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## Interventions and Management

### 1. Dev Neurorehabil. 2014 Sep 2:1-6. [Epub ahead of print]

#### **Feasibility of caregiver-directed home-based hand-arm bimanual intensive training: A brief report.**

Ferre CL1, Brandão MB, Hung YC, Carmel JB, Gordon AM.

**Objective:** To determine feasibility of a home-based, intensive bimanual intervention with children with unilateral spastic cerebral palsy. **Methods:** Eleven children (aged 29-54 months) received 90 hours of home hand-arm bimanual intensive therapy (H-HABIT) provided by their trained caregivers. Parenting stress levels and compliance were monitored using the Parenting Stress Index and daily logs. Quality of bimanual performance and changes in performance/satisfaction of functional goals were assessed using the Assisting Hand Assessment (AHA) and Canadian Occupational Performance Measure (COPM), respectively, at two pretreatment baseline sessions and two posttreatment sessions (immediate and six months). **Results:** Ten children completed the study with caregivers completing on average 85.6 hours of H-HABIT. Daily logs indicated high caregiver compliance. Stress levels remained stable across the intervention. Children demonstrated significant improvements in the AHA and COPM. **Conclusion:** H-HABIT is a feasible intervention for improving hand function and merits further investigation in a randomized-control trial.

[PMID: 25180530](https://pubmed.ncbi.nlm.nih.gov/25180530/) [PubMed - as supplied by publisher]

### 2. Pediatr Phys Ther. 2014 Sep 4. [Epub ahead of print]

#### **Level Versus Inclined Walking: Ambulatory Compensations in Children With Cerebral Palsy Under Outdoor Conditions**

Stott NS1, Reynolds N, McNair P.

**PURPOSE:** To investigate how children with cerebral palsy (CP) adapt their gait to inclined outdoor walking conditions. **METHODS:** Ten children with CP, Gross Motor Function System level II, and 10 children with typical development participated. Walking velocity, stride length and ankle, knee, hip, and trunk sagittal plane angles were calculated for 4 conditions: indoor walkway, outdoor walkway, and walking up and down a 7° inclined ramp. **RESULTS:** Gait patterns were unchanged between indoor and outdoor level walking. During up-slope walking, both groups increased hip and knee flexion at foot strike to accommodate the slope. During down-slope walking, both groups increased knee flexion in midstance to lower the body down the slope. Children with CP had greater forward trunk lean ( $P < .005$ ) during up-slope walking and greater posterior trunk lean during down-slope walking

( $P < .0001$ ). **CONCLUSION:** Children with CP adapt to inclined walking conditions similarly to peers but use greater postural adaptations.

[PMID: 25192000](#) [PubMed - as supplied by publisher]

### 3. Eur J Phys Rehabil Med. 2014 Sep 3. [Epub ahead of print]

#### **Does gait analysis change clinical decision-making in post-stroke patients? Results from a pragmatic prospective observational study.**

Ferrarin M1, Rabuffetti M, Bacchini M, Casiraghi A, Castagna A, Pizzi A, Montesano A.

**BACKGROUND:**Gait Analysis (GA) was demonstrated to change pre-surgical planning and improve gait outcomes in children with Cerebral Palsy. GA is often used also to assess walking capability of post-stroke subjects, although its influence in the clinical management of these patients has not yet been established. **OBJECTIVE:** To assess the impact of GA on clinical decision-making in adult chronic post-stroke patients. **DESIGN:** Pragmatic prospective observational study. **SETTING:** Rehabilitation hospital, both outpatients and inpatients. **POPULATION:** 49 patients (age:  $53.3 \pm 14.5$  yrs) who had had a cerebrovascular accident  $35.2 \pm 26.4$  months before and where referred to the gait analysis service. **METHODS:** Recommendations of therapeutic treatments before and after the analysis of GA data were compared, together with the confidence level of recommendations on a 10-point scale. Frequency of changes of post-GA vs pre-GA recommendations were computed for each recommendation type: surgery, botulinum toxin (BT), orthotic management and physiotherapy. **RESULTS:** Based on the analysis of GA data, 71% of post-stroke subjects had their treatment planning changed in some components. Indeed, 73% of patients with indications for surgery had their surgical planning changed; 81%, 37% and 32% had, respectively, their BT, orthotic and physiotherapy planning changed. Confidence level of recommendations increased significantly after GA, in both the whole group of patients (from  $6.7 \pm 1.4$  to  $8.7 \pm 0.6$ ,  $p < 0.01$ ) and the subgroup whose recommendations had not changed ( $7.0 \pm 1.5$  vs  $8.8 \pm 0.4$ ,  $p < 0.01$ ). **CONCLUSION:**GA significantly influences the therapeutic planning and reinforces decision-making for chronic post-stroke patients. Further work should be done to better translate GA results into indications for specific physiotherapy. **CLINICAL REHABILITATION IMPACT:** the use of GA as a tool to better define the rehabilitation planning in post-stroke patients should be fostered, particularly when surgery or botulinum toxin are considered and/or the prescription of orthoses is hypothesised.

[PMID: 25184798](#) [PubMed - as supplied by publisher]

### 4. Acta Orthop. 2014 Sep 5:1-6. [Epub ahead of print]

#### **Pain and rehabilitation problems after single-event multilevel surgery including bony foot surgery in cerebral palsy.**

Høiness PR1, Capjon H, Lofterød B.

**Background and purpose -** Surgical correction of foot deformities as part of single-event multilevel surgery (SEMLS) to optimize postoperative training is sometimes indicated in ambulatory children with cerebral palsy. We have, however, experienced excessive postoperative pain and rehabilitation problems in a number of these patients. We therefore investigated children who underwent such procedures regarding postoperative rehabilitation and pain, gait parameters 1 year after surgery, and mobility 5 years after surgery. **Patients and methods -** 9 children with diplegic cerebral palsy who had also undergone bony foot surgery were identified from a cohort of 70 children treated with SEMLS according to a standardized protocol. 2 children were excluded due to mental retardation and atypical surgery, and 7 patients (4 of them boys) were included. The children and their parents underwent a semi-structured interview on average 5 (3-7) years after the surgery. Gait parameters preoperatively and 1 year postoperatively were compared. **Results -** 5 children had experienced regional pain syndrome and considerable sociopsychological problems during the first postoperative year. 5 years after surgery, 4 of the 5 children still had hypersensitive and painful feet, 2 had lost their ability to walk, 1 child was no longer self-reliant in daily care, and 3 were wheelchair bound. There were, however, no clinically significant differences in functional mobility scale (FMS) or gait parameters preoperatively and 1 year postoperatively. **Interpretation -** We found troublesome postoperative rehabilitation and poor outcomes in this series of children who had undergone simultaneous multilevel surgeries and bony foot corrections. Caution is warranted when treating marginally ambulatory children with bilateral spastic cerebral palsy and foot deformities.

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#### 5. Am J Phys Med Rehabil. 2014 Aug 29. [Epub ahead of print]

##### **Comparison of Ultrasound-Guided Anterior and Posterior Approaches for Needle Insertion into the Tibialis Posterior in Hemiplegic Children with Spastic Cerebral Palsy.**

Rha DW1, Park ES, Jung S, Lee SC, Suh M, Choi HS.

**OBJECTIVE:** Although the tibialis posterior is a potentially difficult muscle to locate for botulinum toxin injection because of its deep location, needle insertion is usually performed using anatomic landmarks for guidance. Accordingly, the ultrasonographic anatomy of the lower leg was investigated in hemiplegic children with spastic cerebral palsy to improve the safety and the accuracy of needle placement into the tibialis posterior. **DESIGN:** Twenty-five subjects (2 yrs 2 mos to 5 yrs 11 mos; 12 boys, 13 girls; Gross Motor Function Classification System levels I-II) were recruited. B-mode, real-time ultrasonography was performed using a 5- to 12-MHz linear array transducer. During anterior and posterior approaches, safety window width (tibia to the neurovascular bundle) and depth (skin to the midpoint of the tibialis posterior) were measured at the upper third and at the midpoint of the tibia. **RESULTS:** For the anterior approach, the safety window width at the upper third of the tibia (mean [SD], 0.63 [0.12] cm, range, 0.44-0.93 cm) was significantly larger than that at the midpoint (0.38 [0.09] cm, range from 0.22 to 0.59 cm,  $P < 0.05$ ) of the affected leg. However, for the posterior approach, the safety window width at the midpoint (0.74 [0.23] cm, range from 0.21 to 1.18 cm) was significantly larger than that at the upper third of the tibia (0.48 [0.23] cm, range from 0.10 to 0.97 cm,  $P < 0.05$ ) on the affected leg. **CONCLUSIONS:** Ultrasonographic guidance is a useful, safe, and accurate tool for needle insertion into the tibialis posterior. Considering the safety window width, this study suggests needle placement at the upper third point of the tibia for the anterior approach and at the midpoint for the posterior approach.

[PMID: 25180837](#) [PubMed - as supplied by publisher]

#### 6. Arch Phys Med Rehabil. 2014 Jun 2. pii: S0003-9993(14)00405-5. doi: 10.1016/j.apmr.2014.05.010. [Epub ahead of print]

##### **Assessment of Muscle Endurance of the Knee Extensor Muscles in Adolescents With Spastic Cerebral Palsy Using a Submaximal Repetitions-to-Fatigue Protocol.**

Eken MM1, Dallmeijer AJ2, Doorenbosch CA3, Dekkers H4, Becher JG2, Houdijk H5.

**OBJECTIVE:** To compare muscle endurance in adolescents with spastic cerebral palsy (CP) with typically developing (TD) peers using a submaximal repetitions-to-fatigue (RTF) protocol. **DESIGN:** Cross sectional. **SETTING:** Human motion laboratory. **PARTICIPANTS:** Adolescents with spastic CP (n=16; Gross Motor Function Classification System levels I or II) and TD adolescents (n=18) within the age range of 12 to 19 years old. **INTERVENTIONS:** Not applicable. **MAIN OUTCOME MEASURES:** Each participant performed 3 RTF tests at different submaximal loads, ranging from 50% to 90% of their maximal voluntary knee extension torque. The relation between the number of repetitions (repetition maximum [RM]) and imposed submaximal relative (percent of maximal voluntary torque [%MVT]) and absolute (Nm/kg) torque was quantified. To compare adolescents with CP with TD adolescents, a mixed linear model was used to construct load endurance curves. Surface electromyography of quadriceps muscles was measured to assess changes in normalized amplitude and median frequency (MF) as physiological indicators of muscle fatigue. **RESULTS:** Adolescents with CP showed a larger decrease in %MVT per RM than TD adolescents ( $P < .05$ ). TD adolescents showed substantial higher absolute (Nm/kg) load endurance curves than adolescents with CP ( $P < .001$ ), but they did not show a difference in slope. Electromyographic normalized amplitude increased significantly ( $P < .05$ ) in the quadriceps muscles in all tests for both groups. Electromyographic MF decreased significantly ( $P < .05$ ) in tests with the low and medium loads. Electromyographic responses did not differ between groups, indicating that similar levels of muscle fatigue were reached. **CONCLUSIONS:** Adolescents with CP show slightly lower muscle endurance compared with TD adolescents on a submaximal RTF protocol, which is in contrast with earlier findings in a maximal voluntary fatigue protocol. Accordingly, adolescents with CP have a reduced capacity to endure activities at similar relative loads compared with TD adolescents.

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**7. Dev Med Child Neurol. 2014 Aug 30. doi: 10.1111/dmcn.12572. [Epub ahead of print]**

**Taking steps towards improving the mobility of children with cerebral palsy.**

Kurz MJ1, Reelfs H.

[PMID: 25174951](#) [PubMed - as supplied by publisher]

**8. Dev Neurorehabil. 2014 Sep 2:1-5. [Epub ahead of print]**

**Pilates improves lower limbs strength and postural control during quiet standing in a child with hemiparetic cerebral palsy: A case report study.**

Dos Santos AN1, Serikawa SS, Rocha NA.

**Objective:** To verify the effect of Pilates exercises in a child with cerebral palsy (CP) with mild functional impairment. **Methods:** We evaluated average peak torque of ankle and knee extensors/flexors using a Biodex System, using concentric active-assisted test. We also evaluated amplitude of anterior-posterior and of medial-lateral displacement of the CoP and area of oscillation during quiet standing with a BERTEC platform. We applied Pilates exercises for eight weeks. **Results:** Peak torque/body weight of ankle and knee extensors/flexors of both affected and unaffected limbs increased after Pilates. Also, all kinetic variables decreased after Pilates' intervention. After one-month follow-up, isokinetic variable values were higher while kinetic variable values were lower than baseline values. **Conclusion:** Pilates may be an important rehabilitation technique for children with CP that present mild deficits in motor structures and high functional level, especially when the aims are to improve muscle strength and postural control during quiet standing.

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**9. Dev Neurorehabil. 2014 Sep 2:1-14. [Epub ahead of print]**

**Intrinsic properties and functional changes in spastic muscle after application of BTX-A in children with cerebral palsy: Systematic review.**

García Salazar LF1, Santos GL, Pavão SL, Rocha NA, Russo TL.

**Objective:** This article aimed to review the literature to verify the effect of botulinum toxin type A (BTX-A) on the intrinsic properties of spastic muscles and functionality in children with cerebral palsy (CP). **Methods:** A literature search was conducted in the following databases: CINAHL, SCOPUS, Web of Science and PubMed. Database searches were limited to the period from January 1993 to March 2014. **Results:** A total of 2182 papers were identified, and 17 met the inclusion criteria. Only one study analyzed the effect of the toxin on muscle intrinsic properties and others analyzed the effect on functionality. **Conclusion:** BTX-A application demonstrated no changes in the passive stiffness of spastic muscle. In relation to functional level, the evidence of BTX-A effect was controversial. These studies showed methodological quality limitations that restrict the interpretation of the results for the entire CP population, which justifies the need for further randomized controlled trials.

[PMID: 25180438](#) [PubMed - as supplied by publisher]

**10. Zh Nevrol Psikhiatr Im S S Korsakova. 2014;114(7):33-36.****Botulinum toxin type A (disport) in the complex rehabilitation of children with spastic forms of cerebral palsy. [Article in Russian]**

Zmanovskaia VA1, Levitina EV, Popkov DA, Butorina MN, Pavlova OL.

Objective: To analyze the efficacy of repeated use of disport in children with spastic forms of cerebral palsy (CP). Material and methods: Forty-five children with CP (main group) received 8 consecutive injections of disport in the complex treatment. A comparison group consisted of 41 children with CP who received the same complex treatment but without disport. Disport was used intramuscular in mean dose  $26 \pm 4$  u/kg. Results and conclusion: A significant decrease of the muscle tone was observed after each following injection of disport. The muscle tone did not return to baseline 24 weeks after each following injection and significantly differed after the first 4 injections. After 8 repeated courses of botulinotherapy, a number of children needed the operative treatment, were significantly greater in the comparison group (71% vs 47%,  $p=0,041$ ).

[PMID: 25176264](#) [PubMed - as supplied by publisher]

**11. Gesundheitswesen. 2014 Sep 3. [Epub ahead of print]****Children and Adolescents in Need of Long-Term Care. An Analysis of Data Obtained by the Medical Service of Compulsory Health Insurance Funds, MDK Bavaria. [Article in German]**

Beck-Ripp JC1, Dressel H2.

Children and adolescents among those in need of long-term care differ significantly from older long-term care patients. The aim of this investigation was to characterise the features of this group. We analysed 6 141 records of children and adolescents produced in 2011 by the medical service of the statutory health insurance of Bavaria. The need for long-term care usually occurred before school age, initially mainly to care level 1. Typically, support for long-term care was initially applied for with the diagnosis of severe developmental disorder. Most likely, a care level was recommended for children with malignant diseases. The majority of children requiring long-term care suffered from Down syndrome, developmental disorders and cerebral palsy. In the population group, 60% were male. Typically, most of the assistance was needed for personal hygiene, however the higher the care level required the more time was needed for nourishment. Only few children regained age-appropriate independence. The majority of the children requiring long-term care for congenital diseases or those present at a young age stay dependent on outside assistance permanently.

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**12. Disabil Rehabil. 2014 Sep 1:1-8. [Epub ahead of print]****Negotiating identity: a qualitative analysis of stigma and support seeking for individuals with cerebral palsy.**

Read SA1, Morton TA, Ryan MK.

Purpose: The current research investigates how adults with cerebral palsy construct their personal and social identities in the face of stigma when support seeking, and considers the dilemmas they might face when doing so. Method: Participants were 28 adults with cerebral palsy who completed an online survey reporting on their identity as a person with cerebral palsy and their experiences of stigma when seeking and accessing support. Results: Qualitative analyses indicated that the majority of participants sought support to help manage their cerebral palsy. Of these, half reported experiencing stigma in these environments, although they largely continued seeking support despite this. The majority viewed both their personal identity (i.e. as a unique individual) and their social identity (i.e. as a person with cerebral palsy) as important to their sense of self. However, how participants constructed their identity also appeared to vary according to context. While they appeared to value being seen as an individual to receive support that was unique to their needs (their personal identity), they also reported valuing the group to

facilitate coping with stigma (their social identity). Yet, despite their utilities, enacting their identity in each of these ways was associated with costs. In order to access desired support, they had to incorporate their social identity as similar to other disabled people, which led to stigmatization through feelings of difference to the non-disabled. Conversely emphasizing individuality and difference from the disabled stereotype was associated with concerns about the degree to which their suitability for support might be questioned by their care provider. Conclusions: As has been observed in many fields, stigma can complicate identity. In this domain, people with cerebral palsy face a number of threats in how they construe their identity, both in navigating stigma and maintaining access to needed support. Implications for Rehabilitation Stigma in help and support settings remains a significant problem for adults with cerebral palsy (CP). This creates dilemmas regarding how they view and construct their identity in the contexts of stigma and support-seeking. It is important for specialists to recognize that the needs of adults with CP are unique, and so provided services should be tailored to the individual. Healthcare providers should also encourage their patients to actively engage with online disability support groups in order to build a meaningful social identity with other people with CP.

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### **13. Health Qual Life Outcomes. 2014 Aug 30;12(1):132. doi: 10.1186/s12955-014-0132-1.**

#### **Health-related quality of life of ambulant adults with cerebral palsy and its association with falls and mobility decline: a preliminary cross sectional study.**

Morgan PE1, Soh SE, McGinley JL.

**BACKGROUND:** Despite an increasing number of studies examining the profile of falls and mobility decline in adults with cerebral palsy (CP), little is known about its impact on an individual's life quality. The aim of this preliminary study was to assess the wellbeing and health status aspects of health-related quality of life (HRQOL) in ambulant adults with CP and explore the relationship of falls and mobility decline with HRQOL. **METHOD:** Ambulant adults with CP completed postal surveys which sought demographic data, mobility (Gross Motor Function Classification System; GMFCS-E&R), presence of mobility decline, falls history, and HRQOL (Personal Wellbeing Index (PWI), Short Form-36 Health Survey (SF-36)). **RESULTS:** Thirty-four community-dwelling ambulant adults with CP with a mean age of 44.2 years (SD; 8.6; range 26-65) participated. Twenty-eight (82%) participants reported mobility decline since reaching adulthood, and a similar proportion of individuals (82%) reported having had more than two falls in the previous year. The health status and wellbeing of this sample of ambulant adults with CP were generally lower compared with the Australian normative population. Mobility decline was found by univariate regression analysis to be associated with mental health status ( $\beta=0.52$ ;  $p=0.002$ ), but not when other predictor variables were included in the multivariate model ( $\beta=0.27$ ;  $p=0.072$ ). In contrast, self-reported history of falls was found to be a significant contributing factor for both physical health status ( $\beta=-0.55$ ;  $p=0.002$ ) and personal wellbeing ( $\beta=-0.43$ ;  $p=0.006$ ). **CONCLUSIONS:** This sample of ambulant adults with CP perceived their HRQOL to be poor, with some health status and wellbeing domains below that of population wide comparisons. A majority of these individuals also experienced a fall in the last year and a decline in their mobility since reaching adulthood. While further research is required, this preliminary study has highlighted the potential implications of falls and mobility decline on HRQOL in adults with CP.

[PMID: 25176595](#) [PubMed - in process] Free full text

### **14. Health Soc Care Community. 2014 Sep 1. doi: 10.1111/hsc.12121. [Epub ahead of print]**

#### **Delivering healthcare services to children with cerebral palsy and their families: a narrative review.**

Hayles E1, Jones A, Harvey D, Plummer D, Ruston S.

Children with cerebral palsy have complex healthcare needs and often require complex multidisciplinary care. It is important for clinicians to understand which approaches to healthcare service delivery for this population are supported in the literature and how these should be applied in clinical practice. This narrative review aims to identify and review the evidence for current approaches to healthcare service delivery for children with cerebral palsy. Databases were searched using key terms to identify relevant research articles and grey literature from December 2011 to September 2013. Search results were screened and sorted according to inclusion and exclusion criteria. Thirty-two documents were included for evaluation and their content was analysed thematically. Three current

approaches to healthcare service delivery for children with cerebral palsy identified in this narrative review were family-centred care, the World Health Organisation's International Classification of Functioning, Disability and Health, and collaborative community-based primary care. However, healthcare services for children with cerebral palsy and their families are inconsistently delivered according to these approaches and the identified guidelines or standards of care for children with cerebral palsy have limited incorporation of these approaches. Future research is required to investigate how these approaches to healthcare service delivery can be integrated into clinical practices to enable clinicians to improve services for this population.

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## Prevention and Cure

**15. J Child Neurol. 2014 Sep 2. pii: 0883073814543306. [Epub ahead of print]**

### **Cerebral Palsy Litigation: Change Course or Abandon Ship.**

Sartwelle TP1, Johnston JC2.

The cardinal driver of cerebral palsy litigation is electronic fetal monitoring, which has continued unabated for 40 years. Electronic fetal monitoring, however, is based on 19th-century childbirth myths, a virtually nonexistent scientific foundation, and has a false positive rate exceeding 99%. It has not affected the incidence of cerebral palsy. Electronic fetal monitoring has, however, increased the cesarian section rate, with the expected increase in mortality and morbidity risks to mothers and babies alike. This article explains why electronic fetal monitoring remains endorsed as efficacious in the worlds' labor rooms and courtrooms despite being such a feeble medical modality. It also reviews the reasons professional organizations have failed to condemn the use of electronic fetal monitoring in courtrooms. The failures of tort reform, special cerebral palsy courts, and damage limits to stem the escalating litigation are discussed. Finally, the authors propose using a currently available evidence rule-the Daubert doctrine that excludes "junk science" from the courtroom-as the beginning of the end to cerebral palsy litigation and electronic fetal monitoring's 40-year masquerade as science.

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**16. J Neuroinflammation. 2014 Sep 5;11(1):153. [Epub ahead of print]**

### **The immune response after hypoxia-ischemia in a mouse model of preterm brain injury.**

Albertsson AM, Bi D, Duan L, Zhang X, Leavenworth JW, Qiao L, Zhu C, Cardell S, Cantor H, Hagberg H, Mallard C, Wang X.

Background: Preterm brain injury consists primarily of periventricular leukomalacia accompanied by elements of gray-matter injury, and these injuries are associated with cerebral palsy and cognitive impairments. Inflammation is believed to be an important contributing factor to these injuries. The aim of this study was to examine the immune response in a postnatal day (PND) 5 mouse model of preterm brain injury induced by hypoxia-ischemia (HI) that is characterized by focal white and gray-matter injury. Methods: C57Bl/6 mice at PND 5 were subjected to unilateral HI induced by left carotid artery ligation and subsequent exposure to 10% O<sub>2</sub> for 50 minutes, 70 minutes, or 80 minutes. At seven days post-HI, the white/gray-matter injury was examined. The immune responses in the brain after HI were examined at different time points after HI using RT-PCR and immunohistochemical staining. Results: HI for 70 minutes in PND 5 mice induced local white-matter injury with focal cortical injury and hippocampal atrophy, features that are similar to those seen in preterm brain injury in human infants. HI for 50 minutes resulted in a small percentage of animals being injured, and HI for 80 minutes produced extensive infarction in multiple brain areas. Various immune responses, including changes in transcription factors and cytokines that are associated with a T-

helper (Th)1/Th17-type response, an increased number of CD4+ T-cells, and elevated levels of triggering receptor expressed on myeloid cells 2 (TREM-2) and its adaptor protein DNAX activation protein of 12 kDa (DAP12) were observed using the HI 70 minute preterm brain injury model. Conclusions We have established a reproducible model of HI in PND 5 mice that produces consistent local white/gray-matter brain damage that is relevant to preterm brain injury in human infants. This model provides a useful tool for studying preterm brain injury. Both innate and adaptive immune responses are observed after HI, and these show a strong pro-inflammatory Th1/Th17-type bias. Such findings provide a critical foundation for future studies on the mechanism of preterm brain injury and suggest that blocking the Th1/Th17-type immune response might provide neuroprotection after preterm brain injury.

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#### 17. *J Vis Exp.* 2014 Aug 25;(90). doi: 10.3791/3368.

##### **Assessment and Evaluation of the High Risk Neonate: The NICU Network Neurobehavioral Scale.**

Lester BM1, Andreozzi-Fontaine L2, Tronick E3, Bigsby R2.

There has been a long-standing interest in the assessment of the neurobehavioral integrity of the newborn infant. The NICU Network Neurobehavioral Scale (NNNS) was developed as an assessment for the at-risk infant. These are infants who are at increased risk for poor developmental outcome because of insults during prenatal development, such as substance exposure or prematurity or factors such as poverty, poor nutrition or lack of prenatal care that can have adverse effects on the intrauterine environment and affect the developing fetus. The NNNS assesses the full range of infant neurobehavioral performance including neurological integrity, behavioral functioning, and signs of stress/abstinence. The NNNS is a noninvasive neonatal assessment tool with demonstrated validity as a predictor, not only of medical outcomes such as cerebral palsy diagnosis, neurological abnormalities, and diseases with risks to the brain, but also of developmental outcomes such as mental and motor functioning, behavior problems, school readiness, and IQ. The NNNS can identify infants at high risk for abnormal developmental outcome and is an important clinical tool that enables medical researchers and health practitioners to identify these infants and develop intervention programs to optimize the development of these infants as early as possible. The video shows the NNNS procedures, shows examples of normal and abnormal performance and the various clinical populations in which the exam can be used.

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#### 18. *Muscle Nerve.* 2014 Sep 3. doi: 10.1002/mus.24441. [Epub ahead of print]

##### **Skeletal muscle satellite cells: Mediators of muscle growth during development and implications for developmental disorders.**

Dayanidhi S1, Lieber RL.

Satellite cells (SCs) are the muscle stem cells responsible for longitudinal and cross-sectional postnatal growth, repair after injury and which provide new myonuclei when needed. Here we review their morphology, contribution to development, and their role in sarcomere and myonuclear addition. SCs, similar to other tissue stem cells, cycle through different states such as quiescence, activation, and self-renewal and thus we consider the signaling mechanisms involved in maintenance of these states. The role of the SC niche, their interactions with other cells such as fibroblasts and the extracellular matrix are all emerging as important factors that affect aging and disease. Interestingly, children with cerebral palsy appear to have a reduced SC number, which could play a role in their reduced muscular development and even in muscular contracture formation. Finally we review the current information on SC dysfunction in children with muscular dystrophy and emerging therapies that target promotion of myogenesis and reduction of fibrosis. © 2014 Wiley Periodicals, Inc.

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