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Interventions and Management

1. Combination of Constraint-Induced Movement Therapy with Electroacupuncture Improves Functional Recovery following Neonatal Hypoxic-Ischemic Brain Injury in Rats.

Kim H, Koo YS, Shin MJ, Kim SY, Shin YB, Choi BT, Yun YJ, Lee SY, Shin HK.

Biomed Res Int. 2018 Feb 7;2018:8638294. doi: 10.1155/2018/8638294. eCollection 2018.

AIM: Neonatal hypoxic-ischemia (HI) due to insufficient oxygen supply and blood flow during the prenatal and postnatal periods can cause cerebral palsy, a serious developmental condition. The purpose of this study was to investigate the efficacy of combining constraint-induced movement therapy (CIMT) and electroacupuncture to treat rat neonatal HI brain injury. **METHODS:** The left common carotid arteries of postnatal day 7 rats were ligated to induce HI brain injury, and the neonates were kept in a hypoxia chamber containing 8% oxygen for 2 hrs. Electroacupuncture at Baihui (GV 20) and Zusanli (ST 36) was performed concurrently with CIMT 3 weeks after HI induction for 4 weeks. **RESULTS:** Motor asymmetry after HI was significantly improved in the CIMT and electroacupuncture combination group, but HI lesion size was not improved. The combination of CIMT and electroacupuncture after HI injury increases NeuN and decreases GFAP levels in the cerebral cortex, suggesting that this combination treatment inversely regulates neurons and astrocytes. In addition, the combination treatment group reduced the level of cleaved caspase-3, a crucial mediator of apoptosis, in the cortex. **CONCLUSIONS:** Our findings indicate that a combination of CIMT and electroacupuncture is an effective method to treat hemiplegia due to neonatal HI brain injury.

[PMID: 29568769](#)

2. A randomized controlled trial to compare two methods of constraint-induced movement therapy to improve functional ability in the affected upper limb in pre-school children with hemiplegic cerebral palsy: CATCH TRIAL.

Christmas PM, Sackley C, Feltham MG, Cummins C.

Clin Rehabil. 2018 Mar 1:269215518763512. doi: 10.1177/0269215518763512. [Epub ahead of print]

OBJECTIVE: To determine the feasibility and short-term efficacy of caregiver-directed constraint-induced movement therapy to improve upper limb function in young children with hemiplegic cerebral palsy. **DESIGN:** Randomized controlled trial with masked assessment. **SETTING:** Community paediatric therapy services. **SUBJECTS:** Pre-school children with hemiplegic cerebral palsy. **INTERVENTIONS:** Caregiver-directed constraint-induced movement therapy administered using either 24-hour short-arm restraint device (prolonged) or intermittent holding restraint during therapy (manual). **MAIN MEASURES:** Primary measures include Assisting Hand Assessment (AHA) at 10 weeks. Secondary measures include adverse events, Quality of Upper Extremity Skills Test and Pediatric Quality of Life Inventory. Feasibility measures include recruitment, retention, data completeness and adherence. **RESULTS:** About 62/81 (72%) of eligible patients in 16 centres were randomized (prolonged restraint n = 30; manual restraint n = 32) with 97% retention at 10 weeks. The mean change at 10 weeks on the AHA logit-based 0-100 unit was 9.0 (95% confidence interval (CI): 5.7, 12.4; P < 0.001) for prolonged restraint and 5.3 (95% CI: 1.3, 9.4; P = 0.01) for manual restraint with a mean group difference of 3.7 (95% CI: -1.5, 8.8; P = 0.156) (AHA smallest detectable difference = 5 units). No serious related adverse events were reported. There were no differences in secondary outcomes. More daily therapy was delivered with prolonged restraint (60 vs 30 minutes; P < 0.001). AHA data were complete

at baseline and 10 weeks. **CONCLUSION:** Caregiver-directed constraint-induced movement therapy is feasible and associated with improvement in upper limb function at 10 weeks. More therapy was delivered with prolonged than with manual restraint, warranting further testing of this intervention in a longer term trial.

[PMID: 29552921](#)

3. Neural activation within the prefrontal cortices during the goal-directed motor actions of children with hemiplegic cerebral palsy.

Surkar SM, Hoffman RM, Harbourne R, Kurz MJ.

Neurophotronics. 2018 Jan;5(1):011021. doi: 10.1117/1.NPh.5.1.011021. Epub 2018 Mar 10.

The primary aim of the study was to explore the prefrontal cortical (PFC) activation while performing a shape-matching motor task in children with hemiplegic cerebral palsy (HCP) as compared with typically developing (TD) children. Fifteen TD children ([Formula: see text]) and 12 children with HCP ([Formula: see text]) were included. We assessed the PFC activation while performing an ecologically valid upper extremity shape-matching task of different complexities by measuring the concentration of oxygenated hemoglobin (HbO) using functional near-infrared spectroscopy. The motor task performance was assessed by quantifying the average number of shapes matched, reaction time (RT), task errors, nine-hole peg test (NHPT), and the box and block test (BBT). Overall, there was a systematic increase in the HbO in the PFC across the shape-matching complexity conditions. Our results also revealed that the children with HCP had an increased amount of PFC activation while performing all of the shape-matching tasks. The increased PFC activation paralleled the differences in the number of shapes matched, RT, task errors, NHPT, and BBT. The atypical motor actions seen in children with HCP may be partially related to the greater cognitive demands placed on the PFC.

[PMID: 29541647](#)

4. Functional Anaerobic and Strength Training in Young Adults with Cerebral Palsy.

Gillett JG, Lichtwark GA, Boyd RN, Barber LA.

Med Sci Sports Exerc. 2018 Mar 20. doi: 10.1249/MSS.0000000000001614. [Epub ahead of print]

PURPOSE: To investigate the efficacy of a 12-week combined functional anaerobic and strength training program on neuromuscular properties and functional capacity in young adults with spastic-type CP. **METHODS:** 17 young adults (21±4 years, 9 males, GMFCS I=11, II=6) were randomized to 12 weeks, 3 sessions per week, of high intensity functional anaerobic and progressive resistance training of the lower limbs (n=8), or a waitlist control group (n=9). Pre- and post-training plantar flexor and tibialis anterior muscle volumes and composition, passive and active plantar flexor muscle properties, and functional capacity outcomes were assessed. **RESULTS:** The training group had higher values compared to the control group (adjusted mean difference) at 12-weeks for: more- and less-impaired total plantar flexor and tibialis anterior muscle volumes; maximum isometric plantar flexion strength; muscle power sprint test peak power; agility shuttle time; composite functional strength score; and six-minute walk test distance. The change in total plantar flexor muscle volume was associated with the change in plantar flexor muscle strength. There were relationships between the change in plantar flexor muscle strength and change in functional capacity outcomes (functional strength; six-minute walk test). **CONCLUSIONS:** Combined functional anaerobic and strength training increased muscle size, strength and functional capacity in young adults with CP. The addition of anaerobic training to progressive resistance training programs assists in the transfer to improved functional capacity.

[PMID: 29557839](#)

5. Application of Commercial Games for Home-Based Rehabilitation for People with Hemiparesis: Challenges and Lessons Learned.

Valdés BA, Glegg SMN, Lambert-Shirzad N, Schneider AN, Marr J, Bernard R, Lohse K, Hoens AM, Van der Loos HFM.

Games Health J. 2018 Mar 22. doi: 10.1089/g4h.2017.0137. [Epub ahead of print]

OBJECTIVE: To identify the factors that influence the use of an at-home virtual rehabilitation gaming system from the perspective of therapists, engineers, and adults and adolescents with hemiparesis secondary to stroke, brain injury, and cerebral palsy. **MATERIALS AND METHODS:** This study reports on qualitative findings from a study, involving seven adults (two female; mean age: 65 ± 8 years) and three adolescents (one female; mean age: 15 ± 2 years) with hemiparesis, evaluating the feasibility and clinical effectiveness of a home-based custom-designed virtual rehabilitation system over 2 months. Thematic

analysis was used to analyze qualitative data from therapists' weekly telephone interview notes, research team documentation regarding issues raised during technical support interactions, and the transcript of a poststudy debriefing session involving research team members and collaborators. **RESULTS:** Qualitative themes that emerged suggested that system use was associated with three key factors as follows: (1) the technology itself (e.g., characteristics of the games and their clinical implications, system accessibility, and hardware and software design); (2) communication processes (e.g., preferences and effectiveness of methods used during the study); and (3) knowledge and training of participants and therapists on the technology's use (e.g., familiarity with Facebook, time required to gain competence with the system, and need for clinical observations during remote therapy). Strategies to address these factors are proposed. **CONCLUSION:** Lessons learned from this study can inform future clinical and implementation research using commercial videogames and social media platforms. The capacity to track compensatory movements, clinical considerations in game selection, the provision of kinematic and treatment progress reports to participants, and effective communication and training for therapists and participants may enhance research success, system usability, and adoption.

[PMID: 29565694](#)

6. How physiotherapists supervise to enhance practical skills in dedicated aides of toddlers with cerebral palsy: A qualitative observational study.

Sørvoll M, Obstfelder A, Normann B, Øberg GK.

Physiother Theory Pract. 2018 Mar 20;1-10. doi: 10.1080/09593985.2018.1453003. [Epub ahead of print]

BACKGROUND: Physiotherapy from an early age is considered important for children with cerebral palsy (CP). In preschool, dedicated aides are responsible for the daily follow-up and training under the supervision of a physiotherapist (PT). Knowledge is sparse regarding what is created and achieved in clinical practice involving triads (i.e. the PT, aide, and child) with respect to the enhancement of practical skills in dedicated aides. The study purpose was to explore form and content in supervision. **METHODS:** Nonparticipating observations were performed on a purposive sample of seven triads, including seven PTs, seven dedicated aides, and seven preschool toddlers with CP with function level III-IV of the Gross Motor Function Classification System. Each triad was video-recorded once. Data consisted of 371 minutes of video recordings analyzed using content analysis and enactive theory on participatory sense-making. **RESULTS:** From the analysis, three supervision approaches emerged: (1) the Cognitive Supervision approach; (2) the Joint Action Supervision approach; and (3) the Embodied Supervision approach. Each approach gives rise to different types of sense-making processes, ranging from merely reflective ways of knowing through verbal and visual conveyance to mutual embodied ways of knowing through joint actions and physical interplay. To make use of all approaches, PTs require incorporated handling skills and action competence. **CONCLUSION:** Supervision is an emergent process where knowledge is transformed through interactions and shared sense-making processes. **IMPLICATIONS:** Clinicians should be aware of the context-dependent and interactional factors that drive the supervision process.

[PMID: 29558237](#)

7. Innovative robotic hippotherapy improves postural muscle size and postural stability during the quiet stance and gait initiation in a child with cerebral palsy: A single case study.

Park JH, You JSH.

NeuroRehabilitation. 2018;42(2):247-253. doi: 10.3233/NRE-172290.

BACKGROUND: Postural instability is an important pathomarker in children with cerebral palsy (CP), and is often implicated in gait disturbance. **OBJECTIVE:** The purpose of this study was to investigate the therapeutic effects of long-term robotic hippotherapy (HPOT) on postural muscles size and static and dynamic postural stability in a child with CP. **METHODS:** Ultrasonography was used to measure postural muscles size. We also evaluated the magnitude of the separation between the center of pressure (COP) and center of mass (COM) during quiet stance and gait initiation (GI) using an eight-camera motion capture system and two force plates. Robotic HPOT was provided as a 45-minute session once per week for 12 weeks. **RESULTS:** As transverse abdominal (12%) and lumbar multifidus (60%) muscles size improved, normalized sway area (16%) during the quiet stance decreased. Similarly, the maximal resultant COP-COM distance (12.84%) during the initial phase of GI increased. **CONCLUSIONS:** In a child with CP, robotic HPOT may be an important treatment for improving postural muscles size and postural stability in static and dynamic states.

[PMID: 29562564](#)

8. Immediate effects of a single session of robot-assisted gait training using Hybrid Assistive Limb (HAL) for cerebral palsy.

Matsuda M, Mataki Y, Mutsuzaki H, Yoshikawa K, Takahashi K, Enomoto K, Sano K, Mizukami M, Tomita K, Ohguro H, Iwasaki N.

J Phys Ther Sci. 2018 Feb;30(2):207-212. doi: 10.1589/jpts.30.207. Epub 2018 Feb 20.

[Purpose] Robot-assisted gait training (RAGT) using Hybrid Assistive Limb (HAL, CYBERDYNE) was previously reported beneficial for stroke and spinal cord injury patients. Here, we investigate the immediate effect of a single session of RAGT using HAL on gait function for cerebral palsy (CP) patients. [Subjects and Methods] Twelve patients (average age: 16.2 ± 7.3 years) with CP received a single session of RAGT using HAL. Gait speed, step length, cadence, single-leg support per gait cycle, hip and knee joint angle in stance, and swing phase per gait cycle were assessed before, during, and immediately after HAL intervention. [Results] Compared to baseline values, single-leg support per gait cycle ($64.5 \pm 15.8\%$ to $69.3 \pm 12.1\%$), hip extension angle in mid-stance ($149.2 \pm 19.0^\circ$ to $155.5 \pm 20.1^\circ$), and knee extension angle in mid-stance ($137.6 \pm 20.2^\circ$ to $143.1 \pm 19.5^\circ$) were significantly increased immediately after intervention. Further, the knee flexion angle in mid-swing was significantly decreased immediately after treatment ($112.0 \pm 15.5^\circ$ to $105.2 \pm 17.1^\circ$). Hip flexion angle in mid-swing also decreased following intervention ($137.2 \pm 14.6^\circ$ to $129.7 \pm 16.6^\circ$), but not significantly. Conversely, gait speed, step length, and cadence were unchanged after intervention. [Conclusion] A single-time RAGT with HAL improved single-leg support per gait cycle and hip and knee joint angle during gait, therapeutically improving gait function in CP patients.

[PMID: 29545679](#)

9. A wearable resistive robot facilitates locomotor adaptations during gait.

Washabaugh EP, Krishnan C.

Restor Neurol Neurosci. 2018;36(2):215-223. doi: 10.3233/RNN-170782.

BACKGROUND: Robotic-resisted treadmill walking is a form of task-specific training that has been used to improve gait function in individuals with neurological injury, such as stroke, spinal cord injury, or cerebral palsy. Traditionally, these devices use active elements (e.g., motors or actuators) to provide resistance during walking, making them bulky, expensive, and less suitable for overground or in-home rehabilitation. We recently developed a low-cost, wearable robotic brace that generates resistive torques across the knee joint using a simple magnetic brake. However, the possible effects of training with this device on gait function in a clinical population are currently unknown. OBJECTIVE: The purpose of this study was to test the acute effects of resisted walking with this device on kinematics, muscle activation patterns, and gait velocity in chronic stroke survivors. METHODS: Six stroke survivors wore the resistive brace and walked on a treadmill for 20 minutes (4×5 minutes) at their self-selected walking speed while simultaneously performing a foot trajectory-tracking task to minimize stiff-knee gait. Electromyography, sagittal plane gait kinematics, and overground gait velocity were collected to evaluate the acute effects of the device on gait function. RESULTS: Robotic-resisted treadmill training resulted in a significant increase in quadriceps and hamstring EMG activity during walking. Significant aftereffects (i.e., improved joint excursions) were also observed on the hip and knee kinematics, which persisted for several steps after training. More importantly, training resulted in significant improvements in overground gait velocity. These results were consistent in all the subjects tested. CONCLUSION: This study provides preliminary evidence indicating that robotic-resisted treadmill walking using our knee brace can result in meaningful biomechanical aftereffects that translate to overground walking.

[PMID: 29526856](#)

10. Incidence of scoliosis in cerebral palsy.

Hägglund G, Pettersson K, Czuba T, Persson-Bunke M, Rodby-Bousquet E.

Acta Orthop. 2018 Mar 14:1-5. doi: 10.1080/17453674.2018.1450091. [Epub ahead of print]

Background and purpose - Surveillance of scoliosis in individuals with cerebral palsy (CP) is important for ensuring timely diagnosis and identification of curve progression. We analyzed the incidence of scoliosis in relation to age, sex, and gross motor function in a population-based cohort of individuals with CP. Patients and methods - This was a prospective register study of all 1,025 individuals born 1990-2012 in southern Sweden (1.4 million inhabitants) in the Swedish surveillance program for CP, which included >95% of the total population of people with CP in the area. Annual clinical examinations and radiographic measurement of the Cobb angle of those with a moderate or severe scoliosis were registered. We determined the incidence of scoliosis related to age, sex, and the Gross Motor Function Classification System (GMFCS) level. Results - The inclusion criteria were fulfilled by 962 individuals. The number of people (140/962) with scoliosis increased up to 20-25 years of age. The incidence of scoliosis was related to age and GMFCS level. In individuals at the lowest level of gross motor function (GMFCS V) scoliosis was seen in 10/131 before 5 years of age and at the age of 20 years 75% of these individuals had

a Cobb angle $\geq 40^\circ$. No one in the highest level of motor function (GMFCS I) developed a Cobb angle $\geq 40^\circ$ Interpretation - Surveillance programs for scoliosis in CP should be based on age and GMFCS level and should be initiated at a young age and continued into adulthood.

[PMID: 29537343](#)

11. Comparison of Morphological Characteristics of the Subaxial Cervical Spine between Athetoid Cerebral Palsy and Normal Control.

Kim JY, Kwon JY, Kim MS, Lee JJ, Kim IS, Hong JT.

J Korean Neurosurg Soc. 2018 Mar;61(2):243-250. doi: 10.3340/jkns.2017.0303.011. Epub 2018 Feb 28.

OBJECTIVE: To compare the morphometry of subaxial cervical spine between cerebral palsy (CP) and normal control. **METHODS:** We retrospectively analyzed 72 patients with CP, as well as 72 patients from normal population. The two groups were matched for age, sex, and body mass index. Pedicle, lateral mass (LM), and vertebral foramen were evaluated using computed tomography (CT) imaging. Pedicle diameter, LM height, thickness, width and vertebral foramen asymmetry (VFA) were measured and compared between the two groups. Cervical dynamic motion, disc and facet joint degeneration were investigated. Additionally, we compared the morphology of LM between convex side and concave side with cervical scoliotic CP patients. **RESULTS:** LM height was smaller in CP group. LM thickness and width were larger in CP group at mid-cervical level. In 40 CP patients with cervical scoliosis, there were no height and width differences between convex and concave side. Pedicle outer diameter was not statistically different between two groups. Pedicle inner diameter was significantly smaller in CP group. Pedicle sclerosis was more frequent in CP patients. VFA was larger in CP group at C3, C4, and C5. Disc/facet degeneration grade was higher in the CP group. Cervical motion of CP group was smaller than those of the control group. **CONCLUSION:** LM morphology of CP patients was different from normal population. Sclerotic pedicles and vertebral foramen asymmetry were more commonly identified in CP patients. CP patients were more likely to demonstrate progressive disc/facet degeneration. This data may provide useful information on cervical posterior instrumentation in CP patients.

[PMID: 29526068](#)

12. Intrathecal Baclofen Therapy Prior to Spinal Fusion for Patients With Gross Motor Function Classification System IV-V Cerebral Palsy.

Buxton K, Difazio R, Morgan A, McCabe M, Forbes PW.

Orthop Nurs. 2018 Mar/Apr;37(2):136-143. doi: 10.1097/NOR.0000000000000434.

BACKGROUND: Patients with Gross Motor Function Classification System (GMFCS) IV-V cerebral palsy (CP) have significant spasticity and frequently develop scoliosis. Intrathecal baclofen (ITB) pumps are effective in managing spasticity. The effect of ITB therapy on the postoperative course following spinal fusion in patients with GMFCS IV-V CP has not been described. This study sought to compare postoperative recovery, including complications, in patients using ITB therapy with those with no ITB therapy. **PURPOSE:** Evaluate the effect of ITB on the postoperative recovery for patients with GMFCS IV-V CP who undergo spinal fusion for scoliosis. **METHODS:** Health records for patients with GMFCS IV-V CP who underwent a spinal fusion for scoliosis at a major quaternary-care children's hospital from January 2009 to October 2015 were reviewed and relevant data were abstracted. Descriptive statistics and regression models were used to compare patients. **RESULTS:** Sixty-nine patients were included-19 ITB therapy and 50 no ITB therapy. Demographic and operative characteristics were similar across groups. The mean length of stay for patients in the ITB therapy group was 11.2 days and 14.3 days for the no ITB therapy group, with no difference between groups ($p = .12$). Pain scores in both groups decreased at the same rate, with scores in the ITB therapy group averaging one-half point lower ($p = .32$). The average amount of morphine equivalents ($p = .71$) and benzodiazepine equivalents ($p = .53$) used were similar between groups. Complication rates were significantly different between groups. Four (21%) of the ITB therapy patients had 1 or more complications whereas 28 (56%, $p = .01$) in the no ITB therapy group had 1 or more complications. The average number of complications per patient in the ITB therapy group was 0.3 (SD: 0.075, range: 0-3) and the no ITB therapy group was 1.1 (SD: 1.1, range: 0-6, $p = .01$). **CONCLUSIONS:** There was no significant difference in length of stay, pain scores, or pain/spasticity medication use between groups after spinal fusion, but there was a significantly lower incidence of complications in the ITB therapy group.

[PMID: 29570548](#)

13. Surgical reconstruction of hip subluxation and dislocation in children with cerebral palsy.

Oto M, Sarıkaya İA, Erdal OA, Şeker A.

Eklemler Hastalıkları Cerrahisi. 2018 Apr;29(1):8-12. doi: 10.5606/ehc.2018.59227.

OBJECTIVES: This study aims to review the efficacy of femoral varus derotation osteotomy (VDRO) and Dega transiliac osteotomy in the treatment of hip subluxation and dislocation of cerebral palsy (CP) patients. **PATIENTS AND METHODS:** This retrospective study included 25 hips of 22 CP patients (9 males, 13 females; mean age 8.7 years; range 4 to 18 years) who were operated due to hip subluxation and dislocation between July 2010 and December 2015. The mean follow-up period was 36.1±10.4 months (range, 20 to 65.6 months). Femoral VDRO and Dega transiliac osteotomy were performed in all cases. None of the patients were administered cast immobilization postoperatively. Patients were evaluated clinically with gross motor function classification system preoperatively and at the follow-up period. Acetabular index (AI), migration percentage (MP), and neck-shaft angle (NSA) were measured and documented by pelvic radiographs taken pre- and postoperatively and at the follow-up period. Intra- and postoperative complications were recorded. **RESULTS:** Gross motor function classification system scores improved in 16 patients. Mean AI was 33.2° preoperatively and 20.4° postoperatively. In preoperative period, MP and NSA were 72.7% and 160°, respectively, which improved to 24.3% and 130°, respectively, postoperatively. The postoperative improvement in AI, NSA and MP were statistically significant ($p<0.001$). We performed revision surgery due to implant failure in two patients and detected hip subluxation due to increased pelvic obliquity in one patient who had thoracolumbar scoliosis. **CONCLUSION:** In CP patients, reconstruction of hip subluxation and dislocation with femoral VDRO and Dega transiliac osteotomy establish femoroacetabular congruency. Without any cast immobilization, early physical therapy is encouraged for immediate recovery.

[PMID: 29526153](#)

14. Mid-term development of hamstring tendon length and velocity after distal femoral extension osteotomy in children with bilateral cerebral palsy: a retrospective cohort study.

Salami F, Wagner J, van Drongelen S, Klotz MCM, Dreher T, Wolf SI, Niklasch M.

Dev Med Child Neurol. 2018 Mar 14. doi: 10.1111/dmcn.13739. [Epub ahead of print]

AIM: Flexed knee gait can be treated with distal femoral extension osteotomy (DFEO) and additional patellar tendon advancement (PTA) in children with cerebral palsy (CP). This study assesses changes in hamstring muscle tendon length (MTL) and velocity after DFEO (+PTA). **METHOD:** Nineteen children (mean age 13y [standard deviation 3y] at surgery) with CP and flexed knee gait who were treated with DFEO (15 limbs) or DFEO+PTA (10 limbs) were retrospectively included in this study. Gait analyses were performed preoperatively (E0), 1 year postoperatively (E1), and for 10 limbs additionally 2 to 5 years postoperatively (E2). Hamstring MTL and velocities were assessed at all examination dates using OpenSim. **RESULTS:** Hamstring MTL and velocity did not change significantly over time. From E0 to E1, knee flexion in stance improved for both DFEO and DFEO+PTA ($p<0.05$), knee flexion in swing only improved after DFEO+PTA ($p<0.05$). The improved knee flexion in stance and swing was maintained at E2. **INTERPRETATION:** DFEO led to a significant improvement in knee kinematics at E1 which was maintained at E2. DFEO seems to prevent recurrent hamstring tightness but does not lead to lengthened or fastened hamstrings. **WHAT THIS PAPER ADDS:** Distal femoral extension osteotomy (DFEO) does not change hamstring muscle tendon length. DFEO does not change hamstring lengthening velocity. DFEO leads to a significant improvement in knee kinematics. Changes in knee kinematics after DFEO can be maintained at mid-term. DFEO seems to prevent recurrent hamstring tightness.

[PMID: 29536527](#)

15. Influence of surgery involving tendons around the knee joint on ankle motion during gait in patients with cerebral palsy.

Lee SY, Kwon SS, Chung CY, Lee KM, Sung KH, Kim S, Park MS.

BMC Musculoskelet Disord. 2018 Mar 15;19(1):82. doi: 10.1186/s12891-018-2003-0.

BACKGROUND: Simultaneous motion of the knee and ankle joints is required for many activities including gait. We aimed to evaluate the influence of surgery involving tendons around the knee on ankle motion during gait in the sagittal plane in cerebral palsy patients. **METHODS:** We included data from 55 limbs in 34 patients with spastic cerebral palsy. Patients were followed up after undergoing only distal hamstring lengthening with or without additional rectus femoris transfer. The patients' mean age at the time of knee surgery was 11.2 ± 4.7 years, and the mean follow-up duration was 2.2 ± 1.5 years (range, 0.9-6.0 years). Pre- and postoperative kinematic variables that were extracted from three-dimensional gait analyses were then compared to assess changes in ankle motion after knee surgery. Outcome measures included ankle dorsiflexion at initial contact, peak ankle

dorsiflexion during stance, peak ankle dorsiflexion during swing, and dynamic range of motion of the ankle. Various sagittal plane knee kinematics were also measured and used to predict ankle kinematics. A linear mixed model was constructed to estimate changes in ankle motion after adjusting for multiple factors. **RESULTS:** Improvement in total range of motion of the knee resulted in improved motion of the ankle joint. We estimated that after knee surgery, ankle dorsiflexion at initial contact, peak ankle dorsiflexion during stance, peak ankle dorsiflexion during swing, and dynamic range of motion of the ankle decreased, respectively, by 0.4° ($p = 0.016$), 0.6° ($p < 0.001$), 0.2° ($p = 0.038$), and 0.5° ($p = 0.006$) per degree increase in total range of motion of the knee after either knee surgery. Furthermore, dynamic range of motion of the ankle increased by 0.4° per degree increase in postoperative peak knee flexion during swing. **CONCLUSIONS:** Improvement in total knee range of motion was found to be correlated with improvement in ankle kinematics after surgery involving tendons around the knee. As motion of the knee and ankle joints is cross-linked, surgeons should be aware of potential changes in the ankle joint after knee surgery.

[PMID: 29544488](#)

16. The tonic response to the infant knee jerk as an early sign of cerebral palsy.

Hamer EG, La Bastide-Van Gemert S, Boxum AG, Dijkstra LJ, Hielkema T, Jeroen Vermeulen R, Hadders-Algra M.

Early Hum Dev. 2018 Mar 14;119:38-44. doi: 10.1016/j.earlhumdev.2018.03.001. [Epub ahead of print]

BACKGROUND: Early identification of infants at risk of cerebral palsy (CP) is desirable in order to provide early intervention. We previously demonstrated differences in knee jerk responses between 3-month-old high risk and typically developing infants. **AIMS:** To improve early identification by investigating whether the presence of tonic responses (continuous muscle activity occurring after the typical phasic response), clonus or contralateral responses to the knee jerk during infancy is associated with CP. **STUDY DESIGN:** Longitudinal EMG-study. **SUBJECTS:** We included 34 high-risk infants (median gestational age 31.9 weeks) who participated in the LEARN2MOVE 0-2 years trial. **OUTCOME MEASURES:** Video-recorded knee jerk EMG-assessments were performed during infancy (1-4 times). Developmental outcome was assessed at 21 months corrected age (CA). Binomial generalized estimating equations models with repeated measurements were fitted using predictor variables. **RESULTS:** Infants who later were diagnosed with CP ($n = 18$) showed more often than infants who were not diagnosed with CP i) tonic responses - from 4 months CA onwards, ii) clonus - from 13 months CA onwards, and iii) contralateral responses - from 15 months CA onwards. **LIMITATIONS:** The main limitation is the relatively small sample size. **CONCLUSIONS:** The assessment of tonic responses to the knee jerk using EMG may be a valuable add-on tool to appraise a high risk of CP.

[PMID: 29549793](#)

17. A systematic review of randomised controlled trials assessing effectiveness of prosthetic and orthotic interventions.

Healy A, Farmer S, Pandyan A, Chockalingam N.

PLoS One. 2018 Mar 14;13(3):e0192094. doi: 10.1371/journal.pone.0192094. eCollection 2018.

BACKGROUND: Assistive products are items which allow older people and people with disabilities to be able to live a healthy, productive and dignified life. It has been estimated that approximately 1.5% of the world's population need a prosthesis or orthosis. **OBJECTIVE:** The objective of this study was to systematically identify and review the evidence from randomized controlled trials assessing effectiveness and cost-effectiveness of prosthetic and orthotic interventions. **METHODS:** Literature searches, completed in September 2015, were carried out in fourteen databases between years 1995 and 2015. The search results were independently screened by two reviewers. For the purpose of this manuscript, only randomized controlled trials which examined interventions using orthotic or prosthetic devices were selected for data extraction and synthesis. **RESULTS:** A total of 342 randomised controlled trials were identified (319 English language and 23 non-English language). Only 4 of these randomised controlled trials examined prosthetic interventions and the rest examined orthotic interventions. These orthotic interventions were categorised based on the medical conditions/injuries of the participants. From these studies, this review focused on the medical condition/injuries with the highest number of randomised controlled trials (osteoarthritis, fracture, stroke, carpal tunnel syndrome, plantar fasciitis, anterior cruciate ligament, diabetic foot, rheumatoid and juvenile idiopathic arthritis, ankle sprain, cerebral palsy, lateral epicondylitis and low back pain). The included articles were assessed for risk of bias using the Cochrane Risk of Bias tool. Details of the clinical population examined, the type of orthotic/prosthetic intervention, the comparator/s and the outcome measures were extracted. Effect sizes and odds ratios were calculated for all outcome measures, where possible. **CONCLUSIONS:** At present, for prosthetic and orthotic interventions, the scientific literature does not provide sufficient high quality research to allow strong conclusions on their effectiveness and cost-effectiveness.

[PMID: 29538382](#)

18. Predicting respiratory hospital admissions in young people with cerebral palsy.

Blackmore AM, Bear N, Blair E, Langdon K, Moshovis L, Steer K, Wilson AC.

Arch Dis Child. 2018 Mar 19. pii: archdischild-2017-314346. doi: 10.1136/archdischild-2017-314346. [Epub ahead of print]

OBJECTIVE: To determine the early predictors of respiratory hospital admissions in young people with cerebral palsy (CP). **DESIGN:** A 3-year prospective cohort study using linked data. **PATIENTS:** Children and young people with CP, aged 1 to 26 years. **MAIN OUTCOME MEASURES:** Self-reported and carer-reported respiratory symptoms were linked to respiratory hospital admissions (as defined by the International Statistical Classification of Diseases and Related Health Problems 10th Revision codes) during the following 3 years. **RESULTS:** 482 participants (including 289 males) were recruited. They were aged 1 to 26 years (mean 10 years, 10 months; SD 5 years, 11 months) at the commencement of the study, and represented all Gross Motor Function Classification Scale (GMFCS) levels. During the 3-year period, 55 (11.4%) participants had a total of 186 respiratory hospital admissions, and spent a total of 1475 days in hospital. Statistically significant risk factors for subsequent respiratory hospital admissions over 3 years in univariate analyses were GMFCS level V, at least one respiratory hospital admission in the year preceding the survey, oropharyngeal dysphagia, seizures, frequent respiratory symptoms, gastro-oesophageal reflux disease, at least two courses of antibiotics in the year preceding the survey, mealtime respiratory symptoms and nightly snoring. **CONCLUSIONS:** Most risk factors for respiratory hospital admissions are potentially modifiable. Early identification of oropharyngeal dysphagia and the management of seizures may help prevent serious respiratory illness. One respiratory hospital admission should trigger further evaluation and management to prevent subsequent respiratory illness.

[PMID: 29555725](#)

19. Oral Health Status and Dental Treatment Needs of 5-12-year-old Children with Disabilities Attending Special Schools in Western Maharashtra, India.

Shivakumar KM, Patil S, Kadashetti V, Raje V.

Int J Appl Basic Med Res. 2018 Jan-Mar;8(1):24-29. doi: 10.4103/ijabmr.IJABMR_57_17.

INTRODUCTION: The individuals suffering from various disabilities form a considerable proportion of the community. The psychological reactions associated with a deformity can be devastating to the disabled, parents, caregivers, and family which often lead to attitudes of hopelessness in the lives of these disabled individuals. **OBJECTIVES:** To assess the oral health status and treatment needs among 5-12-year-old children attending special school in Western Maharashtra, India. **MATERIALS AND METHODS:** A descriptive cross-sectional study was conducted among 5-12-year-old children attending special school in Western Maharashtra, India. The study group consisted of 100 children (62 males and 38 females). The oral health status was assessed by using decayed, missing, and filled teeth (DMFT) index, Community Periodontal Index, Dentition status and treatment needs. Information on disability status, intelligent quotient, and systemic diseases were recorded. **RESULTS:** The mean age of the study population was 9.35 ± 2.92 years. There were 62 (62%) males and 38 (38%) females in the study population. Among the total children examined, 50% of the children were suffering from mental retardation (MR), followed by MR with cerebral palsy (20%). The overall mean decayed and filled teeth and DMFT scores were 3.53 ± 1.02 and 3.89 ± 1.30 , respectively, and decayed component had the highest score in both the groups. A statistically significant difference has been observed among the gender ($P < 0.001$). **CONCLUSION:** There is a high proportion of dental treatment needs required for these children which reflect the barriers to access and utilize oral health care among these children. As dentist, we should emphasize on health education, periodic recall, and monitoring among these individuals.

[PMID: 29552531](#)

20. A common data language for clinical research studies: the National Institute of Neurological Disorders and Stroke and American Academy for Cerebral Palsy and Developmental Medicine Cerebral Palsy Common Data Elements Version 1.0 recommendations.

Schiariti V, Fowler E, Brandenburg JE, Levey E, McIntyre S, Sukal-Moulton T, Ramey SL, Rose J, Sienko S, Stashinko E, Vogtle L, Feldman RS, Koenig JI.

Dev Med Child Neurol. 2018 Mar 15. doi: 10.1111/dmcn.13723. [Epub ahead of print]

To increase the efficiency and effectiveness of clinical research studies, cerebral palsy (CP) specific Common Data Elements (CDEs) were developed through a partnership between the National Institute of Neurological Disorders and Stroke (NINDS) and the American Academy of Cerebral Palsy and Developmental Medicine (AAPDM). International experts reviewed existing NINDS CDEs and tools used in studies of children and young people with CP. CDEs were compiled, subjected to internal review, and posted online for external public comment in September 2016. Guided by the International Classification of Functioning, Disability and Health framework, CDEs were categorized into six domains: (1) participant characteristics; (2) health, growth, and genetics; (3) neuroimaging; (4) neuromotor skills and functional assessments; (5) neurocognitive, social, and emotional assessments; and (6) engagement and quality of life. Version 1.0 of the NINDS/AAPDM CDEs for CP is

publicly available on the NINDS CDE and AACPDM websites. Global use of CDEs for CP will standardize data collection, improve data quality, and facilitate comparisons across studies. Ongoing collaboration with international colleagues, industry, and people with CP and their families will provide meaningful feedback and updates as additional evidence is obtained. These CDEs are recommended for NINDS-funded research for CP. **WHAT THIS PAPER ADDS:** This is the first comprehensive Common Data Elements (CDEs) for children and young people with CP for clinical research. The CDEs for children and young people with CP include common definitions, the standardization of case report forms, and measures. The CDE guides the standardization for data collection and outcome evaluation in all types of studies with children and young people with CP. The CDE ultimately improves data quality and data sharing.

[PMID: 29542813](#)

21. Optimizing an eHealth insomnia intervention for children with neurodevelopmental disorders: a Delphi study.

Ali N, Rigney G, Weiss SK, Brown CA, Constantin E, Godbout R, Hanlon-Dearman A, Ipsiroglu O, Reid GJ, Shea S, Smith IM, Van der Loos M, Corkum PV.

Sleep Health. 2018 Apr;4(2):224-234. doi: 10.1016/j.sleh.2017.12.008. Epub 2018 Feb 22.

Insomnia, which is related to daytime deficits and is a common problem for children with neurodevelopmental disorders (NDDs), is often successfully treated with behavioral strategies. However, there are barriers to accessing these treatments, and there has been little research examining what these interventions need to be usable and effective. The goal of this study was to gain consensus from experts in the field on the key components of an eHealth, parent-implemented, intervention program aimed at improving sleep in children with attention-deficit/hyperactivity disorder, autism spectrum disorder, cerebral palsy, and fetal alcohol spectrum disorder. This was achieved using the Delphi method, which involves asking participants to respond to open-ended questions about a topic of interest and then, in iterative rounds, to rate the recommendations that were made by the group. In the current study, participants (27 responders in the first round, 21 in the second, and 18 in the third) rated a total of 131 recommendations. Of those 131 recommendations, 52 items had high importance and high consensus and were deemed to be priority items to consider for creating an eHealth, parent-delivered, behaviorally-based intervention for insomnia in children with NDD. Furthermore, 75% (n = 84) of the 112 recommendations from the first round were believed to be applicable across all 4 NDD groups, thus providing evidence of the potential for a transdiagnostic intervention.

[PMID: 29555138](#)

22. A whole new world: a qualitative investigation of parents' experiences in transitioning their preterm child with cerebral palsy to developmental/rehabilitation services.

Ballantyne M, Bernardo S, Sozer A, Orava T, McPherson AC, Church P, Fehlings D.

Dev Neurorehabil. 2018 Mar 12:1-11. doi: 10.1080/17518423.2018.1434698. [Epub ahead of print]

BACKGROUND: Parents' experiences transitioning their children from neonatal to developmental/rehabilitation services (DRS) are unknown. **METHODS:** A qualitative descriptive approach was used, including interviews with 18 parents (13 mothers and 5 fathers) of children born preterm and diagnosed with cerebral palsy (CP), located in a large urban center in Canada. Interview data underwent thematic analysis. **RESULTS:** Parents' experiences with transition to DRS were a whole new world with three key themes: Wanting to know what to expect, feeling supported in their transition, and getting there emotionally and physically. Transition broke an emotional bond with neonatal services while parents were simultaneously entering DRS, experiencing their child's CP diagnosis, and reliving prior emotional trauma. **CONCLUSIONS:** The findings reveal a cumulative emotional burden for parents in the first 3 years of life; a known critical period for parenting and early childhood development. Early transition interventions should consider including enhanced supports and services for parents.

[PMID: 29528280](#)

23. Differences in Sexual Behavior of Teenagers and Young Adults with Cerebral Palsy: The Role of Sexual Needs and Sexual Esteem.

Czapla K, Otrębski W.

Sex Disabil. 2018;36(1):33-46. doi: 10.1007/s11195-017-9512-x. Epub 2017 Nov 29.

Sexuality is an inherent attribute of all human beings regardless of their race, religion and the level of physical fitness. The way it is perceived and manifested is determined by a number of biopsychosocial factors. In some people, including persons with cerebral palsy, the factors and their influence are rooted in the psychophysical condition of the human body. The aim of this

study was to answer the question about how the levels of sexual esteem and sexual needs differentiate the sexual behaviors of young people with cerebral palsy. The study being presented was conducted with 62 young persons with cerebral palsy (half women and half men), who were selected using purposive sampling. They were aged 15-25 years and were individuals without cognitive difficulties. The research tool used was the Cerebral Palsy Individual's Sexual Behavior Questionnaire developed by the authors. The findings of the study showed that half of the participants engaged in various sexual behaviors from the list that was presented to them. The frequencies of these engagements depended on the levels of their sexual esteem and sexual needs. Persons characterized by high levels of sexual esteem and sexual needs (much fewer than those with the low levels of both characteristics) engaged in sexual behaviors significantly more frequently. The most frequent among them was direct engagement in sexual activity (petting and sexual intercourse; $p \leq .001$) and then exposure to sexually explicit magazines or films ($p \leq .05$).

[PMID: 29568142](#)

24. Documenting an epidemic of suffering: low health-related quality of life among transgender youth.

Zou Y, Szczesniak R, Teeters A, Conard LAE, Grosseohme DH.

Qual Life Res. 2018 Mar 21. doi: 10.1007/s11136-018-1839-y. [Epub ahead of print]

PURPOSE: To quantify HRQOL of TGN patients using the PedsQL 4.0 generic core scales, and to compare reported HRQOL of TGN adolescents with published data from comparison populations. **METHODS:** Transgender children and adolescents ($N = 142$; 68% natal females) ages 6-23 years ($M = 15.9$, $SD = 3.7$) attending an outpatient clinic for TGN care at an academic pediatric hospital and caregivers of children and adolescents ($N = 95$) completed the PedsQL 4.0 generic core scales. Scores were compared with published scores for healthy adolescents and adolescents with 10 chronic diseases. **RESULTS:** TGN youth reported significantly lower overall HRQOL (more than twice the clinically meaningful difference) compared to youth without chronic disease. Total self-reported TGN HRQOL ($M(SD)$, 65.72(17.40)) was lower than all chronic disease comparison groups except for rheumatology and cerebral palsy. TGN youth reported physical functioning ($M(SD)$, 75.33(22.87)) lower than or similar to chronically ill comparisons, but higher than rheumatology and cerebral palsy groups. Psychosocial functioning ($M(SD)$, 59.87(17.83)) was lower than all comparison samples and similar to youth with cerebral palsy. Results were similar for parent proxy-reports of TGN youth HRQOL (LS means: 68.75; 95% CI 65.87-71.61 vs 66.16; 95% CI 62.87-69.45; $p = 0.12$). **CONCLUSIONS:** TGN youth reported low HRQOL across all domains; most were significantly lower than healthy peers or peers with chronic diseases. Clinicians should understand the magnitude of TGN youth's low HRQOL and offer them and their caregivers resources to maximize their ability to achieve their full potential for healthy and productive lives.

[PMID: 29564711](#)

25. [Mental impairment in children with cerebral palsy: diagnosis and treatment].

[Article in Russian; Abstract available in Russian from the publisher]

Nemkova SA.

Zh Nevrol Psikhiatr Im S S Korsakova. 2018;118(2):105-113. doi: 10.17116/jnevro201811821105-113.

The article covers the problems of diagnosis and treatment of mental impairment in children with cerebral palsy. Mental disorders in cerebral palsy include cognitive impairment (disorders of perception, memory, attention, motor-visual coordination, intelligence and speech), border disorders (cerebral/asthenic, neurosis-like, psychopathic-like syndromes) and personality disorders (accentuation of character, mental infantilism). Diagnosis of mental disorders in patients with cerebral palsy is a challenging task, due to various combinations of them with physical, speech and sensory disorders, which requires a differentiated approach. Current trends in comprehensive system of rehabilitation, including medical and social, and psychological-pedagogical correction of cognitive, emotional and behavioral disorders, in cerebral palsy are reviewed. Experience of using cortexin, which compensates for cognitive impairment and improves social adaptation, is discussed.

[PMID: 29560951](#)

26. "Everyone sees you sitting there struggling with your food": experiences of adolescents and young adults with cerebral palsy.

Remijn L, van den Engel-Hoek L, Satink T, de Swart BJM, Nijhuis-van der Sanden MWG.

Disabil Rehabil. 2018 Mar 21:1-8. doi: 10.1080/09638288.2018.1451923. [Epub ahead of print]

OBJECTIVE: The impact of difficulties with eating and drinking in adolescents and young adults with cerebral palsy is unknown. The purpose of this study is to find out which difficulties adolescents and young adults with cerebral palsy experience with eating and drinking in daily life and how they deal with these difficulties. The study also explores how they think about themselves with respect to eating and what does or does not help regarding social participation. **METHOD:** We collected the data from ten participants with spastic cerebral palsy (aged 15-23 years) living in the Netherlands. We used a qualitative study design with a conventional content analysis. Semi-structured in-depth interviews were used to identify meaningful factors related to eating and drinking difficulties. We coded relevant phrases from each interview and clustered and synthesized them into categories. **RESULT:** We derived four categories from the transcripts: (I) perceived eating and drinking difficulties (e.g., not managing to eat all food textures and/or choking); (II) challenges in physical and social context (e.g., accessibility of restaurants, menu supply, and/or needing assistance or not); (III) dealing with eating and drinking difficulties (e.g., adaptation, food avoidance, and/or giving up); (IV) Negative feelings about their eating and drinking (e.g., shame, frustration, fear for choking, and/or concerns about the future). One striking finding was that most participants had not recently received either monitoring or intervention for their feeding skills. **CONCLUSION:** This study shows that adolescents and young adults with cerebral palsy experience many restrictions in eating and drinking situations leading to negative feelings and lower participation levels, while little attention is directed towards these difficulties. Regular multidisciplinary rehabilitation programs should include evaluation, advice, and intervention regarding eating and drinking ability in order to increase social participation and self-management. Implications for Rehabilitation Adolescents and young adults with cerebral palsy experience difficulties with eating, drinking, and swallowing, and they encounter difficulties in participating in mealtimes with family and friends. Although adolescents and young adults with cerebral palsy rated their eating and drinking abilities as reasonable, they reported feelings of shame, frustration, fear, distress, and concerns for the future or unknown environments. Regular multidisciplinary involvement with eating and drinking is needed for purposes of evaluation, advice, and intervention throughout the life course, adjusted to living conditions and the latest evidence. Adolescents and young adults with cerebral palsy showed limited initiative in asking for personal assistance in eating and drinking activities.

[PMID: 29558834](#)

27. A review of preference-based measures for the assessment of quality of life in children and adolescents with cerebral palsy.

Mpundu-Kaambwa C, Chen G, Huynh E, Russo R, Ratcliffe J.

Qual Life Res. 2018 Mar 22. doi: 10.1007/s11136-018-1837-0. [Epub ahead of print]

PURPOSE: To examine the psychometric properties and suitability for use within the context of cerebral palsy research in children and adolescents of generic preference-based outcome measures (PROMs). **METHODS:** Nine electronic databases were searched in this systematic review. The consensus-based standards for the selection of health measurement instruments (COSMIN) checklist were used to measure the psychometric properties of the PROMs. A meta-analysis was used to pool correlation coefficients for convergent validity using the Schmidt-Hunter method. Heterogeneity was assessed using the I-squared statistic (I²). **RESULTS:** Four preference-based PROMs were identified from eight studies: Health Utilities Index-Mark 2 and 3 (HUI-2 and HUI-3, respectively), the Assessment Quality of Life-4 dimension (AQoL-4D) and the EuroQoL-5 dimension 3 level (EQ-5D-3L). Only the HUI system was primarily developed for application with children/adolescents though health-state values for scoring the PROM were elicited from adults. The HUI-3 covered the most relevant constructs though it excludes important modules of health-related quality of life (HRQOL) such as activity limitations and participation restrictions. In terms of psychometric properties, evidence was presented for only five of COSMIN measurement properties: reliability (HUI3), measurement error (HUI-3), content validity (HUI-2 and HUI-3), Hypotheses testing (HUI-3 and AQoL-4D) and criterion validity (HUI-3). No papers reported on internal consistency, structural validity, cross-cultural validity or responsiveness of the preference-based measures in children and adolescents with cerebral palsy. **CONCLUSIONS:** This review highlights the dearth in studies using preference-based PROMs to measure HRQOL associated with cerebral palsy in children and adolescents. The HUI-3 demonstrated the strongest psychometric properties, though it does not cover all dimensions relevant to this population.

[PMID: 29569017](#)

28. Economic evaluations of interventions for people with cerebral palsy: implications for future research.

Marцениuk G.

Dev Med Child Neurol. 2018 Mar 22. doi: 10.1111/dmcn.13745. [Epub ahead of print]

[This commentary is on the systematic review by Shih et al]

[PMID: 29569231](#)

Prevention and Cure

29. Dose-Dependent Effect of Intravenous Administration of Human Umbilical Cord-Derived Mesenchymal Stem Cells in Neonatal Stroke Mice.

Tanaka E, Ogawa Y, Mukai T, Sato Y, Hamazaki T, Nagamura-Inoue T, Harada-Shiba M, Shintaku H, Tsuji M.

Front Neurol. 2018 Mar 8;9:133. doi: 10.3389/fneur.2018.00133. eCollection 2018.

Neonatal brain injury induced by stroke causes significant disability, including cerebral palsy, and there is no effective therapy for stroke. Recently, mesenchymal stem cells (MSCs) have emerged as a promising tool for stem cell-based therapies. In this study, we examined the safety and efficacy of intravenously administered human umbilical cord-derived MSCs (UC-MSCs) in neonatal stroke mice. Pups underwent permanent middle cerebral artery occlusion at postnatal day 12 (P12), and low-dose (1×10^4) or high-dose (1×10^5) UC-MSCs were administered intravenously 48 h after the insult (P14). To evaluate the effect of the UC-MSC treatment, neurological behavior and cerebral blood flow were measured, and neuroanatomical analysis was performed at P28. To investigate the mechanisms of intravenously injected UC-MSCs, systemic blood flowmetry, in vivo imaging and human brain-derived neurotrophic factor (BDNF) measurements were performed. Functional disability was significantly improved in the high-dose UC-MSC group when compared with the vehicle group, but cerebral blood flow and cerebral hemispheric volume were not restored by UC-MSC therapy. The level of exogenous human BDNF was elevated only in the cerebrospinal fluid of one pup 24 h after UC-MSC injection, and in vivo imaging revealed that most UC-MSCs were trapped in the lungs and disappeared in a week without migration toward the brain or other organs. We found that systemic blood flow was stable over the 10 min after cell administration and that there were no differences in mortality among the groups. Immunohistopathological assessment showed that the percent area of Iba1-positive staining in the peri-infarct cortex was significantly reduced with the high-dose UC-MSC treatment compared with the vehicle treatment. These results suggest that intravenous administration of UC-MSCs is safe for a mouse model of neonatal stroke and improves dysfunction after middle cerebral artery occlusion by modulating the microglial reaction in the peri-infarct cortex.

[PMID: 29568282](#)

30. In Utero Administration of Drugs Targeting Microglia Improves the Neurodevelopmental Outcome Following Cytomegalovirus Infection of the Rat Fetal Brain.

Cloarec R, Bauer S, Teissier N, Schaller F, Luche H, Courtens S, Salmi M, Pauly V, Bois E, Pallesi-Pocachard E, Buhler E, Michel FJ, Gressens P, Malissen M, Stamminger T, Streblov DN, Bruneau N, Szepietowski P.

Front Cell Neurosci. 2018 Mar 6;12:55. doi: 10.3389/fncel.2018.00055. eCollection 2018.

Congenital cytomegalovirus (CMV) infections represent one leading cause of neurodevelopmental disorders. Recently, we reported on a rat model of CMV infection of the developing brain in utero, characterized by early and prominent infection and alteration of microglia—the brain-resident mononuclear phagocytes. Besides their canonical function against pathogens, microglia are also pivotal to brain development. Here we show that CMV infection of the rat fetal brain recapitulated key postnatal phenotypes of human congenital CMV including increased mortality, sensorimotor impairment reminiscent of cerebral palsy, hearing defects, and epileptic seizures. The possible influence of early microglia alteration on those phenotypes was then questioned by pharmacological targeting of microglia during pregnancy. One single administration of clodronate liposomes in the embryonic brains at the time of CMV injection to deplete microglia, and maternal feeding with doxycycline throughout pregnancy to modify microglia in the litters' brains, were both associated with dramatic improvements of survival, body weight gain, sensorimotor development and with decreased risk of epileptic seizures. Improvement of microglia activation status did not persist postnatally after doxycycline discontinuation; also, active brain infection remained unchanged by doxycycline. Altogether our data indicate that early microglia alteration, rather than brain CMV load per se, is instrumental

in influencing survival and the neurological outcomes of CMV-infected rats, and suggest that microglia might participate in the neurological outcome of congenital CMV in humans. Furthermore this study represents a first proof-of-principle for the design of microglia-targeted preventive strategies in the context of congenital CMV infection of the brain.

[PMID: 29559892](#)

31. Motor Impairment Trends in Extremely Preterm Children: 1991-2005.

Spittle AJ, Cameron K, Doyle LW, Cheong JL; Victorian Infant Collaborative Study Group.

Pediatrics. 2018 Mar 22. pii: e20173410. doi: 10.1542/peds.2017-3410. [Epub ahead of print]

BACKGROUND: There are increasing numbers of surviving children who were born extremely preterm (EP; gestational age <28 weeks) or extremely low birth weight (ELBW; birth weight <1000 g). Our objective in this study was to compare the rates of motor impairment at 8 years of age between 3 cohorts of EP and/or ELBW and term-born children to establish if motor impairment rates are changing over time. **METHODS:** All children born EP and/or ELBW in the calendar years of 1991-1992, 1997, and 2005 in Victoria, Australia, were recruited at birth. Randomly selected normal birth weight (>2499 g) and term-born controls were matched for expected date of birth, sex, and sociodemographic status. At 8 years' corrected age, motor impairment was defined as cerebral palsy (CP) or a score less than the fifth centile on the Movement Assessment Battery for Children for the 1991-1992 and 1997 cohorts and less than or equal to the fifth centile on the Movement Assessment Battery for Children-Second Edition for the 2005 cohort. **RESULTS:** Motor impairment was more likely in children born EP and/or ELBW compared with children born at term for all epochs. There was a significant increase in motor impairment in EP and/or ELBW children over the 3 eras, from 23% in 1991-1992 and 26% in 1997 to 37% in 2005 ($\chi^2_{trend} = 10.2$; $P = .001$). This was due to an increase in non-CP motor impairment (13% in 1991 to 1992; 15% in 1997; 26% in 2005; $\chi^2_{trend} = 12.5$; $P < .001$), not CP (11% in 1991 to 1992; 11% in 1997; 12% in 2005). **CONCLUSIONS:** The rate of motor impairment in EP and/or ELBW children assessed at 8 years of age increased between eras, an increase caused by non-CP motor impairment.

[PMID: 29567814](#)

32. A case of new PCDH12 gene variants presented as dyskinetic cerebral palsy with epilepsy.

Suzuki-Muromoto S, Wakusawa K, Miyabayashi T, Sato R, Okubo Y, Endo W, Inui T, Togashi N, Kato A, Oba H, Nakashima M, Saitsu H, Matsumoto N, Haginoya K.

J Hum Genet. 2018 Mar 19. doi: 10.1038/s10038-018-0432-0. [Epub ahead of print]

Here we report a Japanese patient with new compound heterozygous truncating variants in the PCDH12 gene. As compared to the previously reported families who had congenital microcephaly, intrauterine growth retardation, intracranial calcification, and neonatal seizure associated with dysplasia of the midbrain-hypothalamus-optic tract, the present patient showed no midbrain-hypothalamus dysplasia or congenital/postnatal microcephaly, but dyskinetic cerebral palsy and severe intellectual disability as well as multifocal epilepsy. To understand phenotypic spectrum associated with PCDH12 variants, more reports are needed.

[PMID: 29556033](#)

33. Glia and hemichannels: key mediators of perinatal encephalopathy.

Galinsky R, Davidson JO, Dean JM, Green CR, Bennet L, Gunn AJ.

Neural Regen Res. 2018 Feb;13(2):181-189. doi: 10.4103/1673-5374.226378.

Perinatal encephalopathy remains a major cause of disability, such as cerebral palsy. Therapeutic hypothermia is now well established to partially reduce risk of disability in late preterm/term infants. However, new and complementary therapeutic targets are needed to further improve outcomes. There is increasing evidence that glia play a key role in neural damage after hypoxia-ischemia and infection/inflammation. In this review, we discuss the role of astrocytic gap junction (connexin) hemichannels in the spread of neural injury after hypoxia-ischemia and/or infection/inflammation. Potential mechanisms of hemichannel mediated injury likely involve impaired intracellular calcium handling, loss of blood-brain barrier integrity and release of adenosine triphosphate (ATP) resulting in over-activation of purinergic receptors. We propose the hypothesis that inflammation-induced opening of connexin hemichannels is a key regulating event that initiates a vicious cycle of excessive ATP release, which in turn propagates activation of purinergic receptors on microglia and astrocytes. This suggests that

developing new neuroprotective strategies for preterm infants will benefit from a detailed understanding of glial and connexin hemichannel responses.

[PMID: 29557357](#)

34. Long-Term Neurodevelopmental Outcomes of Premature Infants in Singapore.

Teo CM, Poon WB, Ho SK.

Ann Acad Med Singapore. 2018 Feb;47(2):63-70.

INTRODUCTION: Neonatal care advances have resulted in improved survival but have raised concerns of increase in neurodevelopmental impairment. This study looked at long-term neurodevelopmental outcomes at ages 5 and 8 years of very low birthweight infants born in the 2000s as compared to the 1990s. Neurodevelopmental assessment at 2 years old was compared to that at 5 and 8 years to determine if assessment at 2 years was predictive of later outcomes. **MATERIALS AND METHODS:** A retrospective cohort study of consecutive infants with birthweight less than 1250 grams admitted to a tertiary centre in Singapore between January 1994 to December 1995 (Epoch I) and January 2004 to December 2005 (Epoch II) were included. Neurodevelopmental impairment was defined as having intelligence quotient (IQ) of less than 70, cerebral palsy, legal blindness, or hearing impairment requiring hearing aids. **RESULTS:** Mean gestational age was lower for Epoch II compared to Epoch I (28.1 ± 2.5 vs 29.4 ± 2.7 weeks, $P = 0.004$). Death or neurodevelopmental impairment rates did not differ (24.3% and 17.1% at 5 years old, $P = 0.398$; 29.1% and 25.0% at 8 years old, $P = 0.709$). There was improvement in visual impairment rate at 8 years in Epoch II (10.7% vs 34.0%, $P = 0.024$). Mean IQ was better in Epoch II (109 and 107 vs 97 and 99 at 5 [$P = 0.001$] and 8 years [$P = 0.047$], respectively). All infants with no neurodevelopmental impairment at 2 years remained without impairment later on. **CONCLUSION:** Over a decade, neurodevelopmental outcomes did not worsen despite lower mean gestational age. Long-term improvement in IQ scores and a reduction in visual impairment rates were seen. Our data suggests that children without neurodevelopmental impairment at 2 years are without impairment later on; therefore, they may need only developmental monitoring with targeted assessments instead of routine formal IQ assessments.

[PMID: 29549372](#)

35. Continuous Electronic Fetal Monitoring during Labor: A Critique and a Reply to Contemporary Proponents.

Sartwelle TP, Johnston JC.

Surg J (N Y). 2018 Mar 7;4(1):e23-e28. doi: 10.1055/s-0038-1632404. eCollection 2018 Jan.

A half century after continuous electronic fetal monitoring (EFM) became the omnipresent standard of care for the vast majority of labors in the developed countries, and the cornerstone for cerebral palsy litigation, EFM advocates still do not have any scientific evidence justifying EFM use in most labors or courtrooms. Yet, these EFM proponents continue rationalizing the procedure with a rhetorical fog of meaningless words, misleading statistics, archaic concepts, and a complete disregard for medical ethics. This article illustrates the current state of affairs by providing an evidence-based review penetrating the rhetorical fog of a prototypical EFM advocate.

[PMID: 29527573](#)