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## Interventions and Management

### **1. Cortical mapping of mirror visual feedback training for unilateral upper extremity: A functional near-infrared spectroscopy study.**

Bai Z, Fong KNK, Zhang J, Hu Z.

Brain Behav. 2019 Dec 5:e01489. doi: 10.1002/brb3.1489. [Epub ahead of print]

**INTRODUCTION:** Mirror therapy has been shown to be effective in promoting hemiplegic arm recovery in patients with stroke or unilateral cerebral palsy. This study aimed to explore the cortical mapping associated with mirror therapy in a group of healthy adults by using functional near-infrared spectroscopy. **METHODS:** Fifteen right-handed healthy adults were recruited by means of convenience sampling. A  $2 \times 2$  factorial design was used: movement complexity with two levels-task-based (T) and movement-based (M), and visual direction with two levels-mirror visual feedback task (MT) and covered mirror with normal visual feedback task (NoT) as the control, constituting four conditions, namely TMT, MMT, TNoT, and MNoT. The regions of interest were the sensorimotor cortex (SMC), the supplementary motor area (SMA), the superior parietal cortex (SPL), and the precuneus in both the contralateral and ipsilateral hemispheres. **RESULTS:** Our findings showed that in the ipsilateral hemisphere, MT induced a higher activation in the SMA and SPL than NoT. With regard to the activation of the ipsilateral SMC, only one channel was found showing superior effects of MT compared with NoT. In addition, MT can strengthen the functional connectivity between the SMC and SMA. In the contralateral hemisphere, both movement complexity and visual direction showed significant main effects in the SMC, while only movement complexity showed a significant main effect in the SMA and SPL. The precuneus of both sides was deactivated and showed no significant difference among the four conditions. **CONCLUSIONS:** Our experiment implies that the modest activation of ipsilateral SMC during MT is likely to be associated with the enhanced activity of ipsilateral SMA and that the precuneus may not be an essential component of the MT-related neural network.

PMID: [31805613](#)

### **2. Incidence of spinal deformities and the relationship with physical status and back pain in ambulant adults with cerebral palsy and spastic diplegia.**

Langerak NG, Britz E, Dix-Peek S, du Toit J, Fiegggen AG, Lamberts RP.

Eur Spine J. 2019 Dec 3. doi: 10.1007/s00586-019-06235-3. [Epub ahead of print]

**PURPOSE:** The purpose of this study was to determine the incidence of spinal deformities in ambulant adults with cerebral palsy (CP) and spastic diplegia, more than 15 years after orthopaedic interval surgery approach (ISA) treatment, and its relationship to contextual factors, level of pain and physical status. **METHODS:** Spinal X-rays, pain (Oswestry Disability Index (ODI) and location/frequency) questionnaires and physical examination assessing lower extremity muscle strength (Medical Research Council scale), motor control (selectivity scale) and muscle tone (Ashworth score) were conducted in 30

adults with spastic diplegic CP. RESULTS: Mild scoliosis (curve 12-22°) was determined in eight (28%) participants. Hyperkyphosis (> 50°) was reported in two (7%) and lumbar hyperlordosis (> 60°) in five (17%) participants. Pain was most commonly reported at cervical (n = 19, 63%) and lumbosacral (n = 18, 60%) area, resulting in 'moderate disability' for six (20%) and 'severe disability' for one (3%) participant. Most apparent physical abnormalities determined were hip abduction weakness and increased rectus femoris muscle tone. Regarding correlations, no relations were found for scoliosis curvature, but kyphosis curvature was related to females, ODI scores (lifting and sitting) and increased muscle tone of ankle plantar flexor muscles, lordosis curvature to passive hip extension mobility, and hip flexors and ankle plantar flexors muscle tone. CONCLUSION: Adults with spastic diplegic CP who received their first orthopaedic intervention more than 15 years ago (based on ISA) showed similar incidence of spinal deformities as reported in the younger CP population, suggesting stability of spinal curvature into adulthood. These slides can be retrieved under Electronic Supplementary Material.

PMID: [31797136](#)

### 3. In support of selective dorsal rhizotomy in cerebral palsy: the strength of clinical experience.

Park TS.

Dev Med Child Neurol. 2019 Nov 29. doi: 10.1111/dmcn.14406. [Epub ahead of print]

PMID: [31784986](#)

### 4. Use of the Dyskinesia Impairment Scale in non-ambulatory dyskinetic cerebral palsy.

Haberfehlner H, Bonouvrié LA, Boeschoten K, Fleuren S, Monbaliu E, Becher JG, Vermeulen RJ, Buizer AI.

Dev Med Child Neurol. 2019 Nov 29. doi: 10.1111/dmcn.14415. [Epub ahead of print]

AIM: To assess the responsiveness, concurrent validity, and feasibility of the Dyskinesia Impairment Scale (DIS) in non-ambulatory patients with dyskinetic cerebral palsy (CP). METHOD: The study is a secondary analysis of data collected in the IDYS trial, a randomized controlled trial on the effects of intrathecal baclofen (ITB). The DIS and Barry-Albright Dystonia Scale (BADS) were conducted at baseline and after 3 months of ITB or placebo treatment. Responsiveness was assessed by comparing the effect sizes and correlation of change after treatment between the DIS and BADS. Concurrent validity was evaluated by assessing the correlations between scales. Feasibility was evaluated for each DIS item by the number of participants who successfully accomplished the item. RESULTS: Thirty-three non-ambulatory patients (9 females, 24 males) with dyskinetic CP (ITB-treated: n=17, mean [SD] age: 14y 1mo [4y 1mo]; placebo-treated: n=16, mean [SD] age: 14y 7mo [4y]) were included in the study. The effect sizes for BADS and DIS were similar in The ITB-treated group (-0.29 and -0.22 respectively). Changes after treatment on the DIS dystonia subscale correlated with changes on the BADS (r=0.64; p<0.001). The DIS dystonia subscale and BADS correlated at baseline and follow-up (r=0.78; p<0.001 and r=0.79; p<0.001). Not all DIS activity items could be performed in this sample of patients. INTERPRETATION: For non-ambulatory patients with dyskinetic CP, the responsiveness of the DIS equalled the responsiveness of BADS. Concurrent validity was adequate. Feasibility for activity items was restricted in patients with severe dyskinetic CP.

PMID: [31784988](#)

### 5. Architecture of the Triceps Surae Muscles Complex in Patients with Spastic Hemiplegia: Implication for the Limited Utility of the Silfverskiöld Test.

Park KB, Joo SY, Park H, Rhee I, Shin JK, Abdel-Baki SW, Kim HW.

J Clin Med. 2019 Dec 1;8(12). pii: E2096. doi: 10.3390/jcm8122096.

The Silfverskiöld test has long been used as an important tool for determining the affected muscles of the triceps surae in patients with equinus deformity. However, the test may not reflect the altered interactions between the muscles of the triceps which are affected by spasticity. The purpose of this study was to compare the architectural properties of the triceps surae muscles complex using ultrasonography, between hemiplegic patients and typically-developing children. Specifically, we wished to examine any differences in the architecture of the three muscles with various angle configurations of the knee and ankle joints. Ultrasound images of the medial gastrocnemius, lateral gastrocnemius, and soleus were acquired from paretic (group I) and non-paretic (group II) legs of ten patients and the legs (group III) of 10 age-matched normal children. A mixed model was used to evaluate the differences in the measurements of muscle architecture among the groups and the effects of various joint configurations on the measurements within the muscles. Compared to the results of measurements in groups II and III, the fascicle length was not different in the medial gastrocnemius of a paretic leg but it was longer in the lateral gastrocnemius and shorter in the soleus; the pennation angle was smaller in both medial and lateral gastrocnemii and was not different in the soleus; and the muscle thickness was found to be reduced in the three muscles of the paretic leg. Contrary to the observations in both the medial and lateral gastrocnemii, the fascicle length was increased and the pennation angle was

decreased in the soleus with an increase of knee flexion. Through the current simulation study of the Silfverskiöld test using ultrasonography, we found that the changes detected in the architectural properties of the three muscles induced by systematic variations of the position at the ankle and the knee joints were variable. We believe that the limited utility of the Silfverskiöld test should be considered in determining an appropriate operative procedure to correct the equinus deformity in patients with altered architecture of the muscles in conditions such as cerebral palsy, as the differing muscle architectures of the triceps surae complex may affect the behavior of the muscles during the Silfverskiöld test.

PMID: [31805732](#)

## **6. Excessive Lateral Trunk Lean in Patients With Cerebral Palsy: Is It Based on a Kinematic Compensatory Mechanism?**

Rethwilm R, Böhm H, Dussa CU, Federolf P.

Front Bioeng Biotechnol. 2019 Nov 19;7:345. doi: 10.3389/fbioe.2019.00345. eCollection 2019.

**Introduction:** Excessive lateral trunk lean is a commonly observed gait deviation in children with cerebral palsy (CP), with implications for energy expenditure and the development of back pain. While the trunk lean toward the stance leg is widely interpreted as a compensatory strategy to unload the hip, in CP the relation to hip abductor muscle strength is only weak. Therefore, other mechanisms may play a role in the prevalence of excessive trunk lean in CP, or it could be a primary motor function deficit. **Research Question:** Is the excessive lateral trunk lean in patients with CP part of an underlying biomechanical mechanism? **Materials and Methods:** Patients with bilateral CP (N = 255; age 13.6 ± 6.6 years) were retrospectively included and divided into a group with (n = 174) and without (n = 81) excessive lateral trunk lean. Ten lower-extremity joint angle waveforms were analyzed using a principal component analysis (PCA) to identify patterns of correlated deviations from average angle waveforms. Binary logistic regressions were performed to determine the discriminative capacity of the identified patterns. **Results:** The PCA identified correlated kinematic patterns, with lower-order patterns showing more common gait pathologies, such as torsional malalignments and crouch gait pattern. Within five patterns, significant (p < 0.0025) group differences were identified. Interestingly, the trunk lean was not always distinctive in these patterns and despite the significant differences their effect sizes were small. The logistic regression was unable to reliably classify patients based on their trunk lean patterns. **Discussion:** The current study identified multiple trunk lean-related patterns, however, excessive trunk lean was not attributable to a distinctive CP related gait pathology or to a specific compensatory strategy. Overall, the results do not support the hypothesis that excessive trunk lean is part of a biomechanical mechanism. Therefore, it seems more likely that excessive lateral trunk lean is based on other disease specific dysfunctions, influenced by the severity of the disease.

PMID: [31803737](#)

## **7. Effect of simultaneous proprioceptive-visual feedback on gait of children with spastic diplegic cerebral palsy.**

Hussein ZA, Salem IA, Ali MS.

J Musculoskelet Neuronal Interact. 2019 Dec 1;19(4):500-506.

**OBJECTIVE:** To evaluate the effect of simultaneous proprioceptive - visual training on gait parameters in children with spastic diplegic cerebral palsy. **METHOD:** Gait parameters of 30 spastic diplegic children (age range 4-6 years) were evaluated before and after treatment by Tekscan's Walkway Pressure system. They were randomly and equally assigned into two groups (study and control). All children received regular therapeutic exercise program for one hour. In control group walked for 30 minutes without feedback, while those in study group walked for 30 minutes with proprioceptive-visual feedback. Duration of treatment was 3 times/week for 8 successive weeks. **RESULTS:** There were significant differences after treatment in spatial parameters and temporal parameters of both groups with more improvement in study group than control one, and insignificant difference in kinetic gait parameters. **CONCLUSION:** The simultaneous proprioceptive - visual training might improve spatial and temporal gait parameters with no effect on kinetic gait parameters of children with spastic diplegic cerebral palsy.

PMID: [31789301](#)

## **8. Plyometric exercises: subsequent changes of weight-bearing symmetry, muscle strength and walking performance in children with unilateral cerebral palsy.**

Elnaggar RK, Elbanna MF, Mahmoud WS, Alqahtani BA.

J Musculoskelet Neuronal Interact. 2019 Dec 1;19(4):507-515.

**OBJECTIVE:** To evaluate the subsequent effects of plyometric training on weight-bearing symmetry, muscle strength, and gait performance in children with unilateral cerebral palsy. **METHODS:** Thirty-nine children with spastic hemiplegia (age 8-12 years) were randomly divided into either the PLYO group (n=19, received a 30-minute plyometric exercise program plus the traditional physical rehabilitation, twice/week for eight consecutive weeks) or Non-PLYO group (n=20, received the traditional physical rehabilitation only). The weight-bearing symmetry index (WB-SI), maximum isometric muscle strength (MIMS) of quadriceps and hamstring muscles, and spatial-temporal gait parameters were assessed pre and post-intervention. **RESULTS:** From pre- to post-intervention, changes of WB-SI among PLYO and Non-PLYO groups did not differ significantly (P=.81; hindfoot and P=.23; forefoot). MIMS of quadriceps and hamstring muscles at 90° knee flexion (P=.008 and .013 respectively) increased significantly in PLYO compared to Non-PLYO group. Walking speed (P=.033), stride length (P=.002), and step time (P<.001) improved markedly in PLYO group more than in Non-PLYO group. The proportion of single leg support (P=.14) among PLYO and Non-PLYO groups did not differ significantly. **CONCLUSION:** Addition of plyometric exercises to the physical rehabilitation programs of children with unilateral CP could achieve greater improvement in muscles strength and walking performance, but not in WB-SI.

PMID: [31789302](#)

### **9. The Effect of Spinal Arthrodesis on Health-Related Quality of Life for Patients with Nonambulatory Cerebral Palsy: A Critical Analysis Review.**

Shaw KA, Reifsnnyder J, Hire JM, Fletcher ND, Murphy JS.

JBJS Rev. 2019 Dec 3. doi: 10.2106/JBJS.RVW.19.00036. [Epub ahead of print]

PMID: [31794497](#)

### **10. Nutritional status of neurologically impaired children: Impact on comorbidity.**

Leonard M, Dain E, Pelc K, Dan B, De Laet C.

Arch Pediatr. 2019 Nov 29. pii: S0929-693X(19)30198-8. doi: 10.1016/j.arcped.2019.11.003. [Epub ahead of print]

**BACKGROUND AND AIMS:** Malnutrition is common in neurologically impaired (NI) children. It is, however, ill-defined and under-diagnosed. If not recognized and treated, it increases the burden of comorbidities and affects the quality of life of these children. The aim of this study was to characterize the nutritional status of a cohort of children followed up at a reference center for cerebral palsy (CP) in Brussels, Belgium, and to investigate possible links with the occurrence of comorbidities. **MATERIAL AND METHODS:** We conducted a single-center retrospective study including all the children followed up at the Inter-university Reference Center for Cerebral Palsy ULB-VUB-ULg. The data were obtained by reviewing medical files. Anthropometric measurements as well as the etiology of neurological impairment, comorbidities, feeding patterns, and laboratory test results were collected. The children were assigned a nutritional diagnosis according to the World Health Organization and Waterlow definitions. **RESULTS:** A total of 260 children with cerebral palsy were included, 148 males and 112 females. Their mean age was 10.9±4.3 years. The gross motor function classification system (GMFCS) level was I for 79 children, II for 63 children, III for 35 children, IV for 33 children, and V for 50 children. Of the children, 54% had a normal nutritional status, 34% showed malnutrition, and 8% were obese; 38% had oropharyngeal dysphagia. The sensitivity of mean upper arm circumference of <p>10 to detect severe malnutrition was 95%. Specific growth charts for CP were neither sensitive nor specific for predicting the risk of comorbidities. Malnutrition was associated with an increased risk of comorbidities (relative risk of 2.4 [1.7; 3.4]). It was also associated with the occurrence of pneumonia, pressure ulcers, and pathological bone fracture. **DISCUSSION AND CONCLUSION:** Children who are NI should be systematically and thoroughly screened for malnutrition, in the hope of offering early nutritional support and reduce comorbidities.

PMID: [31791829](#)

### **11. Feasibility Study of a Therapeutic Mobility Summer Camp for Children with Severe Cerebral Palsy: Power Fun.**

Rosenberg L, Macir A, Gilboa Y.

Phys Occup Ther Pediatr. 2019 Dec 5:1-15. doi: 10.1080/01942638.2019.1695699. [Epub ahead of print]

**Aim:** Powered mobility has positive effects on development of children with limited independent locomotion, but many are deprived of this opportunity due to their limitations. This study aimed to evaluate the feasibility of Power Fun, a therapeutic summer camp, for students with severe cerebral palsy (CP). **Methods:** Five students with CP, ages 11-15, received personally adapted powered wheelchairs and participated daily in the camp. The camp ran five days a week during three weeks and

included two mobility sessions daily. Assessments were conducted three weeks prior to the camp (T1), at baseline (T2), post-intervention (T3) and six weeks follow-up (T4). Measures used were Power Mobility Program (PMP), Assessment of Learning Power mobility use (ALP), Wheelchair Outcome Measure for Young People (WhOM-YP), Goal Attainment Scaling (GAS) and Dimensions of Mastery Questionnaire (DMQ). Results: All participants finished the camp. Outcome measures showed no change between T1-T2 but improved significantly ( $p < .05$ ) after the intervention (T2-T3), and gains were maintained at T4 (Wilcoxon signed-rank test). Goals improved to slightly above the expected outcome (GAS average 0.11). Conclusions: Power Fun shows good feasibility and significant improvement in mobility skills and goals of children with severe CP. Further studies are warranted.

PMID: [31805802](#)

## 12. Comparing children's driving abilities in physical and virtual environments.

Gefen N, Rigbi A, Archambault PS, Weiss PL.

Disabil Rehabil Assist Technol. 2019 Dec 5:1-8. doi: 10.1080/17483107.2019.1693644. [Epub ahead of print]

**Purpose:** To compare children's driving abilities in a physical and virtual environment and to validate the McGill Immersive Wheelchair Simulator (MiWe-C) for the use of children with disabilities. **Materials and methods:** Participants included 30 children (17 males, 13 females; mean age 14 y 1 mo, [SD 3 y 6 mo]; range: 5-18 y) with cerebral palsy, neuromuscular disease and spinal cord injury. All children were proficient drivers with more than 3 months' experience, who had their own powered wheelchairs. Participants drove a 15-minute physical route and high-fidelity simulation of that route in a counterbalanced order. Performance of the two routes was compared using the 32 item Powered Mobility Programme (PMP). Differences between the driving modes were analyzed with the non-parametric Wilcoxon signed-rank test. Significance was set at  $\alpha = 0.05$ . **Results:** The scores for the total PMP score as rated during both simulator wheelchair driving and during physical driving were very high ( $M = 4.90$ ,  $SD = 0.20$ ;  $M = 4.96$ ,  $SD = 0.12$ , respectively) with no significant difference between them ( $z = -1.69$ ,  $p = .09$ ). Five out of the 32 PMP tasks showed significant differences between driving modes (narrow corridors, crowded corridors, doorway, sidewalks), with higher scores for the physical driving mode. **Conclusions:** Having a validated powered mobility simulator for children provides a viable option for an additional practice mode. The MiWe-C simulator is affordable and a user-friendly simulator that can be used anywhere including at home and in school. Children can be independent when practicing even if they are not yet proficient drivers since continual adult assistance is not needed. **Implications for rehabilitation** Having a validated powered mobility simulator for children provides a viable option for an additional practice mode. The MiWe-C is now validated to be used with children 5-18 years with physical disabilities. The MiWe-C is one of the few options for children to practice outside of a research environment.

PMID: [31805790](#)

## 13. Effectiveness of training with motion-controlled commercial video games on hand and arm function in young people with cerebral palsy: A systematic review and meta-analysis.

Johansen T, Strøm V, Simic J, Rike PO.

J Rehabil Med. 2019 Dec 3. doi: 10.2340/16501977-2633. [Epub ahead of print]

**OBJECTIVE:** To examine the effect of motion-controlled commercial video games compared with traditional occupational and physiotherapy methods for hand and arm function in persons of all ages with cerebral palsy. **DATA SOURCES:** A systematic literature search was conducted in Medline, EMBASE, CINAHL, Cochrane Central Register of Controlled Trials, OTseeker and PEDro for randomized controlled trials involving persons with cerebral palsy using motion-controlled commercial video games as a training method for hand and arm function, compared with traditional therapy. **STUDY SELECTION AND DATA EXTRACTION:** Screening, data-extraction, risk of bias and quality assessment was carried out independently by 2 of the authors. The risk of bias of each study was assessed using the Cochrane Collaborations Risk of Bias Tool. The quality of evidence was assessed using Grading of Recommendations Assessment, Development and Evaluation (GRADE). **DATA SYNTHESIS:** Eight randomized controlled trials, with a total of 262 participants, were included. A random effects meta-analysis showed a statistically significant difference between the groups in favour of motion-controlled commercial video games. The quality of the evidence was, however, rated as very low. **CONCLUSION:** Despite a significantly greater improvement in hand and arm function in favour of motion-controlled commercial video games, the results of this review should be interpreted with caution with regards to high risk of bias and the low strength of evidence. There is a need for high-powered studies on the effectiveness of training with motion-controlled commercial video games for persons with cerebral palsy, especially in adults.

PMID: [31794044](#)

#### **14. Finding the best fit: examining the decision-making of augmentative and alternative communication professionals in the UK using a discrete choice experiment.**

Webb EJD, Lynch Y, Meads D, Judge S, Randall N, Goldbart J, Meredith S, Moulam L, Hess S, Murray J.

BMJ Open. 2019 Dec 1;9(11):e030274. doi: 10.1136/bmjopen-2019-030274.

**OBJECTIVES:** Many children with varied disabilities, for example, cerebral palsy, autism, can benefit from augmentative and alternative communication (AAC) systems. However, little is known about professionals' decision-making when recommending symbol based AAC systems for children. This study examines AAC professionals' preferences for attributes of AAC systems and how they interact with child characteristics. **DESIGN:** AAC professionals answered a discrete choice experiment survey with AAC system and child-related attributes, where participants chose an AAC system for a child vignette. **SETTING:** The survey was administered online in the UK. **PARTICIPANTS:** 155 UK-based AAC professionals were recruited between 20 October 2017 and 4 March 2018. **OUTCOMES:** The study outcomes were the preferences of AAC professionals' as quantified using a mixed logit model, with model selection performed using a step-wise procedure and the Bayesian Information Criterion. **RESULTS:** Significant differences were observed in preferences for AAC system attributes, and large interactions were seen between child attributes included in the child vignettes, for example, participants made more ambitious choices for children who were motivated to communicate using AAC, and predicted to progress in skills and abilities. These characteristics were perceived as relatively more important than language ability and previous AAC experience. **CONCLUSIONS:** AAC professionals make trade-offs between attributes of AAC systems, and these trade-offs change depending on the characteristics of the child for whom the system is being provided.

PMID: [31791963](#)

#### **15. Short- and Long-Term Neurodevelopmental Outcomes of Very Preterm Infants with Neonatal Sepsis: A Systematic Review and Meta-Analysis.**

Cai S, Thompson DK, Anderson PJ, Yang JY.

Children (Basel). 2019 Dec 1;6(12). pii: E131. doi: 10.3390/children6120131.

Sepsis is commonly experienced by infants born very preterm (<32 weeks gestational age and/or <1500 g birthweight), but the long-term functional outcomes are unclear. The objective of this systematic review was to identify observational studies comparing neurodevelopmental outcomes in very preterm infants who had blood culture-proven neonatal sepsis with those without sepsis. Twenty-four studies were identified, of which 19 used prespecified definitions of neurodevelopmental impairment and five reported neurodevelopmental outcomes as continuous variables. Meta-analysis was conducted using 14 studies with defined neurodevelopmental impairment and demonstrated that very preterm infants with neonatal sepsis were at higher risk of impairments, such as cerebral palsy and neurosensory deficits, compared with infants without sepsis (OR 3.18; 95% CI 2.29-4.41). Substantial heterogeneity existed across the studies ( $I^2 = 83.1$ , 95% CI 73-89). The five studies that reported outcomes as continuous variables showed no significant difference in cognitive performance between sepsis and non-sepsis groups. Neonatal sepsis in very preterm infants is associated with increased risk of neurodevelopmental disability. Due to the paucity of longitudinal follow-up data beyond 36 months, the long-term cognitive effect of neonatal sepsis in very preterm infants could not be conclusively determined. Effects on the development of minor impairment could not be assessed, due to the small numbers of infants included in the studies.

PMID: [31805647](#)

#### **16. Neonatal and neurodevelopmental outcomes in preterm infants according to maternal body mass index: A prospective cohort study.**

Moreau M, Remy M, Nusinovic S, Rouger V, Molines L, Flamant C, Legendre G, Roze JC, Salle A, Van Bogaert P, Coutant R, Gascoin G.

PLoS One. 2019 Dec 5;14(12):e0225027. doi: 10.1371/journal.pone.0225027. eCollection 2019.

**OBJECTIVE:** Maternal obesity is associated with an increase in maternal, foetal and neonatal morbidity and mortality. The aim of our study was to evaluate the relationships between maternal pre-pregnancy body mass index and (1) neonatal outcome in preterm infants, and (2) neurodevelopmental outcome at 2 years of corrected age. **METHOD:** We conducted a single-centre cohort study. Infants born between 24+0 and 33+6 weeks of gestation between January 2009 and December 2013, hospitalised in the neonatal intensive care unit of Angers University Hospital, and with available data regarding maternal pre-pregnancy

body mass index were eligible. Three groups were defined according to maternal body mass index: normal (n = 418), overweight (n = 136) and obese (n = 89). The primary outcome was neurodevelopment at 2 years of corrected age. Children with a non-optimal neuromotor and/or psychomotor assessment and/or a sensory disability were regarded as having a "non-optimal neurodevelopmental outcome". Neuromotor function was regarded as non-optimal when cerebral palsy was present or when the clinical examination revealed neurological signs of abnormal muscular tone. Psychomotor assessment was regarded as non-optimal if the revised Brunet-Lézine test was < 85 or when the overall score in the parental Ages and Stages Questionnaire (ASQ) was < 185. Finally, sensory disabilities such as blindness and children who required a hearing aid were taken into account. The secondary outcome was the composite criteria of neonatal complications. Multivariable analysis included the following variables: mother's age, gestational age, smoking during pregnancy, magnesium sulphate and steroid treatment during pregnancy, twin status, gender, socioeconomic status and social security benefits for those with low incomes. RESULTS: The study population was composed of 643 preterm infants. Among them, 520 were assessed at 2 years. There was no difference in the proportion of infants with non-optimal neurodevelopmental outcomes between the three groups (16.6% for obese, 13.5% for overweight, 16.9% for normal body mass index mothers; p = 0.73). According to multivariable analysis, being born from an overweight or obese mother was not associated with an increased risk of non-optimal neuro-development at 2 years (adjusted OR = 0.84 [0.40-1.76] for obese, adjusted OR = 0.83 [0.43-1.59] for overweight mothers). There was no difference in the proportion of preterm infants with a non-optimal composite criterion of neonatal complications between the three groups. In the multivariable analysis, being born from an overweight or obese mother was not associated with an increased risk of non-optimal neonatal outcomes (adjusted OR = 0.95 [0.49-1.83] for obese, adjusted OR = 1.18 [0.69-2.01] for overweight mothers). CONCLUSION: In this large prospective cohort of preterm infants born before 34 weeks of gestation, we found no relationship between maternal body mass index and neurodevelopmental outcomes at 2 years of corrected age and no relationship between maternal body mass index and neonatal outcomes. Other prematurity-related factors may be more relevant for neurodevelopmental outcome than the mother's pre-pregnancy BMI.

PMID: [31805081](#)

### 17. Neurodevelopmental impairment in necrotising enterocolitis survivors: systematic review and meta-analysis.

Matei A, Montalva L, Goodbaum A, Lauriti G, Zani A.

Arch Dis Child Fetal Neonatal Ed. 2019 Dec 4. pii: fetalneonatal-2019-317830. doi: 10.1136/archdischild-2019-317830. [Epub ahead of print]

AIM: To determine (1) the incidence of neurodevelopmental impairment (NDI) in necrotising enterocolitis (NEC), (2) the impact of NEC severity on NDI in these babies and (3) the cerebral lesions found in babies with NEC. METHODS: Systematic review: three independent investigators searched for studies reporting infants with NDI and a history of NEC (PubMed, Medline, Cochrane Collaboration, Scopus). Meta-analysis: using RevMan V.5.3, we compared NDI incidence and type of cerebral lesions between NEC infants versus preterm infants and infants with medical vs surgical NEC. RESULTS: Of 10 674 abstracts screened, 203 full-text articles were examined. In 31 studies (n=2403 infants with NEC), NDI incidence was 40% (IQR 28%-64%) and was higher in infants with surgically treated NEC (43%) compared with medically managed NEC (27%, p<0.00001). The most common NDI in NEC was cerebral palsy (18%). Cerebral lesions: intraventricular haemorrhage (IVH) was more common in NEC babies (26%) compared with preterm infants (18%; p<0.0001). There was no difference in IVH incidence between infants with surgical NEC (25%) and those treated medically (20%; p=0.4). The incidence of periventricular leukomalacia (PVL) was significantly increased in infants with NEC (11%) compared with preterm infants (5%; p<0.00001). CONCLUSIONS: This study shows that a large proportion of NEC survivors has NDI. NEC babies are at higher risk of developing IVH and/or PVL than babies with prematurity alone. The degree of NDI seems to correlate to the severity of gut damage, with a worse status in infants with surgical NEC compared with those with medical NEC. TRIAL REGISTRATION NUMBER: CRD42019120522.

PMID: [31801792](#)

### 18. An Individualized Approach to Neuroplasticity After Early Unilateral Brain Damage.

Gaberova K, Pacheva I, Timova E, Petkova A, Velkova K, Ivanov I.

Front Psychiatry. 2019 Nov 19;10:747. doi: 10.3389/fpsy.2019.00747. eCollection 2019.

Introduction: Reorganization after early lesions in the developing brain has been an object of extensive scientific work, but even growing data from translational neuroscience studies in the last 20 years does not provide unified factors for prediction of type of reorganization and rehabilitation potential of patients with unilateral cerebral palsy (UCP) due to pre/perinatal insult. Aim: To analyze the type of motor, language, and sensory brain reorganization in patients with right-sided cerebral palsy due to pre/perinatal isolated left-sided brain lesions taking into consideration the type (cortico-subcortical or periventricular) and extent (gray and white matter damage) of the lesion, etiology, comorbidity, and other postnatal factors that could have played a

role in the complex process of brain plasticity. **Material and Methods:** Eight patients with unilateral right cerebral palsy were included in the study. The individual data from fMRI of primary sensory, motor, and language representation were analyzed and compared with respective comprehensive etiological, clinical, and morphological data. Patients were examined clinically and psychologically, and investigated by structural and functional 3T GE scanner. A correlation between the type and extent of the lesion (involvement of cortical and subcortical structures), timing of lesion, type of reorganization (laterality index), and clinical and psychological outcome was done. **Results:** Significant interindividual diversity was found in the patient group predominantly in the patterns of motor reorganization. Patients with small periventricular lesions have ipsilesional representation of primary motor, sensory, and word generation function. Patients with lesions involving left cortico-subcortical regions show various models of reorganization in all three modalities (ipsilesional, contralesional, and bilateral) and different clinical outcome that seem to be impossible for prediction. However, patients with UCP who demonstrate ipsilesional motor cortical activation have better motor functional capacity. **Conclusion:** The type and size of the pre/perinatal lesion in left hemisphere could affect the natural potential of the young brain for reorganization and therefore the clinical outcome. Much larger sample and additional correlation with morphological data (volumetry, morphometry, tractography) is needed for determination of possible risk or protective factors that could play a role in the complex process of brain plasticity.

PMID: [31798467](#)

### **19. Factors associated with death in people with intellectual disability.**

Reppermund S, Srasuebkul P, Dean K, Trollor JN.

J Appl Res Intellect Disabil. 2019 Dec 1. doi: 10.1111/jar.12684. [Epub ahead of print]

**BACKGROUND:** People with intellectual disability (ID) experience higher mortality than the general population. This study examines factors contributing to deaths in people with intellectual disability. **METHOD:** Linked administrative data spanning ten years for 49,947 people with intellectual disability receiving disability services were analysed to assess the impact of demographic variables, comorbidities and health service utilization on the risk of death using Cox proportional hazard models. **RESULTS:** People admitted for cancer were 8 times more likely to die within the study period compared to people not admitted for cancer. Down syndrome, cerebral palsy and heart disease also increased the risk of death. Emergency department presentations and/or mental health admissions increased the risk of death 4 times. **CONCLUSIONS:** Our findings provide a basis for policy changes and public health interventions. Cancer screening, mental health interventions, inclusion of people with intellectual disability in health policy and improved health care are needed to meet the needs of this population.

PMID: [31786826](#)

### **20. Animal models of cerebral palsy.**

Dan B.

Dev Med Child Neurol. 2020 Jan;62(1):4. doi: 10.1111/dmcn.14397.

PMID: [31797358](#)

## **Prevention and Cure**

### **21. Umbilical cord blood stem cell therapy in premature brain injury: Opportunities and challenges.**

Peng X, Song J, Li B, Zhu C, Wang X.

J Neurosci Res. 2019 Dec 3. doi: 10.1002/jnr.24548. [Epub ahead of print] Author information

Preterm birth and associated brain injury are the primary cause of cerebral palsy and developmental disabilities and are among the most serious global health issues that modern society faces. Current therapy for infants suffering from premature brain injury is still mainly supportive, and there are no effective treatments. Thus there is a pressing need for comparative and translational studies on how to reduce brain injury and to increase regeneration and brain repair in preterm infants. There is strong supporting evidence for the use of umbilical cord blood (UCB)-derived stem cell therapy for treating preterm brain injury and neurological sequelae. UCB-derived stem cell therapy is effective in many animal models and has been shown to be



feasible in clinical trials. Most of these therapies are still experimental, however. In this review, we focus on recent advances on the efficacy of UCB-derived stem cell therapy in preterm infants with brain injury, and discuss the potential mechanisms behind their therapeutic effects as well as application strategies for future preclinical and clinical trials.

PMID: [31797400](#)