Cerebral Palsy ALLIANCE

NEWS
Cerebral Palsy Research

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Interventions and Management

1. Dev Med Child Neurol. 2012 Oct 16. doi: 10.1111/dmcn.12011. [Epub ahead of print]

Stability of the Gross Motor Function Classification System after single-event multilevel surgery in children with cerebral palsy.

Rutz E, Tirosh O, Thomason P, Barg A, Graham HK.

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Aim: There are conflicting reports about the stability of the Gross Motor Function Classification System (GMFCS) in children with cerebral palsy (CP) after orthopaedic surgery. We studied the stability of the GMFCS in children with bilateral spastic CP after single-event multilevel surgery, using the Gait Profile Score (GPS) as the primary outcome measure. Method: This was a retrospective cohort study of 107 children (46 females, 61 males) with bilateral spastic CP, classified as GMFCS level II or III, who underwent surgery at a single tertiary institution between 1997 and 2008. The mean age at surgery was 10 years 7 months (SD 2y 8mo). The primary outcome measure was the GPS. Changes in GMFCS level were studied at multiple time points before and after intervention. Results: Gait dysfunction was partially corrected, with a mean improvement of 28% in the GPS. The GMFCS remained stable and unchanged in 95% of children and improved by one level in 5% of children. The improvement in GPS was three times the minimal clinically important difference. The mean age at final postoperative GPS assessment was 11 years 10 months (SD 2y 10mo) and at final GMFCS assessment was 15 years 7 months (SD 3y 9mo). Interpretation: Stability of the GMFCS was confirmed in the majority of children with bilateral spastic CP after single-event multilevel surgery, despite statistically and clinically significant improvements in gait dysfunction and functional mobility. This information is important in realistic goal-setting and in counselling families.

PMID: 23067343 [PubMed - as supplied by publisher]

2. Gait Posture. 2012 Oct 15. pii: S0966-6362(12)00321-9. doi: 10.1016/j.gaitpost.2012.08.016. [Epub ahead of print]

Predicting the outcome of intramuscular psoas lengthening in children with cerebral palsy using preoperative gait data and the random forest algorithm.

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This study used the random forest algorithm to predict outcomes of intramuscular psoas lengthening as part of a single event multi-level surgery in patients with cerebral palsy. Data related to preoperative medical history, physical exam, and instrumented three-dimensional gait analysis were extracted from a historic database in a motion analysis center. Data from 800 limbs of patients with diplegic cerebral palsy were analyzed. An index quantifying the overall deviation in pelvic tilt and hip flexion was used to define outcome categories. The random forest algorithm was used to derive criteria that predicted the outcome of a limb. The criteria were applied to limbs that underwent psoas lengthening with outstanding results (accuracy=.78, sensitivity=.82, specificity=.73). The criteria were then validated using an extended retrospective case-control design. Case limbs met the criteria and underwent psoas lengthening. Control limbs met the criteria, but did not undergo psoas lengthening. Over-treated limbs failed the criteria and underwent psoas lengthening. Other-treated limbs failed the criteria and did not undergo psoas lengthening. The rate of good outcomes among Cases exceeded that observed among controls (82% vs. 60%, relative risk=1.37), and far exceeded that observed in Over-treated limbs (27%). Other-treated limbs had good outcomes 52% of the time. Application of the criteria in the future is estimated to increase the overall rate of good pelvis-hip outcomes from 58% to 72% among children with diplegia who undergo single-event multi-level surgery (SEMLS).

PMID: 23079586 [PubMed - as supplied by publisher]

3. Arch Phys Med Rehabil. 2012 Oct 10. pii: S0003-9993(12)01002-7. doi: 10.1016/j.apmr.2012.09.027. [Epub ahead of print]

The NuStep® is a feasible and safe mode of physical activity for significantly motorimpaired adults with cerebral palsy.

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OBJECTIVE: To examine the feasibility and potential benefits of using the NuStep® Recumbent Cross Trainer for non-ambulatory adults with cerebral palsy (CP). DESIGN: Observational SETTING: Clinical center for CP treatment and rehabilitation. PARTICIPANTS: Significantly motor-impaired adults with CP (N = 11) with a mean age ± SD of 36.3 ± 13.2 years, and Gross Motor Functional Classification System (GMFCS) levels III and IV. INTERVENTIONS: Participants completed a 40-minute session of aerobic exercise using the NuStep® recumbent cross trainer, in which resistance was progressively increased at 5-minute intervals. MAIN OUTCOME MEASURE(S): Every 5-minutes during the exercise session, heart rate (HR), blood pressure (BP), oxygen consumption (VO2), energy expenditure (EE), and respiratory exchange ratios (RER) were recorded along with rating of perceived exertion (RPE). Immediately after, and 24-hours post-exercise participants received a standard survey to assess levels of pain and discomfort. RESULTS: All participants were able to complete th e 40-minute exercise protocol. Five of the eleven participants achieved a HR of at least 60% maximum throughout the duration, ten participants had a significant elevation in VO2 from baseline, and all participants had elevated RER values. Six participants reported pain during exercise, but only two reported pain after exercise was over. CONCLUSIONS: The NuStep® recumbent cross trainer is a feasible exercise modality for significantly motor-impaired adults with CP, GMFCS III and IV. Moreover, this mode was sufficient to stimulate a significant cardiorespiratory response in all participants, and thus it and similar devices may serve as a viable option for aerobic exercise interventions in this population, to prevent obesity and related cardiometabolic consequences.

PMID: 23063881 [PubMed - as supplied by publisher]

4. Ann Neurol. 2012 Jun 28. doi: 10.1002/ana.23681. [Epub ahead of print]

Effects of hyperbaric oxygen on motor function in children with cerebral palsy.

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OBJECTIVE: We conducted a randomized, double-blind, controlled clinical trial to determine whether hyperbaric oxygen (HBO) improves gross motor function in children with cerebral palsy. METHODS: Forty-nine children aged 3 to 8 years with spastic cerebral palsy were randomized to 40 treatments of HBO (100% oxygen at 1.5atm) or hyperbaric air (HBA, 14% oxygen at 1.5atm) over an 8-week period. The primary outcome was the Gross Motor Function Measure (GMFM) global score. Other outcomes included the Pediatric Evaluation of Disability Inventory (PEDI). Assessments were made before and immediately, 3 months, and 6 months after the treatment period. Within-group changes were analyzed with paired t tests or repeated measures analysis of variance. Analysis of covariance was used for between-group comparisons. RESULTS: Forty-six children (24 HBO, 22 HBA) were analyzed at the second interim analysis, which was scheduled to take place when at least half of the required number of patients in each group had completed pre- and post-treatment testing. No changes occurred in the GMFM from pre- to post-treatment in either group or between groups. Statistically significant increases occurred in both groups on the PEDI, with no difference between groups. The study was stopped because the calculated conditional probability of obtaining a difference between groups if the study continued to the end was only between 0.5% and 1.6%. INTERPRETATION: HBO was not effective in improving GMFM scores, and was no more effective than HBA in improving PEDI scores. These results do not support use of HBO as a therapy for cerebral palsy in young children who did not have neonatal hypoxic-ischemic encephalopathy. ANN NEUROL 2012.

PMID: 23071074 [PubMed - as supplied by publisher]

5. Dev Med Child Neurol. 2012 Sep;54(9):807-8. doi: 10.1111/j.1469-8749.2012.04361.x. Epub 2012 Jul 16.

Reporting outcomes of the Assisting Hand Assessment: what scale should be used?

Krumlinde-Sundholm L.

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PMID: 22803624 [PubMed - indexed for MEDLINE]

6. Dev Med Child Neurol. 2012 Sep;54(9):778. doi: 10.1111/j.1469-8749.2012.04356.x. Epub 2012 Jul 5.

The role of inhibition in action observation treatment.

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Comment on: Improving upper limb motor functions through action observation treatment: a pilot study in children with cerebral palsy. [Dev Med Child Neurol. 2012]

PMID: 22765385 [PubMed - indexed for MEDLINE] PMCID: PMC3467763

7. Cochrane Database Syst Rev. 2012 Oct 17;10:CD009456. doi: 10.1002/14651858.CD009456.pub2.

Interventions for oropharyngeal dysphagia in children with neurological impairment.

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BACKGROUND: Oropharyngeal dysphagia encompasses problems with the oral preparatory phase of swallowing (chewing and preparing the food), oral phase (moving the food or fluid posteriorly through the oral cavity with the tongue into the back of the throat) and pharyngeal phase (swallowing the food or fluid and moving it through the pharynx to the oesophagus). Populations of children with neurological impairment who commonly experience dysphagia include, but are not limited to, those with acquired brain impairment (for example, cerebral palsy, traumatic brain injury, stroke), genetic syndromes (for example, Down syndrome, Rett syndrome) and degenerative conditions (for example, myotonic dystrophy).

OBJECTIVES: To examine the effectiveness of interventions for oropharyngeal dysphagia in children with neurological impairment.

SEARCH METHODS: We searched the following electronic databases in October 2011: CENTRAL 2011(3), MEDLINE (1948 to September Week 4 2011), EMBASE (1980 to 2011 Week 40) , CINAHL (1937 to current) , ERIC (1966 to current), PsycINFO (1806 to October Week 1 2011), Science Citation Index (1970 to 7 October 2011), Social Science Citation Index (1970 to 7 October 2011), Cochrane Database of Systematic Reviews, 2011 (3), DARE 2011(3), Current Controlled Trials (ISRCTN Register) (15 October 2011), ClinicalTrials.gov (15 October 2011) and WHO ICTRP (15 October 2011). We searched for dissertations and theses using Networked Digital Library of Theses and Dissertations, Australasian Digital Theses Program and DART-Europe E-theses Portal (11 October 2011). Finally, additional references were also obtained from reference lists from articles.

SELECTION CRITERIA: The review included randomised controlled trials and quasi-randomised controlled trials for children with oropharyngeal dysphagia and neurological impairment.

DATA COLLECTION AND ANALYSIS: All three review authors (AM, PD and EW) independently screened titles and abstracts for inclusion and discussed results. In cases of uncertainty over whether an abstract met inclusion criterion, review authors obtained the full-text article and independently evaluated each paper for inclusion. The data were categorised for comparisons depending on the nature of the control group (for example, oral sensorimotor treatment versus no treatment). Effectiveness of the oropharyngeal dysphagia intervention was assessed by considering primary outcomes of physiological functions of the oropharyngeal mechanism for swallowing (for example, lip seal maintenance), the presence of chest infection and pneumonia, and diet consistency a child is able to consume. Secondary outcomes were changes in growth, child's level of participation in the mealtime routine and the level of parent or carer stress associated with feeding.

MAIN RESULTS: Three studies met the inclusion criteria for the review. Two studies were based on oral sensorimotor interventions for participants with cerebral palsy compared to standard care and a third study trialled lip strengthening exercises for children with myotonic dystrophy type 1 compared to no treatment (Sjogreen 2010). A meta-analysis combining results across the three studies was not possible because one of the studies had participants with a different condition, and the remaining two, although using oral sensorimotor treatments, used vastly different approaches with different intensities and durations. The decision not to combine these was in line with our protocol. In this review, we present the results from individual studies for four outcomes: physiological functions of the oropharyngeal mechanism for swallowing, the presence of chest infection and pneumonia, diet consistency, and changes in growth. However, it is not possible to reach definitive conclusions on the effectiveness of particular interventions for oropharyngeal dysphagia based on these studies. One study had a high risk of attrition bias owing to missing data, had statistically significant differences (in weight) across experimental and control groups at baseline, and did not describe other aspects of the trial sufficiently to enable assessment of other potential risks of bias. Another study was at high risk of detection bias as some outcomes were assessed by parents who knew whether their child was in the intervention or control group. The third study overall seemed to be at low risk of bias, but like the other two studies, suffered from a small sample size.

AUTHORS' CONCLUSIONS: The review demonstrates that there is currently insufficient high-quality evidence from randomised controlled trials or quasi-randomised controlled trials to provide conclusive results about the effectiveness of any particular type of oral-motor therapy for children with neurological impairment. There is an

urgent need for larger-scale (appropriately statistically powered), randomised trials to evaluate the efficacy of interventions for oropharyngeal dysphagia.

PMID: 23076958 [PubMed - in process]

8. Clin Nutr. 2012 Sep 25. pii: S0261-5614(12)00208-7. doi: 10.1016/j.clnu.2012.09.005. [Epub ahead of print]

Validation of a modified three-day weighed food record for measuring energy intake in preschool-aged children with cerebral palsy.

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BACKGROUND & AIMS: Accurate energy intake (EI) determination in children with cerebral palsy (CP) is critical for nutritional management, however no valid measures exist. We aimed to validate a modified three-day weighed food record for measuring EI in preschool-aged children with CP. METHODS: Thirty-one children with CP (61% male) of all functional abilities and 15 typically developing children (TDC) (63% male), median age 3.79 years participated. A three-day weighed food record was validated by comparing reported EI to measured total energy expenditure (TEE) via doubly labelled water, assuming a state of weight balance. RESULTS: Children with moderate-severe CP showed no difference between EI and TEE. Values for EI were less than TEE in children with mild CP and TDC ($p < 0.01$, limits of agreement -2559 to 845 kJ and -2524 to 350 kJ respectively). The mean difference between EI and TEE as a percentage of measured TEE was 14.8% (mild CP), 4.3% (moderate-severe CP) and 16.8% (TDC), all less than data detailing typical within-subject variability in day-to-day EI. CONCLUSIONS: In contrast to previous literature, results demonstrated that a modified three-day weighed food record accurately measured EI in preschool -aged children with CP. This record can be used in clinical practice and future research to accurately determine EI in this population.

PMID: 23062721 [PubMed - as supplied by publisher]

9. J Electromyogr Kinesiol. 2012 Oct 11. pii: S1050-6411(12)00162-9. doi: 10.1016/j.jelekin.2012.09.002. [Epub ahead of print]

Changes in masticatory muscle activity in children with cerebral palsy.

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The objective of the study was to determine whether children with cerebral palsy (CP) have abnormal bilateral masseter and temporal muscle activation during mastication. The muscular activity of 32 children aged between 7 and 13years was assessed during the task of non-habitual mastication by means of surface electromyograms. During non-habitual mastication, the amplitude of all assessed muscles in the inactive period and the amplitude of the Right Masseter and Left Temporal muscles in the active period of children with CP was greater ($p<0.05$) in relation to the group of children with Typical Development (TD). Considering each muscle individually, only the duration of the active period of Right Masseter and Right Temporal muscles in children with CP was lower ($p<0.05$) than in the TD children. Considering the four analyzed muscles, the duration of time of general active period, when at least one muscle should be activated, was higher in children with CP ($p<0.05$) than in children with TD showing greater time variation in inactivation ($p<0.05$). The higher muscle activity during the phases of the masticatory cycle, with longer duration of the active period and with greater variability between the muscles to inhibit this activity show greater difficulty in coordinating the muscles of mastication in children with CP compared to children with TD.

PMID: 23063911 [PubMed - as supplied by publisher]

10. Int J Oral Maxillofac Surg. 2012 Oct 12. pii: S0901-5027(12)00390-6. doi: 10.1016/j.ijom.2012.09.015. [Epub ahead of print]

Use of botulinum neurotoxin A in uncontrolled salivation in children with cerebral palsy: a pilot study.

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This study investigated the safety and efficacy of botulinum neurotoxin type-A (BNT-A) injections into the salivary glands for treatment of sialorrhea in children with cerebral palsy (CP) and assessed the clinical factors that affect treatment outcome. The parotid and submandibular glands of nine CP patients were injected with BNT-A 1.4U/kg in each parotid gland, and 0.6U/kg in each submandibular gland. All children had neurological disorders. Gross motor function classification system levels ranged from I to V. All children had moderate to severe intellectual disability. A telephone interview with one parent determined response to treatment. Drooling intensity and frequency were measured with the drooling severity and frequency scale. After BNT-A treatment, the patients were followed up for 6 months using self-assessed rating scales for drooling intensity, discomfort and treatment effect (drooling impact scale). All parents reported an improvement in sialorrhea in the first week. Drooling was very intensive at baseline, and moderate 2 weeks after treatment. Maximum response occurred at 2-8 weeks. The use of BNT-A in uncontrolled salivation in children with CP can be considered acceptable and effective. Malocclusion and anterior salivation are closely related clinical characteristics and should be taken into account when planning treatment.

PMID: 23068112 [PubMed - as supplied by publisher]

11. BMJ. 2012 Aug 8;345:e5387. doi: 10.1136/bmj.e5387.

Catalogue of failures at Manchester hospital contributed to disabled girl's death.

Dyer C.

PMID: 22874077 [PubMed - indexed for MEDLINE]

12. Disabil Rehabil. 2012 Oct 17. [Epub ahead of print]

Differences in habitual physical activity levels of young people with cerebral palsy and their typically developing peers: a systematic review.

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Purpose: To systematically review and compare the daily habitual physical activity levels and sedentary times of young people with cerebral palsy to their typically developing peers and to physical activity guidelines. Method: After searching electronic databases, two reviewers independently applied criteria. Studies were required to include young people with cerebral palsy (up to 18 years) and to quantitatively measure habitual physical activity, defined as activity across at least one day. Data extraction was independently verified, and quality analysis completed by two reviewers. Results: Of 895 identified studies, six moderate to high quality studies were included. There were four measures of habitual physical activity. Participants were aged 5 to 18 years and typically had moderate to high gross motor function. Across all ages and levels of motor function, young people with cerebral palsy participated in 13% to 53% less habitual physical activity than their peers. Levels of activity were approximately 30% lower than guidelines. Sedentary times were twice the maximum recommended amount. Conclusions: Young people with cerebral palsy participate in significantly lower levels of habitual physical activity than their peers, and less than

recommended guidelines. Long-term negative health consequences of inactivity such as metabolic dysfunction, cardiovascular disease and poor bone density are therefore more likely.

PMID: 23072296 [PubMed - as supplied by publisher]

13. Dev Med Child Neurol. 2012 Sep;54(9):777. doi: 10.1111/j.1469-8749.2012.04353.x. Epub 2012 Jul 11.

The conceptualization of participation.

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Division of Pediatric Rehabilitation and Center for Epidemiology and Biostatistics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA.

Comment on: Parent-reported participation in children with cerebral palsy: the contribution of recurrent musculoskeletal pain and child mental health problems. [Dev Med Child Neurol. 2012]

PMID: 22779782 [PubMed - indexed for MEDLINE]

14. J Child Neurol. 2012 Oct 17. [Epub ahead of print]

Behavioral Difficulties in Adolescents With Cerebral Palsy.

Brossard-Racine M, Waknin J, Shikako-Thomas K, Shevell M, Poulin C, Lach L, Law M, Schmitz N; the QUALA Group, Majnemer A.

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Behavioral problems are common in children with cerebral palsy; however, little is known about the persistence of these difficulties during adolescence. This study aimed to describe the nature and frequency of behavioral difficulties in adolescents with cerebral palsy and to explore associated factors. Parents of the participants completed the Strengths and Difficulties Questionnaire. Participants' motor and cognitive abilities, functional status, as well as parental stress were evaluated. Overall, the study enrolled 160 adolescents with cerebral palsy (65 girls, mean age 15.4 ± 2.17 years). Behavioral difficulties were present in 36.9% of the adolescents, with peer problems the most frequently reported (61.9%). Prosocial behaviors were associated with better function (r = 0.24-0.65) whereas hyperactive symptoms were associated with greater limitations (r = -0.19 to -0.55). Weak associations were found between parental stress and externalized problems (r = 0.22-0.24). Behavioral difficulties remained frequent in adolescents with cerebral palsy, particularly in those with greater functional limitations.

PMID: 23076425 [PubMed - as supplied by publisher]

15. Disabil Rehabil. 2012 Oct 15. [Epub ahead of print]

The paradox of normalization through rehabilitation: growing up and growing older with cerebral palsy.

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Purpose: To examine the experience of normalization through rehabilitation for persons growing up & growing older with lifelong physical impairment (cerebral palsy [CP]). Method: A qualitative methodology consisting of narrative inquiry informed by the Life Course Perspective. Multiple (3-4), in-depth interviews were completed with each participant in order to co-construct their life stories. Data were systematically compared for themes and categories, as well as the central plot that weaves the participants' experiences together. Results: Nine community-dwelling individuals (three men; six women), aged 26-70, with mild to severe CP participated. Their common narrative

involved intensive rehabilitation in childhood that focused on "normalizing" movement, particularly walking. In adolescence they were deemed to have achieved their functional potentials and "nothing further could be done". After transitioning out of pediatric health services many start to lose the gains they achieved in rehabilitation (particularly around walking). In their 30's and 40's they begin to slow down and lose functional abilities but no longer have access to rehabilitation to help them manage their aging bodies. Conclusions: Many of the assumptions that underlie the organization and delivery of rehabilitation services for people with long term impairments may contribute to difficulties encountered in adulthood and old age by focusing on normalizing physical function at the expense of learning to manage their bodies across the life course. [Box: see text].

PMID: 23066918 [PubMed - as supplied by publisher]

Prevention and Cure

16. Early Hum Dev. 2012 Oct 15. pii: S0378-3782(12)00232-0. doi: 10.1016/j.earlhumdev.2012.09.011. [Epub ahead of print]

White matter injury following fetal inflammatory response syndrome induced by chorioamnionitis and fetal sepsis: Lessons from experimental ovine models.

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Chorioamnionitis and fetal sepsis can induce a fetal inflammatory response syndrome (FIRS) which is closely related to the development of white matter injury in the fetal brain. Large epidemiological studies support the link between FIRS and fetal brain injury with a clear association between the presence of in utero inflammation and neurodevelopmental complications such as cerebral palsy, autism and cognitive impairments later in life. Translational animal models of chorioamnionitis and fetal sepsis are essential in understanding the underlying pathophysiological mechanisms of fetal brain injury after exposure to intra-uterine inflammation. Concerning this aspect, ovine models have high translational value since neurodevelopment in sheep closely resembles the human situation. In this article, we will review clinical and experimental evidence for the link between FIRS and white matter injury in the fetal brain. With respect to experimental findings, we will particularly focus on the lessons learned from ovine models of chorioamnionitis and fetal sepsis. We also highlight two key players implied in the pathophysiology of white matter injury after in utero exposure to inflammation.

PMID: 23078831 [PubMed - as supplied by publisher]

17. Eur J Paediatr Neurol. 2012 Oct 10. pii: S1090-3798(12)00198-5. doi: 10.1016/j.ejpn.2012.09.006. [Epub ahead of print]

Neurological assessment in infants discharged from a neonatal intensive care unit.

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BACKGROUND: Longitudinal motor assessment in infants at different neurodevelopmental risk has not been previously evaluated using structured assessments. AIM: To verify if the Hammersmith Infant Neurological Examination (HINE) is a good tool to predict the neuromotor outcome in infants discharged from a level II-III Neonatal Intensive Care Unit (NICU) METHODS: In this cohort analysis, 1541 infants discharged from our NICU between January of 2002 and the April 2006 were enrolled and assessed using the HINE at 3, 6, 9, 12 months. At

two years, these infants were further assessed, and grouped into infants with normal outcome (1150), with mild disability (321) and with cerebral palsy (70), RESULTS: Correlation analysis of Spearman showed a significant ($p < 0.0001$) and moderate ($r(2) = -0.55$ to -0.73) negative correlation between HINE scores (3, 6, 9, 12 months) and neurological outcome at two years. Cut-off scores for each assessment' age were provided as predictive value for cerebral palsy. DISCUSSION: This study mainly showed that HINE, as soon as the first months of life, helps in the process of prediction of neurological outcome at two years of age in a heterogeneous population of infants discharged from an NICU.

PMID: 23062755 [PubMed - as supplied by publisher]