy), efficiency (information transfer rate (ITR)), utility metric, subjective workload (National Aeronautics and Space Administration Task Load Index (NASA TLX)) and user satisfaction (Quebec User Evaluation of Satisfaction with assistive Technology (QUEST) 2.0 and Assistive Technology Device Predisposition Assessment (ATD PA), Device Form). RESULTS: The results revealed high performance levels (M≥80% accuracy) in the free painting and the copy painting conditions, ITRs (4.47-6.65bits/min) comparable to other P300 applications and only low to moderate workload levels (5-49 of 100), thereby proving that the complex task of free painting did neither impair performance nor impose insurmountable workload. Users were satisfied with the BCI Brain Painting application. Main obstacles for use in daily life were the system operability and the EEG cap, particularly the need of extensive support for adjustment. CONCLUSION: The P300 Brain Painting application can be operated with high effectiveness and efficiency. End users with severe motor paralysis would like to use the application in daily life. User-friendliness, specifically ease of use, is a mandatory necessity when bringing BCI to end users. Early and active involvement of users and iterative user-centered evaluation enable developers to work toward this goal.

PMID: 24080077 [PubMed - as supplied by publisher]

10. Oman J Ophthalmol. 2013 May;6(2):77-82.

Optic nerve hypoplasia.

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Optic nerve hypoplasia (ONH) is a congenital anomaly of the optic disc that might result in moderate to severe vision loss in children. With a vast number of cases now being reported, the rarity of ONH is obviously now refuted. The major aspects of ophthalmic evaluation of an infant with possible ONH are visual assessment, fundus examination, and visual electrophysiology. Characteristically, the disc is small, there is a peripapillary double-ring sign, vascular tortuosity, and thinning of the nerve fiber layer. A patient with ONH should be assessed for presence of neurologic, radiologic, and endocrine associations. There may be maternal associations like premature births, fetal alcohol syndrome, maternal diabetes. Systemic associations in the child include endocrine abnormalities, developmental delay, cerebral palsy, and seizures. Besides the hypoplastic optic nerve and chiasm, neuroimaging shows abnormalities in ventricles or white- or gray-matter development, septo-optic dysplasia, hydrocephalus, and corpus callosum abnormalities. There is a greater incidence of clinical neurologic abnormalities in patients with

bilateral ONH (65%) than patients with unilateral ONH. We present a review on the available literature on the same to urge caution in our clinical practice when dealing with patients with ONH. Fundus photography, ocular coherence tomography, visual field testing, color vision evaluation, neuroimaging, endocrinology consultation with or without genetic testing are helpful in the diagnosis and management of ONH. (Method of search: MEDLINE, PUBMED).

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11. Pediatr Neurol. 2013 Sep 27. pii: S0887-8994(13)00374-3. doi: 10.1016/j.pediatrneurol.2013.06.010. [Epub ahead of print]

Children's Sleep Disturbance Scale in Differentiating Neurological Disorders.

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BACKGROUND: We use the Sleep Disturbance Scale for Children (SDSC) routinely as a tool for evaluating children's sleep quality in our pediatric neurology clinic. We analyzed at its ability to detect sleep disturbances distinctive to selected neurological disorders. PATIENTS: One-hundred and eighty-six children (age range 2-18 years) who were evaluated by the SDSC questionnaire were divided into three groups according to their principal diagnosis: epilepsy, attention deficit hyperactivity disorder, or others. Their responses were analyzed. RESULTS: The average frequency of abnormal total sleep score was 26.9%. The most frequent sleep disorders were excessive somnolence (25.3%), initiating and maintaining sleep (24.7%), and arousal/nightmares (23.1%). There were no significant group differences for total scores or sleep disorder-specific scores; although a sleep-wake transition disorder was more frequent among children with epilepsy (31%). A literature search revealed that the frequency of abnormal total scores in several neurological disorders (e.g., epilepsy, cerebral palsy) ranges between 20% and 30%. CONCLUSIONS: The mechanism underlying sleep disturbances in many neurological disorders may be unrelated to that of the primary disease but rather originate from nonspecific or environmental factors (e.g., familial/social customs and habits, temperament, psychological parameters). Although the SDSC is noninformative for studying the effect of a specific neurological disorder on sleep, we still recommend its implementation for screening for sleep disturbances in children with neurological abnormalities.

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Prevention and Cure

12. Obstet Gynecol. 2013 Oct;122(4):869-877.

Antecedents of Cerebral Palsy and Perinatal Death in Term and Late Preterm Singletons.

McIntyre S, Blair E, Badawi N, Keogh J, Nelson KB.

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OBJECTIVE: To examine the antecedents of cerebral palsy and of perinatal death in singletons born at or after 35 weeks of gestation. METHODS: From a total population of singletons born at or after 35 weeks of gestation, we

identified 494 with cerebral palsy and 508 neonates in a matched control group, 100 neonatal deaths, and 73 intrapartum stillbirths (all deaths in selected birth years). Neonatal death and cerebral palsy were categorized as without encephalopathy, after neonatal encephalopathy, or after neonatal encephalopathy considered hypoxic-ischemic. We examined the contribution of potentially asphyxial birth events, inflammation, fetal growth restriction, and birth defects recognized by age 6 years to each of these outcomes and to intrapartum stillbirths. RESULTS: The odds of total cerebral palsy after potentially asphyxial birth events or inflammation were modestly increased (odds ratio [OR] 1.9, 95% confidence interval [CI] 1.1-3.2 and OR 2.2, 95% CI 1.0-4.2, respectively). However, potentially asphyxial birth events occurred in 34% of intrapartum stillbirths and 21.6% of cerebral palsy after hypoxic-ischemic encephalopathy. Inflammatory markers occurred in 13.9% and 11.9% of these outcomes, respectively. Growth restriction contributed significantly to all poor outcome groups. Birth defects were recognized in 5.5% of neonates in the control group compared with 60% of neonatal deaths and more than half of cases of cerebral palsy without hypoxic-ischemic encephalopathy. In children with cerebral palsy, a potentially asphyxial birth event, inflammation, or both were experienced by 12.6%, whereas growth restriction, a birth defect, or both were experienced by 48.6% (P<.001). CONCLUSION: Fetal growth restriction and birth defects recognized by age 6 years were more substantial contributors to cerebral palsy and neonatal death than potentially asphyxial birth events and inflammation.

LEVEL OF EVIDENCE: II.

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