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## Interventions and Management

### 1. Outcomes of a Parent-Delivered Baby-mCIMT Model for Infants at High Risk of Unilateral Cerebral Palsy Using Remote Coaching in Telerehabilitation

Katarina Svensson, Heléne Sundelin, Ann-Christin Eliasson

Children (Basel). 2024 Jan 15;11(1):101. doi: 10.3390/children11010101.

There is growing evidence of the positive effects of constraint-induced movement therapy (CIMT) for infants at high risk of unilateral cerebral palsy (UCP) when provided by parents with in-person coaching/supervision from occupational therapists during home visits. The aim of this study is to investigate whether Baby-mCIMT (modified CIMT) can be as effective if parents are coached/supervised remotely. In this case-control study, we recruited 20 infants and re-used 18 controls, 4-8-month-old infants in both groups at high risk of UCP. The same protocol regarding inclusion criteria, data collection, and training volume was used in both groups. The training was conducted for two 6-week periods, separated by a 6-week break, consisting of daily 30 min sessions conducted by parents, supported by therapist coaching once a week. The primary outcome was measured using the Hand Assessment for Infants (HAI). There was no difference in the change of HAI units ( $p = 0.803$ ) or that of the affected-hand raw score ( $p = 0.942$ ) between the two groups. The remote coaching method was well received by parents. In conclusion, this demonstrates that remote coaching/supervision is as effective as the in-person approach, requiring less time and effort for both families and healthcare providers.

PMID: [38255414](#)

### 2. Hand function after neonatal stroke: A graph model based on basal ganglia and thalami structure

Patty Coupeau, Josselin Démas, Jean-Baptiste Fasquel, Lucie Hertz-Pannier, Stéphane Chabrier, Mickael Dinomais

Neuroimage Clin. 2024 Jan 22;41:103568. doi: 10.1016/j.nicl.2024.103568. Online ahead of print.

**Introduction:** Neonatal arterial ischemic stroke (NAIS) is a common model to study the impact of a unilateral early brain insult on developmental brain plasticity and the appearance of long-term outcomes. Motor difficulties that may arise are typically related to poor function of the affected (contra-lesioned) hand, but surprisingly also of the ipsilesional hand. Although many longitudinal studies after NAIS have shown that predicting the occurrence of gross motor difficulties is easier, accurately predicting hand motor function (for both hands) from morphometric MRI remains complicated. The hypothesis of an association between the structural organization of the basal ganglia (BG) and thalamus with hand motor function seems intuitive given their key role in sensorimotor function. Neuroimaging studies have frequently investigated these structures to evaluate the correlation between their volumes and motor function following early brain injury. However, the results have been controversial. We hypothesize the involvement of other structural parameters. **Method:** The study involves 35 children (mean age 7.3 years, SD 0.4) with middle cerebral artery NAIS who underwent a structural T1-weighted 3D MRI and clinical examination to assess manual dexterity using the Box and Blocks Test (BBT). Graphs are used to represent high-level structural information of the BG and thalami (volumes, elongations, distances) measured from the MRI. A graph neural network (GNN) is proposed to predict children's hand motor function through a graph regression. To reduce the impact of external factors on motor function (such as behavior and cognition), we calculate a BBT score ratio for each child and hand.

Results: The results indicate a significant correlation between the score ratios predicted by our method and the actual score ratios of both hands ( $p < 0.05$ ), together with a relatively high accuracy of prediction (mean L1 distance  $< 0.03$ ). The structural information seems to have a different influence on each hand's motor function. The affected hand's motor function is more correlated with the volume, while the 'unaffected' hand function is more correlated with the elongation of the structures. Experiments emphasize the importance of considering the whole macrostructural organization of the basal ganglia and thalamic networks, rather than the volume alone, to predict hand motor function. Conclusion: There is a significant correlation between the structural characteristics of the basal ganglia/thalamic and motor function in both hands. These results support the use of MRI macrostructural features of the basal ganglia and thalamus as an early biomarker for predicting motor function in both hands after early brain injury.

PMID: [38277807](#)

### 3. Immediate effects of a novel hand rehabilitation board on fine motor skills in children with cerebral palsy: A pilot study

Amitesh Narayan, Abraham M Joshua, Romita Fernandes, Shreekanth D Karnad, Abdulaziz Alammari, Namrata S Chauhan, Mohand Taleb D Almgamese

NeuroRehabilitation. 2024 Jan 24. doi: 10.3233/NRE-230286. Online ahead of print.

Background: In children with cerebral palsy (CP), fine motor skills limit forearm supination and active extension of the elbow, wrist, or fingers. Therapeutic interventions focusing on improving the ranges at these joints while facilitating active movements are the key to augmenting fine motor skills. Objective: This pilot study examines if children with CP (with UE involvement) exposed to the Novel Hand Rehabilitation (NHR) Board will demonstrate 1) changes in spasticity and passive ROM of forearm and wrist/finger muscles, and 2) improvement in fine motor abilities. Methods: The forearm and wrist/fingers of children with spastic CP (N = 15; M = 7, F = 8) aged 49-72 months (65.33±6.355 months) were positioned on the NHR board till their tolerance limit or a minimum duration of 30 minutes. The outcome measures, i.e., spasticity (Modified Ashworth Scale), passive range of motion (PROM) of wrist and fingers, and fine motor skills (PDMS-2 - Fine motor scale), were recorded. Results: The spasticity of forearm pronators (0.001) and wrist flexors (0.008) reduced significantly, but not in wrist extensors. Post-intervention improvements in wrist extension ( $p = 0.005$ ) and ulnar deviation ROM ( $p = 0.007$ ) were significant. In thumb, changes were non-significant for the CMC flexion, but extension (0.003) and abduction (0.001) as well as MCP extension (0.004) were significant. The post-intervention MCP extension ROM for the 2nd (0.001), 3rd (0.007), and 4th fingers (0.014) were also substantial, but not for PIP and DIP joints. The post-intervention percentage change in the Grasping and Visual-motor integration subtests of PDMS-2 was 11.03% ( $p = 0.002$ ) and 5.09% ( $p = 0.001$ ) respectively. Conclusion: The immediate effects on fine motor skills in children with CP after the NHR board application were positive and encouraging. Hence, the NHR board can be recommended as an intervention to improve the fine motor abilities of children with CP.

PMID: [38277311](#)

### 4. Rotation and Asymmetry of the Axial Plane Pelvis in Cerebral Palsy: A CT-Based Study

Akbar N Syed, Jenny L Zheng, Christine Goodbody, Patrick J Cahill, David A Spiegel, Keith Baldwin

Children (Basel). 2024 Jan 2;11(1):63. doi: 10.3390/children11010063.

Spinopelvic malignment is commonly seen with non-ambulatory cerebral palsy (CP). Axial plane deformation is not well described in the literature. The purpose of this study was to describe and quantify the axial plane deformity in CP using CT scans and compare it to normal controls. We retrospectively collected data using CT scans of the abdomen and pelvis of 40 patients with GMFCS IV/V CP and neuromuscular scoliosis (CPP) and normal controls (NP) matched by age and sex. Pre-operative Cobb angle was recorded for the CP patients. Pelvic anatomy was evaluated at the supra-acetabular region of bone using two angles-iliac wing angle and sacral ala angle, measured for each hemipelvis. The larger of each hemipelvis angle was considered externally rotated while the smaller angle was considered internally rotated, termed as follows-iliac wing external (IWE) and internal (IWI); sacral ala external (SAE), and internal (SAI). Differences were noted using an independent t-test while correlations with Cobb angle were performed using Pearson's correlation. Iliac wing measurements showed the externally rotated hemipelvis showed a significantly greater magnitude compared with normal controls at  $47.3 \pm 18.1$  degrees vs.  $26.4 \pm 3.7$  degrees in NP ( $p < 0.001$ ) while no internal rotation was observed ( $p > 0.05$ ). Sacral ala measurements showed greater magnitude in both external and internal rotation. SAE was  $119.5 \pm 9.5$  degrees in CPP vs.  $111.2 \pm 7.7$  degrees in NP ( $p < 0.001$ ) while SAI was  $114.1 \pm 8.5$  degrees in CPP vs.  $107.9 \pm 7.5$  degrees in NP ( $p = 0.001$ ). In the CP cohort, the mean Cobb angle was 61.54 degrees ( $n = 37/40$ ). Cobb angle correlated with the degree of external iliac wing rotation-IWE ( $r = 0.457$ ,  $p = 0.004$ ) and degree of absolute difference in the rotation of the iliac wing ( $r = 0.506$ ,  $p = 0.001$ ). The pelvis in a patient with CP scoliosis is asymmetrically oriented exhibiting a greater external rotation of one hemipelvis relative to normal controls. The severity of neuromuscular scoliosis is related to the pelvic axial rotation in CP patients. Axial plane deformity exists in the CP pelvis and this deformity warrants consideration when considering spinopelvic instrumentation strategies and outcomes of supra-pelvic and infra-pelvic pathologies.

PMID: [38255376](#)

### **5. Effects of structured training on spinal posture and selective motor control in children with unilateral spastic cerebral palsy**

Seda Ayaz Taş, Tamer Çankaya

Gait Posture. 2024 Jan 11:109:22-27. doi: 10.1016/j.gaitpost.2024.01.007. Online ahead of print.

Background: Children with Unilateral Spastic Cerebral Palsy (USCP) have an asymmetrical postural pattern. Although functional limitations are less, deteriorations in spinal posture are observed. Research question: What is the effect of structured training on spinal posture and selective motor control of upper extremity? Methods: Forty five children with USCP were included in the study. Participants were children ages 3-18 with GMFCS levels 1 and 2. Spinal posture and mobility was assessed by Spinal Mouse (SM) and the Spinal Alignment and Range of Motion Measure (SAROMM), and selective motor control of upper extremity was evaluated by the Selective Control of the Upper Extremity Scale (SCUES). Children were divided into two groups: structured training group (STG) (n = 22) and conventional physiotherapy group (CPG) (n = 23). Groups received treatment sessions lasting 45 min, 2 days a week for 8 weeks. Evaluations were made baseline and after treatment. Results: In sagittal plane, there was a significant decrease in the degree of thoracic kyphosis after treatment in the STG (p = 0.004). A significant difference was found in total spine angulation (p = 0.015) and mobility from flexion to extension in the STG group. There was a difference in total spine angulation (p = 0.014) in the CPG group, but no difference in spinal mobility. Post-training differences were found in thoracic angulation (p = 0.006) and lateral flexion mobility to the affected side in the STG in thoracic (p = 0.020), lumbar (p = 0.035) and total spine (p = 0.008) in the frontal plane. When SCUES-shoulder, elbow, wrist, total scores changes was significant in CPG (p < 0.001), SCUES-forearm (p = 0.002) and fingers (p = 0.007) changes was significant in STG. Significance: This study showed that although children with USCP are more mildly affected, there are adverse effects on their selective motor control and spinal posture. This study reveals the contribution of structured training in terms of selective movement, spinal smoothness and mobility in children.

PMID: [38244393](#)

### **6. Foot drop after gastrosoleus lengthening for equinus deformity in children with cerebral palsy**

Nimra Masood, Mahmood Ahmad Joya, Aimal Waqar

Gait Posture. 2024 Jan 9:S0966-6362(24)00006-7. doi: 10.1016/j.gaitpost.2024.01.006. Online ahead of print.

No abstract available

PMID: [38245381](#)

### **7. Control of Tibial Advancement by the Plantar Flexors during the Stance Phase of Gait Depends on Knee Flexion with Respect to the Ground Reaction Force**

Reinald Brunner, Carlo Albino Frigo

Bioengineering (Basel). 2023 Dec 31;11(1):41. doi: 10.3390/bioengineering11010041.

During the stance phase of a normal gait, the triceps surae muscle controls the advancement of the tibia, which contributes to knee extension. Plantar flexor weakness results in excessive dorsiflexion, and consequently, the knee loses this contribution. However, increasing knee flexion is also seen in patients with cerebral palsy who do not have plantar flexor weakness. We aimed to understand this mechanism through the use of a musculoskeletal dynamic model. The model consists of solid segments connected with rotatory joints and springs to represent individual muscles. It was positioned at different degrees of ankle plantarflexion, knee flexion, and hip flexion. The soleus muscle was activated concentrically to produce plantarflexion and push the foot against the ground. The resulting knee extension was analyzed. The principal determinant of knee flexion or extension associated with ankle plantarflexion was the position of the knee joint center. When this was anterior to the line of action of the ground reaction force (GRF), the soleus contraction resulted in increased knee flexion. The knee extension was obtained when the knee was flexed less than approximately 25°. The relation between joint angles, anthropometric parameters, and the position of the GRF was expressed in a mathematical formulation. The clinical relevance of this model is that it explains the failure of plantar flexor control on knee extension in patients with cerebral palsy, when increased knee flexion can occur even if there is a normal or plantarflexed foot position.

PMID: [38247918](#)

## 8. Novel Modular Walking Orthosis (MOWA) for Powerful Correction of Gait Deviations in Subjects with a Neurological Disease

Jan-Hagen Schröder, Gion A Barandun, Pascal Leimer, Rafael Morand, Beat Göpfert, Erich Rutz

Children (Basel). 2023 Dec 26;11(1):30. doi: 10.3390/children11010030.

This article introduces a novel concept where advanced technologies have been leveraged to produce a modular walking orthosis (MOWA) within a completely digital process chain. All processes of this new supply chain are described step-by-step. The prescription and treatment of lower leg orthoses for individuals with paralysis or muscle weakness, particularly cerebral palsy (CP), are complex. A single case study indicates successful treatment with this new orthosis (MOWA). From the authors' perspective, this innovative fitting concept is promising and will contribute to creating more efficient care within a multidisciplinary team.

PMID: [38255343](#)

## 9. Patellar tendon shortening surgery restores the knee extensor mechanism in flexed knee gait in children with cerebral palsy

Henrike Greaves, David Wright, Antonio Eleuteri, Elizabeth Ray, Ornella Pinzone, Alfie Bass, Roger Walton, Gabor Barton

J Orthop Sci. 2024 Jan 23:S0949-2658(24)00005-8. doi: 10.1016/j.jos.2024.01.004. Online ahead of print.

**Background:** This study evaluated a patellar tendon shortening (PTS) surgical procedure that uses an overlapping repair combined with an additional Tycron non-absorbable suture to support the shortening in children with Cerebral Palsy (CP). This study aimed to outline this surgical technique and to evaluate its effectiveness in restoring the knee extensor mechanism. **Methods:** The sagittal plane lower limb kinematics, peak knee extensor moment, gait deviation index (GDI), localised movement deviation profile (MDP), temporospatial parameters, passive knee extension ROM, quadriceps lag, and knee extensor strength were calculated pre- and postoperatively. To determine significant differences a robust linear regression model with high breakdown point and high efficiency was fitted to the data. **Results:** In this retrospective cohort study, a total of 41 patients with CP who were treated with unilateral or bilateral PTS in isolation or as part of single event multilevel surgery (SEMLS), with a mean age of 11.1 years were included. The knee extension angle improved at initial contact ( $p < 0.0001$ ), and during stance phase ( $p < 0.0001$ ). The peak internal knee extensor moment decreased during early ( $p = 0.0014$ ) and late stance phase ( $p < 0.0001$ ). The quadriceps lag decreased ( $p < 0.0001$ ) and knee extensor strength increased ( $p < 0.0001$ ). The GDI improved ( $p < 0.0001$ ), as well as the localised MDP for sagittal angles ( $p < 0.0001$ ) and moments ( $p = 0.0001$ ). Walking speed ( $p = 1.0$ ) remained unchanged, but the cadence decreased ( $p = 0.024$ ) and step length increased ( $p = 0.0001$ ). **Conclusions:** The knee extension angle and moment during stance phase improved significantly. The children with CP in this study showed improvements in knee extensor strength and quadriceps lag. Thereby it can be concluded that the PTS procedure was able to restore the knee extensor mechanism effectively.

PMID: [38262799](#)

## 10. Letter Regarding: Split Transfer of the Tibialis Anterior Tendon Combined With Calcaneocuboid Fusion vs Split Transfer of the Tibialis Anterior Tendon Alone to Treat Equinovarus Foot Deformity in Children With Cerebral Palsy

Sitanshu Barik, Vishal Kumar, Vikash Raj

Foot Ankle Int. 2024 Jan;45(1):99. doi: 10.1177/10711007231213366.

No abstract available

PMID: [38279769](#)

## 11. Aspects of Physical Activity and Quality of Life in Adults with Cerebral Palsy

David A Henning, Oksana K Ellison, Janet L Hauck, Nigel Paneth, Karin A Pfeiffer, Matthew B Pontifex

Res Q Exerc Sport. 2024 Jan 25:1-8. doi: 10.1080/02701367.2023.2290266. Online ahead of print.

**Background:** Physical activity and sedentary behavior may differentially impact health-related quality of life in adults with cerebral palsy. **Objective:** The present investigation assessed the independent relationships between aspects of physical activity and sedentary behavior related to health related quality of life in adults with cerebral palsy. **Methods:** Through a cross-sectional online survey of 118 adults with cerebral palsy, participants self-reported the extent of their functional impairments using the Gross Motor Function Classification System, Manual Ability Classification System, and Communication Function

Classification System; while mental and physical health-related quality of life were assessed using the RAND-36. Physical activity and sedentary behavior were quantified using the Physical Activity and Disability Survey-Revised and Sedentary Behavior Questionnaire, respectively. Results: Accounting for potential confounding influences of impairments, neither exercise-related physical activity, leisure time-related physical activity, occupational physical activity, nor sedentary behavior was associated with any characterization of health-related quality of life. However, greater engagement in general lifestyle physical activity was related to superior mental health-related quality of life. Conclusion: These findings provide initial evidence to suggest that focusing public health and therapeutic recommendations for individuals with cerebral palsy on general physical activity engagement throughout the day might incur potential benefits for enhancing mental health-related quality of life in this population.

PMID: [38271733](#)

## **12. Development of a Play-Based Motor Learning Approach (A.MO.GIOCO) in Children with Bilateral Cerebral Palsy: Theoretical Framework and Intervention Methodology**

Maria Foscan, Antonella Luparia, Francesca Molteni, Elisa Bianchi, Shari Gandelli, Emanuela Pagliano, Ermellina Fedrizzi

Children (Basel). 2024 Jan 19;11(1):127. doi: 10.3390/children11010127.

The early intervention of motor training based on specific tasks and parent empowerment represents the new paradigm for the rehabilitation of children with Cerebral Palsy (CP). However, most published studies address the problem of the effectiveness of rehabilitation intervention without describing the treatment methodology or briefly mentioning it. The purpose of the study is to illustrate the development of a play-based motor learning approach titled A.MO.GIOCO (Apprendimento MOTOrio nel GIOCO) and its systematization. Fifteen children aged between 2 and 6 years with bilateral CP will be enrolled and treated for 6-8 weeks (48 h). Motor Teaching methods applied by senior therapists have been extensively described, starting from rehabilitation goals and proposed therapeutic play activities, tailored to the functional profile of each child. This child-friendly rehabilitative approach (A.MO.GIOCO) refers to the systemic cognitive model of learning and movement control and is implemented in the context of spontaneous play activities and in the therapist-child-family interaction. In this study the theoretical framework of the approach and the process followed by the therapists to transfer it into rehabilitative practice are highlighted. As a result, an operational guide has been created. Further studies will explore the efficacy of the proposed standardized approach.

PMID: [38275437](#)

## **13. Effectiveness of Partial Body Weight-Supported Treadmill Training on Various Outcomes in Different Contexts among Children and Adolescents with Cerebral Palsy: A Systematic Review and Meta-Analysis**

Abdulmajeed Alotaibi, Alaa Ibrahim, Raafat Ahmed, Turki Abualait

Review Children (Basel). 2023 Dec 20;11(1):9. doi: 10.3390/children11010009.

The efficiency of partial body weight-supported treadmill training (PBWSTT) for treating various conditions in children and adolescents with cerebral palsy (CP) in diverse contexts of rehabilitation, households, or schools is unknown. The major objective of this systematic review and meta-analysis was to analyze the effectiveness of PBWSTT on various outcomes in different contexts among children and adolescents with CP. We incorporated full-text, randomized controlled trial studies that specifically assessed the effects of PBWSTT walking, motor function, stride, balance, and endurance in children and adolescents aged 3 to 18 years with CP. The literature search was carried out using Google Scholar, PubMed, Web of Science, CINAHL Plus, Scopus, PEDro, and ResearchGate databases. The methodological quality was evaluated using a Cochrane risk of bias instrument. A meta-analysis of pooled data from 10 studies with 255 participants demonstrated that PBWSTT for 4-12 weeks in rehabilitation (mean difference [MD] = 1.94, 95% confidence interval [CI] = 1.40-2.48,  $p < 0.0001$ ), at home or in a school context (MD = 13.5, 95% CI = 13.9-16.0,  $p < 0.0001$ ), was significantly effective for treating various conditions in children and adolescents suffering with CP. The period of 4-12 weeks of PBWSTT in rehabilitation and at-home/school settings is effective on various outcomes in children or adolescents with CP.

PMID: [38275430](#)

## **14. Prevalence of Bruxism in Children and Adolescents with Cerebral Palsy: Systematic Review and Meta-analysis**

Nathalia Kanhouche, Gabriela Godoy Pizzi, Nathalia Araujo Bim, Rafael Celestino de Souza, Ana Flávia Bissoto Calvo, Isabela Floriano, Thais Gimenez, José Carlos Pettorossi Imparato, Tamara Kerber Tedesco

Curr Pediatr Rev. 2024 Jan 12. doi: 10.2174/0115733963252499231120092148. Online ahead of print.

Aims: To perform a systematic review and meta-analysis compiling data on the prevalence of bruxism in children and adolescents with cerebral palsy. Methods and results: Searches were carried out in PubMed/Medline, Web of Science, and

Scopus databases to identify the articles published by February 2023. Two independent reviewers, and in duplicate, employed a two-stage process to select publications. The same two reviewers performed the data extraction. Studies were included when the following eligibility criteria were met: performed in children and/or adolescents with cerebral palsy and reporting bruxism. Potentially eligible studies were read in full and excluded that: not presented numerical data on the prevalence of bruxism; not reported how the bruxism was assessed; not reported data about the cerebral palsy; and not an observational study. The risk assessment of bias was assessed by the Newcastle- Ottawa Scale. After reading the titles and abstracts of the 358 identified articles, eight articles from 1966 to 2020 were included. The main reason for not including the studies was not to report data about bruxism (59.3%), and 44.5% were excluded for not reporting data from patients with cerebral palsy. The studies were carried out in schools, university hospitals, or centers for patients with special needs (Brazil, the United States, and Egypt). The pooled prevalence of bruxism in children and adolescents with cerebral palsy was 46% (95%CI: 0.38-0.55) after removing one study. Conclusion: The pooled prevalence of bruxism in children with cerebral palsy can be considered high since almost half of the studied population is affected by this condition. PROSPERO #CRD42021225781.

PMID: [38243943](#)

### **15. An investigation of computer-game addiction, physical activity level, quality of life and sleep of children with a sibling with a chronic condition**

Sabiha Bezgin, Yunus Özkaya, Yılmaz Akbaş, Bülent Elbasan

Child Care Health Dev. 2024 Jan;50(1):e13228. doi: 10.1111/cch.13228.

Background: It is known that chronic condition also affects siblings without chronic illness. Healthy siblings of children with a chronic condition and aged 9-14 years and healthy children with a sibling without chronic illness and their parents were included in the study. Aim: The aim of our study was to examine the internet-game addiction, physical activity, quality of life and sleep in children with a sibling with chronic condition and compare them with their peers with a healthy sibling. Methods: Computer game addiction, physical activity, sleep quality and quality of life were evaluated respectively by Computer Game Addiction Scale for Children, Child Physical Activity Questionnaire, Children's Sleep Disorder Scale and Children's Quality of Life Scale. Results: While the mean age of 75 children with chronically ill siblings was  $10.65 \pm 1.59$  years, the mean age of 75 healthy children with healthy siblings was  $10.46 \pm 2.09$  years. It was observed that children with a sibling with a chronic condition were more tend to computer-game addiction, had lower sleep quality, lower quality of life in terms of school functionality and psychosocial health compared to children with a healthy sibling ( $p < 0.05$ ). Conclusions: It was revealed that in families with children with a chronic condition, siblings with no health problems should also be evaluated in psychosocial terms and supported by appropriate approaches, such as to increase the level of physical activity.

PMID: [38265131](#)

### **16. Association Between Assisted Reproductive Technology and Cerebral Palsy: A Meta-Analysis**

Amaia Cavero-Ibiricu, Javier Canelas-Fernández, Inés Gómez-Acebo, Jessica Alonso-Molero, Daniel Martínez-Jiménez, Javier Llorca, María J Cabero-Perez, Trinidad Dierssen-Sotos

Review Pediatr Neurol. 2023 Dec 30;152:115-124. doi: 10.1016/j.pediatrneurol.2023.12.019. Online ahead of print.

Background: Since 1978 many children are born thanks to assisted reproductive technology (ART). However, the long-term effects of these therapies are still not fully known. Our objective is to evaluate the risk of cerebral palsy (CP) after ART compared with that in those spontaneously conceived (SC) and to examine this risk in single, multiple, and preterm births and the evolution of the risk over the years. Methods: PubMed, Embase, and Web of Science databases were searched until December 2022. Studies were included if they studied CP cases in children born through ART. 16 studies were finally selected. Quality of studies was assessed using Newcastle Ottawa Scale. Pooled OR was estimated by weighting individual OR/RR by the inverse of their variance. A random-effect model was applied. To assess the causes of heterogeneity, we performed meta-regression analyses. Results: A significantly high risk of CP was found (OR = 1.27; 95% CI 1.12 to 1.43) in children born through ART compared with those SC. This risk increased in singletons (OR = 1.48; 95% CI 1.23 to 1.79) but disappeared in multiple (OR = 1.05; 95% CI 0.93 to 1.18) and preterm births (OR = 1.09; 95% CI 0.87 to 1.37). We found a higher risk of CP in children born before the year 2000 (OR = 3.40; 95% CI 2.49 to 4.63). Conclusions: ARTs slightly increase the risk of CP once the effect of multiple gestation is controlled. Further studies are needed to clarify whether the techniques themselves, fertility problems, or associated maternal comorbidities are responsible for this risk.

PMID: [38244531](#)

### **17. Visual, perceptual functions, and functional vision in children with unilateral cerebral palsy compared to children with neurotypical development**

Monica Crotti, Els Ortibus, Lisa Mailleux, Lisa Decraene, Lize Kleeren, Nofar Ben Itzhak

Dev Med Child Neurol. 2024 Jan 25. doi: 10.1111/dmcn.15842. Online ahead of print.

**Aim:** To investigate visual (perceptual) function and functional vision in children with unilateral cerebral palsy (CP) and children with neurotypical development (NTD). **Method:** Fifty children with unilateral CP (mean age 11 years 11 months, SD 2 years 10 months, range 7-15 years; 27 males; 26 left-sided unilateral CP; Manual Ability Classification System [MACS] levels: I, 27; II, 16; III, 7) and 50 age- and sex-matched children with NTD participated in a cross-sectional study. Visual acuity, stereoacuity, and visual-perceptual functions were measured with standardized clinical tests. Functional vision was assessed in children with unilateral CP with the Flemish cerebral visual impairment questionnaire (FCVIQ). Group differences were investigated with Mann-Whitney U tests, Kruskal-Wallis tests, and the relative effect sizes  $r$ ,  $\eta^2$  respectively. Correlations between visual assessments and the FCVIQ were investigated with Spearman's rank correlations. **Results:** The total group of children with unilateral CP showed reduced visual acuity compared with children with NTD ( $p = 0.02$ ,  $r = 0.23$ ). Only children with left-sided unilateral CP scored lower than those with NTD on stereoacuity ( $p < 0.01$ ,  $r = 0.36$ ). Children with right/left-sided unilateral CP scored significantly lower than those with NTD on visual-perceptual functions ( $p = 0.001-0.02$ ), with large effect sizes on visuomotor integration and visual closure (both  $r = 0.57$ ). Children with unilateral CP classified in MACS level III showed significantly lower scores on visual-perceptual assessments than children classified in MACS level I. Stereoacuity and visual-perceptual functions negatively correlated with the FCVIQ, with the highest association with visual (dis)interest and anxiety-related behaviours.

PMID: [38269438](#)

### 18. "Tremendous burdens often unveil enormous gifts": The experiences of South African caregivers implementing speech and language teletherapy for children with cerebral palsy during COVID-19

Gabriela Evangelou, Skye Nandi Adams

J Pediatr Rehabil Med. 2024 Jan 16. doi: 10.3233/PRM-220118. Online ahead of print.

**Purpose:** In accordance with South Africa's restrictions to mitigate the spread of COVID-19, some speech-language pathologists (SLPs) attempted to engage in novice teletherapy regimes to ensure continuity of care for children with cerebral palsy (CP). This study aimed to explore the experiences of caregivers of children with CP implementing SLP teletherapy during COVID-19 in South Africa. The goal was to shed light on how these families can be better supported and how teletherapy practices can be adjusted for this population. **Methods:** This study employed a qualitative phenomenological research design using in-person and virtual semi-structured interviews with 18 purposively sampled participants with children with CP who received speech and language teletherapy during COVID-19. The data was evaluated using an inductive thematic analysis approach whereby themes elicited from the caregivers' narratives were analyzed. **Results:** Interviews ( $n = 18$ ) unveiled the significant understanding caregivers gained by becoming integral and active stakeholders in the provision of teletherapy. Caregivers were able to meaningfully communicate and bond with their children with CP. However, caregivers also assumed the burden that teletherapy placed on them, as they had to renegotiate their role during the pandemic in order to provide routine teletherapy. **Conclusion:** Findings indicated the need for person-centered SLP teletherapy interventions that utilize contextually and culturally responsive techniques and resources.

PMID: [38251071](#)

### 19. [Morbidity rate of children's cerebral palsy in Baku city] [Article in Russian] [Abstract in English, Russian]

I E Hajiyeva

Zh Nevrol Psikhiatr Im S S Korsakova. 2024;124(1):143-146. doi: 10.17116/jnevro2024124011143.

**Objective:** To study the morbidity rate of children's cerebral palsy (CP) in Baku in children born in 2006-2016. **Material and methods:** During 2006-2016, 35 891, 37 130, 37 459, 40 050, 34 726, 34 192, 33 258, 30 373, 29 722, 29 654 and 29 564 children were born in Baku. CP was diagnosed in 1162 of these children. Newborns and children with CP were divided into 3 groups by body mass (<1500; 1500- 2500; 2500 and more) and into 4 groups by the gestational age (<28, 28-32; 32-36, 36 and more weeks). The morbidity rates were detected in these groups. The statistical significance of morbidity rates was assessed by  $\chi^2$  criteria. **Results:** The morbidity rate of CP changed within the interval 0.27% (95% CI 0.22-0.33%) in 2006 to 0.37% (95% CI 0.30-0.44%) in 2016. The difference between the minimum and maximum morbidity rates was not statistically significant ( $p > 0.05$ ). The morbidity rate of CP in newborns with body mass <1500 grams was 10.35% (95% CI 0-21.65%) and was 6.1 times higher than in the group of newborns weighing 1500-2500 grams at birth (1.72%; 95% CI 0.20-3.25%) and 30.4 times higher than in the group of newborns with body mass  $\geq 2500$  grams (0.34%; 95% CI 0.27-0.41%). The difference between morbidity rates of CP in groups depending on birth body mass was significant ( $p < 0.0001$ ). **Conclusion:** The incidence rate of CP in a cohort of newborns during the first 60 months after birth in 2006-2016 fluctuated in the range of 0.27-0.37% and had a weak growth trend. The morbidity rate of children's CP is significantly higher in children with body mass at birth <1500 (10.34%) and 1500-2500 grams (1.72%) than in children with body mass at birth 2500 and more grams (0.34%). The gestational age of newborns affects the morbidity rate of CP, which is 5.48; 1.78 and 0.34% at gestational age <32, 32-36 and  $\geq 36$  weeks. The structure of subtypes of this pathology is close to that in other populations against the background of the

comparative morbidity rate of CP in Baku, the proportion of spastic unilateral, spastic bilateral, dyskinetic and atonic CP is 35.2; 58.0; 3.9 and 1.4%, respectively.

PMID: [38261297](#)

## 20. Risk factors for cerebral palsy in children in Taiwan

Yuping Chen, Jing-Yang Huang, James Cheng-Chung Wei, Shih-Yu Lee, Ya-Fang Huang

Dev Med Child Neurol. 2024 Jan 23. doi: 10.1111/dmcn.15846. Online ahead of print.

**Aim:** To determine the significant risk factors of cerebral palsy (CP) in Taiwanese children and the associations between infant-related and parent-related factors. **Method:** Data from 1 459 093 infants and their parents in Taiwan's national databases collected between 2009 and 2016 were used. The cohort with CP included children diagnosed with CP between birth and age 3 years; a total of 3254 children with CP were included in the final analysis. Hierarchical logistic regression models were used to estimate the odds ratio for the risk factors of CP. **Results:** The hierarchical logistic regression models indicated that significant risk factors associated with CP are suburban location, low income, maternal and paternal diabetes mellitus, paternal substance abuse, paternal seizure disorder, male sex, birth by Cesarean section, singleton birth, low birthweight, being born extremely and very preterm, intraventricular hemorrhage, and periventricular leukomalacia, as well as tube feeding, ventilator use, and dopamine administration within 6 months of age. **Interpretation:** In addition to common maternal and infant risk factors, we identified significant paternal risk factors associated with CP, including diabetes mellitus, seizure disorder, and substance abuse. The combination of maternal, paternal, and infant risk factors in CP holds great promise for early identification and intervention.

PMID: [38263613](#)

## 21. Neurodevelopmental Outcome and Neuroimaging of Very Low Birth Weight Infants from an Italian NICU Adopting the Family-Centered Care Model

Licia Lugli, Marisa Pugliese, Natascia Bertoncelli, Luca Bedetti, Cristina Agnini, Isotta Guidotti, Maria Federica Roversi, Elisa Muttini Della Casa, Francesca Cavalleri, Alessandra Todeschini, Antonella Di Caprio, Tommaso Zini, Lucia Corso, Francesca Miselli, Fabrizio Ferrari, Alberto Berardi

Children (Basel). 2023 Dec 21;11(1):12. doi: 10.3390/children11010012.

**Background:** Improvements in perinatal care have substantially decreased mortality rates among preterm infants, yet their neurodevelopmental outcomes and quality of life persist as a pertinent public health concern. Family-centered care has emerged as a holistic philosophy that promotes effective alliances among patients, families, and healthcare providers to improve the quality of care. **Aims:** This longitudinal prospective study aims to evaluate the neurodevelopmental outcomes and brain MRI findings in a cohort of preterm newborns admitted to a neonatal intensive care unit (NICU) adopting a family-centered care model. **Methods:** Very low birth weight (VLBW) infants admitted to the NICU of Modena between 2015 and 2020 were enrolled. Infants who underwent conventional brain magnetic resonance imaging (MRI) at term-equivalent age were included. Neurodevelopmental follow-up was performed until the age of 24 months by a multidisciplinary team using the Amiel-Tison neurological assessment and the Griffiths Mental Developmental Scales (GMDS-R). Neurodevelopmental outcomes were classified as major sequelae (cerebral palsy,  $DQ \leq 70$ , severe sensory impairment), minor sequelae (minor neurological signs such as clumsiness or  $DQ$  between 71 and 85), and normal outcomes (no neurological signs and  $DQ > 85$ ). Risk factors for severe outcomes were assessed. **Results:** In total, 49 of the 356 infants (13.8%) died before hospital discharge, and 2 were excluded because of congenital disorders. Of the remaining 305 infants, 222 (72.8%) completed the 24 month follow-up and were included in the study. Neurodevelopmental outcomes were classified as normal ( $n = 173$ , 77.9%), minor ( $n = 34$ , 15.3%), and major sequelae ( $n = 15$ , 6.8%). Among 221 infants undergoing brain MRI, 76 (34.4%) had major lesions (intraventricular hemorrhage, hemorrhagic parenchymal infarction, periventricular leukomalacia, and large cerebellar hemorrhage). In the multivariate regression model, the retinopathy of prematurity (OR 1.8;  $p$  value 0.016) and periventricular-intraventricular hemorrhage (OR 5.6;  $p$  value  $< 0.004$ ) were associated with major sequelae. **Conclusions:** We reported low rates of severe neurodevelopmental outcomes in VLBW infants born in an Italian NICU with FCC. Identifying the risk factors for severe outcomes can assist in tailoring and optimizing early interventions on an individual basis, both within the NICU and after discharge.

PMID: [38275433](#)

## 22. Evaluation of the association between patent ductus arteriosus approach and neurodevelopment in extremely preterm infants

Soledad Belén Cervera, Sahar Saeed, Thuy Mai Luu, Andrea Gorgos, Marc Beltempo, Martine Claveau, Olga Basso, Anie Lapointe, Sophie Tremblay, Gabriel Altit



J Perinatol. 2024 Jan 26. doi: 10.1038/s41372-024-01877-8. Online ahead of print.

**Objective:** Assess if unit-level PDA management correlates with neurodevelopmental impairment (NDI) at 18-24 months corrected postnatal age (CPA) in extremely preterm infants. **Study design:** Retrospective analysis of infants born at <29 weeks (2014-2017) across two units having distinct PDA strategies. Site 1 utilized an echocardiography-based treatment strategy aiming for accelerated closure (control). Site 2 followed a conservative approach. **Primary endpoint:** NDI, characterized by cerebral palsy, any Bayley-III composite score <85, sensorineural/mixed hearing loss, or at least unilateral visual impairment. **Results:** 377 infants were evaluated. PDA treatment rates remained unchanged in Site 1 but eventually reached 0% in Site 2. Comparable rates of any/significant NDI were seen across both sites (any NDI: 38% vs 36%; significant NDI: 13% vs 10% for Site 1 and 2, respectively). After adjustments, NDI rates remained similar. **Conclusion:** PDA management strategies in extremely preterm newborns showed no significant impact on neurodevelopment outcomes at 18-24 months CPA.

PMID: [38278962](#)

### 23. Comorbidity clusters among adults with cerebral palsy: A latent class analysis

Aleda M Leis, Edward A Hurvitz, Daniel G Whitney

Am J Prev Med. 2024 Jan 24:S0749-3797(24)00025-4. doi: 10.1016/j.amepre.2024.01.011. Online ahead of print.

**Introduction:** Adults with cerebral palsy (CP) are at risk for early multi-morbidity onset, but little is known about the composition of multi-morbidity profiles or how these profiles present across adulthood. The objective of this study was to identify multi-morbidity profiles and association with mortality among adults with CP. **Methods:** This retrospective cohort study used a random 20% fee-for-service Medicare database from 01/01/2008-12/31/2019 from adults ≥18 years old with CP. Latent class analyses using four-class models were conducted within each age cohort (young adults 18-39, middle adulthood 40-64, and older adults ≥65 years) to determine patterns of 30 comorbidities defined using ICD-9 codes, identified from 01/01/2008-12/31/2010, and their association with mortality through 12/31/2019 (up to 11 years of follow-up); statistical analysis was performed in 2023. **Results:** Three classes were relatively consistent in the composition of comorbidities across young (n=7,020), middle (n=13,554), and older (n=4,193) cohorts: (1) "Low Morbidity" (low proportion of all comorbidities) representing 50.1% (young), 41.4% (middle), and 30.9% (older) of the cohorts; (2) "Neurological Multi-Morbidity" (e.g., epilepsy, intellectual disabilities) representing 26.0% (young), 26.6% (middle), and 14.7% (older); and "Complex Multi-Morbidity" (e.g., cardiorespiratory, nutritional, musculoskeletal, neurological) representing 26.0% (young), 26.6% (middle), and 14.7% (older). The fourth class varied by young ("Mental Health Disorders"), middle ("Hypertension"), and older ("Hypertension and Osteoarthritis") age cohorts. Compared to the "Low Morbidity" class, other classes had an increased mortality rate for each age cohort (HR range, 1.34-5.58, all P<0.001). **Conclusions:** Findings provide insight into varied multi-morbidity profiles and associations with mortality across the life course for adults with CP.

PMID: [38278372](#)

### 24. Function and dysfunction of the dystonia network: an exploration of neural circuits that underlie the acquired and isolated dystonias

Jason S Gill, Megan X Nguyen, Mariam Hull, Meike E van der Heijden, Ken Nguyen, Sruthi P Thomas, Roy V Sillitoe

Dystonia. 2023;2:11805. doi: 10.3389/dyst.2023.11805. Epub 2023 Dec 13.

Dystonia is a highly prevalent movement disorder that can manifest at any time across the lifespan. An increasing number of investigations have tied this disorder to dysfunction of a broad "dystonia network" encompassing the cerebellum, thalamus, basal ganglia, and cortex. However, pinpointing how dysfunction of the various anatomic components of the network produces the wide variety of dystonia presentations across etiologies remains a difficult problem. In this review, a discussion of functional network findings in non-mendelian etiologies of dystonia is undertaken. Initially acquired etiologies of dystonia and how lesion location leads to alterations in network function are explored, first through an examination of cerebral palsy, in which early brain injury may lead to dystonic/dyskinetic forms of the movement disorder. The discussion of acquired etiologies then continues with an evaluation of the literature covering dystonia resulting from focal lesions followed by the isolated focal dystonias, both idiopathic and task dependent. Next, how the dystonia network responds to therapeutic interventions, from the "geste antagoniste" or "sensory trick" to botulinum toxin and deep brain stimulation, is covered with an eye towards finding similarities in network responses with effective treatment. Finally, an examination of how focal network disruptions in mouse models has informed our understanding of the circuits involved in dystonia is provided. Together, this article aims to offer a synthesis of the literature examining dystonia from the perspective of brain networks and it provides grounding for the perspective of dystonia as disorder of network function.

PMID: [38273865](#)

## 25. Efficacy of inhaled nitric oxide in preterm infants $\leq 34$ weeks: a systematic review and meta-analysis of randomized controlled trials

Zhoushan Feng, Xiaohong Wu, Xiaona Xu, Qiliang Cui, Fan Wu

Review Front Pharmacol. 2024 Jan 11:14:1268795. doi: 10.3389/fphar.2023.1268795. eCollection 2023.

**Background:** The effect of inhaled nitric oxide (iNO) in neonates  $>34$  weeks on improving respiration is well documented. However, the efficacy of iNO in preterm infants  $\leq 34$  weeks remains controversial. **Objectives:** The main purpose of this review is to assess the effectiveness and safety of iNO treatment in preterm infants  $\leq 34$  weeks. **Search methods:** We systematically searched PubMed, Embase and Cochrane Libraries from their inception to 1 June 2023. We also reviewed the reference lists of retrieved studies. **Selection criteria:** Our study involved randomized controlled trials on preterm infants  $\leq 34$  weeks, especially those receiving iNO treatment, and mainly assessed outcomes such as bronchopulmonary dysplasia (BPD) and mortality. Two authors independently reviewed these trials, extracted data, and evaluated study biases. Disagreements were resolved by consensus. We used the GRADE method to assess evidence quality. **Results:** Our research included a total of 17 studies involving 4,080 neonates and 7 follow-up studies. The synthesis of results showed that in neonates, iNO treatment reduced the incidence of BPD (RR: 0.92; 95% CI: 0.86-0.98). It also decreased the composite outcome of death or BPD (RR: 0.94; 95% CI: 0.90-0.98), without increasing the risk of short-term (such as intraventricular hemorrhage, periventricular leukomalacia) and long-term neurological outcomes (including Bayley mental developmental index  $<70$ , cerebral palsy and neurodevelopmental impairment). Furthermore, iNO did not significantly affect other neonatal complications like sepsis, pulmonary hemorrhage, necrotizing enterocolitis, and symptomatic patent ductus arteriosus. Subgroup analysis revealed that iNO significantly reduced BPD incidence in neonates at 36 weeks under specific intervention conditions, including age less than 3 days, birth weight over 1,000 g, iNO dose of 10 ppm or higher, or treatment duration exceeding 7 days ( $p < 0.05$ ). **Conclusion:** Inhaled NO reduced the incidence of BPD in neonates at 36 weeks of gestation, and the effect of the treatment depended on neonatal age, birth weight, duration and dose of iNO. Therefore, iNO can be considered a promising treatment for the potential prevention of BPD in premature infants. More data, however, would be needed to support nitric oxide registration in this specific patient population, to minimize its off-label use.

PMID: [38273818](#)

## 26. Community-based respiratory health measures in children and young people with cerebral palsy: A scoping review

Rachel Knight Lozano, Harriet Shannon, Jonathan Gilby, Sian Goddard, Leanne Turner, Jonathan Marsden

Review Dev Med Child Neurol. 2024 Jan 25. doi: 10.1111/dmcn.15854. Online ahead of print.

**Aim:** To identify, map, and describe outcome measurement domains and instruments used within a community setting to assess respiratory health in children and young people aged 1 to 18 years, diagnosed with cerebral palsy (CP). **Method:** A scoping review methodology informed structured searches in nine databases, grey literature, and registries, conducted in August 2021 (updated in February 2023). Articles were screened for eligibility by two independent researchers. Any outcome measurement instruments used to assess respiratory health or associated impact were extracted, categorized, and mapped to health and health-related domains of the International Classification of Functioning, Disability, and Health. **Results:** Seventy-six outcome measurement instruments were identified across 78 articles worldwide between 1970 and 2023. These were categorized into 'Body functions and structures' ( $n = 20$ ), 'Activity and performance' ( $n = 22$ ), and 'Participation and quality of life' ( $n = 19$ ), with a further 15 mapped to 'Health care resources use'. **Interpretation:** No consensus of 'what' to measure and 'how' to measure respiratory health in children and young people with CP was found. Moreover, many measures were not replicable in individuals with more severe forms of CP, excluding those at increased risk of respiratory-related morbidity and mortality. Further research is required to agree important outcome domains and associated measures in research and clinical practice.

PMID: [38269611](#)

## 27. Detailed statistical analysis plan for ALBINO: effect of Allopurinol in addition to hypothermia for hypoxic-ischemic Brain Injury on Neurocognitive Outcome - a blinded randomized placebo-controlled parallel group multicenter trial for superiority (phase III)

Corinna Engel, Mario Rüdiger, Manon J N L Benders, Frank van Bel, Karel Allegaert, Gunnar Naulaers, Dirk Bassler, Katrin Klebermaß-Schrehof, Maximo Vento, Ana Vilan, Mari Falck, Isabella Mauro, Marjo Metsäranta, Sampsa Vanhatalo, Jan Mazela, Tuuli Metsvaht, Roselinda van der Vlugt, Axel R Franz; ALBINO Study Group

Clinical Trial Trials. 2024 Jan 24;25(1):81. doi: 10.1186/s13063-023-07828-6.

**Background:** Despite therapeutic hypothermia (TH) and neonatal intensive care, 45-50% of children affected by moderate-to-severe neonatal hypoxic-ischemic encephalopathy (HIE) die or suffer from long-term neurodevelopmental impairment. Additional neuroprotective therapies are sought, besides TH, to further improve the outcome of affected infants. Allopurinol - a xanthine oxidase inhibitor - reduced the production of oxygen radicals and subsequent brain damage in pre-clinical and

preliminary human studies of cerebral ischemia and reperfusion, if administered before or early after the insult. This ALBINO trial aims to evaluate the efficacy and safety of allopurinol administered immediately after birth to (near-)term infants with early signs of HIE. Methods/design: The ALBINO trial is an investigator-initiated, randomized, placebo-controlled, double-blinded, multi-national parallel group comparison for superiority investigating the effect of allopurinol in (near-)term infants with neonatal HIE. Primary endpoint is long-term outcome determined as survival with neurodevelopmental impairment versus death versus non-impaired survival at 2 years. Results: The primary analysis with three mutually exclusive responses (healthy, death, composite outcome for impairment) will be on the intention-to-treat (ITT) population by a generalized logits model according to Bishop, Fienberg, Holland (Bishop YF, Discrete Multivariate Analysis: Theory and Practice, 1975) and ."will be stratified for the two treatment groups. Discussion: The statistical analysis for the ALBINO study was defined in detail in the study protocol and implemented in this statistical analysis plan published prior to any data analysis. This is in accordance with the Declaration of Helsinki and the International Conference on Harmonization Good Clinical Practice guidelines. Trial registration: ClinicalTrials.gov NCT03162653. Registered on 22 May 2017.

PMID: [38267942](#)

## **28. Recreational screen time behaviour among ambulatory children and adolescents diagnosed with cerebral palsy: A cross-sectional analysis**

Christina Esmann Fonvig, Jens Troelsen, Anders Holsgaard-Larsen

Child Care Health Dev. 2024 Jan;50(1):e13221. doi: 10.1111/cch.13221.

Aim: To describe the recreational screen time behaviour of 8-16-year-olds diagnosed with cerebral palsy (CP) and explore associations between health-related quality of life, sleep duration and physical activity behaviour versus screen time. Methods: This cross-sectional study used proxy-reported questionnaire data of 381 ambulatory (with or without assistance) 8-16-year-olds diagnosed with CP corresponding to Gross Motor Function Classification System (GMFCS) levels I-III. Descriptive statistics were used to report age, sex and the GMFCS level. The potential associations of health-related quality of life, physical activity behaviour and sleep duration (dependent variables) versus screen time (independent variable) were determined using multiple linear regression. Health-related quality of life was evaluated using the Pediatric Quality of Life Inventory, including seven dimensions: Daily Activities; School Activities; Movement and Balance; Pain and Hurt; Fatigue; Eating Activities; and Speech and Communication. Results: The participants spent a median screen time of 3.9 h daily. The boys spent a longer screen time during weekends than the girls ( $p = 0.003$ ). Boys spent more time on games ( $p < 0.001$ ), whereas girls spent more time on social media and video calls ( $p < 0.001$ ). Increasing age ( $p < 0.001$ ) was associated with increased screen time but did not differ between the GMFCS levels. Sleep duration, perceived fatigue and perceived movement and balance correlated negatively with screen time. Conclusion: This study sheds light on the recreational screen time habits of ambulatory children and adolescents diagnosed with CP. Further investigation into the observed associations is warranted to investigate potential causation and relationships between sleep behaviour, quality of life and screen time behaviour.

PMID: [38265132](#)

## **29. The aetiology of preterm birth and risks of cerebral palsy and cognitive impairment: A systematic review and meta-analysis**

Milla Ylijoki, Mariane Sentenac, Bernd Pape, Jennifer Zeitlin, Liisa Lehtonen

Review Acta Paediatr. 2024 Jan 24. doi: 10.1111/apa.17118. Online ahead of print.

Aim: The associations between the aetiology of preterm birth and later neurodevelopmental outcomes are unclear. A systematic review and meta-analysis examined the existing evidence. Methods: The PubMed and Embase databases were searched for papers published in English from inception to 16 December 2020. We included original papers on the causes of preterm birth and the risks of cerebral palsy (CP) and suboptimal cognitive development. Two reviewers independently evaluated the studies and extracted the data. Results: The literature search yielded 5472 papers and 13 were selected. The aetiology of preterm birth was classified under spontaneous or medically indicated delivery. A meta-analysis was performed, comprising 104 902 preterm infants from 11 papers on CP. Preterm infants born after a medically indicated delivery had a lower CP risk than infants born after spontaneous delivery, with a pooled odds ratio of 0.59 (95% confidence interval 0.40-0.86). This result was robust in the subgroup and sensitivity analyses. Cognitive development was reported in three papers, which suggested that worse outcomes were associated with medically indicated deliveries. Conclusion: The aetiology of preterm delivery may contribute to the risk of CP and cognitive delay. Further research is needed, using individual-level meta-analyses to adjust for possible confounders, notably gestational age.

PMID: [38265113](#)

### 30. Platelet Transfusion and Death or Neurodevelopmental Impairment in Children Born Extremely Preterm

Patricia E Davenport, Thomas R Wood, Patrick J Heagerty, Martha C Sola-Visner, Sandra E Juul, Ravi M Patel

Observational Study JAMA Netw Open. 2024 Jan 2;7(1):e2352394. doi: 10.1001/jamanetworkopen.2023.52394.

**Importance:** Infants born extremely preterm receive transfusions at higher platelet count thresholds than older children and adults due to concerns for intracranial hemorrhage. A recent randomized trial comparing 2 platelet transfusion thresholds showed the higher threshold was associated with increased risk of long-term adverse neurodevelopmental outcomes. **Objective:** To evaluate the association of platelet transfusion exposure with death and severe neurodevelopmental impairment (NDI) at 2 years' corrected age in a cohort of infants born extremely preterm. **Design, setting, and participants:** An observational cohort study and secondary analysis of the Preterm Erythropoietin Neuroprotection Trial, a randomized, placebo-controlled clinical trial of erythropoietin neuroprotection in neonates born extremely preterm, was conducted in 30 neonatal intensive care units in the US from December 1, 2013, to September 31, 2016. This analysis included 819 infants born extremely preterm at 24 to 27 completed weeks of gestation who had a documented outcome (death or neurodevelopmental assessment). Analysis was performed in April 2023. **Exposures:** Any platelet transfusion during neonatal intensive care unit hospitalization. **Main outcomes and measures:** The primary composite outcome was death or severe NDI evaluated at 2 years' corrected age using the Bayley Scales of Infant Development-Third Edition (BSID-III) and the Gross Motor Function Classification System and was defined as the presence of severe cerebral palsy or a BSID-III composite motor or cognitive score 2 SDs below the mean. **Confounding by indication for platelet transfusion** was addressed with covariate adjustment and propensity score methods. **Results:** Of the 819 infants included in the analysis (429 [52.4%] male; mean [SD] gestational age, 25.5 [1.1] weeks), 245 (30.0%) received at least 1 platelet transfusion during their initial hospitalization. The primary outcome occurred in 46.5% (114 of 245) of infants exposed to a platelet transfusion and 13.9% (80 of 574) of nonexposed infants with a corresponding odds ratio of 2.43 (95% CI, 1.24-4.76), adjusted for propensity score, gestational age at birth, and trial treatment group. The individual components of death and severe NDI were directionally consistent with the overall composite outcome. **Conclusions and relevance:** The findings of this study suggest that platelet transfusion in infants born extremely preterm may be associated with an increased risk of death or severe NDI at 2 years' corrected age, although the possibility of residual confounding by indication cannot be excluded.

PMID: [38261320](#)

### 31. [Early differential diagnosis and restorative treatment of cerebral palsy] [Article in Russian] [Abstract in English, Russian]

S A Nemkova, V G Boldyrev

Zh Nevrol Psikhiatr Im S S Korsakova. 2024;124(1):24-37. doi: 10.17116/jnevro202412401124.

The article is devoted to an urgent problem of modern neurology - early diagnosis and complex restorative treatment of cerebral palsy (cerebral palsy). Etiological factors and pathogenetic aspects of the formation of various forms of cerebral palsy are considered in detail, as well as modern possibilities of differential diagnosis in children of the first years of life of cerebral palsy and a wide range of pathological conditions (somatic, endocrine, hereditary-conditioned, including hereditary-metabolic and neuromuscular diseases). The leading directions of complex rehabilitation of cerebral palsy are widely presented, taking into account modern standards and clinical recommendations. The high efficacy of the drug Cortexin has been shown, due to its positive multimodal action (stimulation of the processes of neuropreparation, neuroprotection, neuroplasticity) in the treatment of motor, cognitive and autonomic disorders in children with perinatal lesions of the central nervous system and cerebral palsy.

PMID: [38261281](#)

### 32. Histological chorioamnionitis and pathological stages on very preterm infant outcomes

Jiajia Duan, Falin Xu, Chaoya Zhu, Ju Wang, Xiaoli Zhang, Yiran Xu, Bingbing Li, Xirui Peng, Jinjin Zhu, Xiaoyang Wang, Changlian Zhu

Histopathology. 2024 Jan 22. doi: 10.1111/his.15147. Online ahead of print.

**Aims:** Histological chorioamnionitis (HCA) is a condition linked to preterm birth and neonatal infection and its relationship with various pathological stages in extremely preterm neonates, and with their associated short- and long-term consequences, remains a subject of research. This study investigated the connection between different pathological stages of HCA and both short-term complications and long-term outcomes in preterm infants born at or before 32 weeks of gestational age. **Methods:** Preterm infants born at  $\leq 32$  weeks of gestation who underwent placental pathology evaluation and were followed-up at 18-24 months of corrected age were included. Neonates were classified based on their exposure to HCA and were further subdivided into different groups according to maternal inflammatory responses (MIR) and fetal inflammatory responses (FIR) stages. We compared short-term complications during their hospital stay between the HCA-exposed and -unexposed groups and examined

the influence of HCA stages on long-term outcomes. Results: The HCA group exhibited distinct characteristics such as higher rates of premature rupture of membranes > 18 h, reduced amniotic fluid, early-onset sepsis, bronchopulmonary dysplasia and intraventricular haemorrhage (IVH) grades III-IV ( $P < 0.05$ ). The moderate-severe HCA group displayed lower gestational age, lower birth weight and higher incidence of IVH (grades III-IV) and preterm sepsis compared with the mild HCA group ( $P < 0.05$ ). After adjusting for confounders, the MIR stages 2-3 group showed associations with cognitive impairment and cerebral palsy ( $P < 0.05$ ), and the FIR stages 2-3 group also showed poor long-term outcomes and cognitive impairment ( $P < 0.05$ ). Conclusions: Moderate-severe HCA was associated with increased early-onset sepsis, severe IVH and poor long-term outcomes, including cognitive impairment and cerebral palsy. Vigilant prevention strategies are warranted for severe HCA cases in order to mitigate poorer clinical outcomes.

PMID: [38253913](#)

### 33. Impact of selective dorsal rhizotomy to cerebral palsy children caregivers' burden

Bernardo Assumpcao de Monaco, Alessandra Alves Du Rocher Candido, Manoel Jacobsen Teixeira, Eduardo Joaquim Lopes Alho

Childs Nerv Syst. 2024 Jan 22. doi: 10.1007/s00381-024-06291-1. Online ahead of print.

Purpose: It is known that cerebral palsy (CP) children's caregivers suffer from burden, depression, and stress, impairing their quality of life (QoL). The more severe the CP, the more burden the caregiver has. Psychosocial support, education, therapies, and financial support are inversely related to the level of stress of the caregiver. Most parents of CP patients submitted to selective dorsal rhizotomy (SDR) report improvement not just on spasticity, but also in the functional role of the children, what can impact on caregiver's QoL. Our objective was to evaluate the burden of CP children's caregivers with and without previous SDR. Methods: Spastic CP children caregivers were divided into two groups: those who take care of children without previous SDR (control group) and those that children were previously submitted to SDR (surgical group). The burden index was compared between groups using Burden Interview Questionnaire (BIQ). For statistical analysis, we used SPSS. Results: The control group had enrolled 31 participants and the surgical group 36. The mean GMFCS level on the control and surgical groups was  $3.94 \pm 1.26$  and  $3.74 \pm 1.12$  ( $p = 0.61$ ), respectively. The surgical group caregivers presented less burden related to the feeling that they should be doing more to their child ( $p = 0.003$ ) and if they could do a better job in caring ( $p = 0.032$ ), compared to controls. The total BIQ index was not significantly different between groups (surgical  $32.14 \pm 12.34$  vs. control  $36.77 \pm 12.77$ ;  $p = 0.87$ ). Low economic status had a weak correlation to a higher BIQ index ( $R^2 = 0.24$ ). After age-matching, there was a significant higher BIQ index in the control group ( $p = 0.008$ ). Conclusion: Caregivers of spastic CP children who were previously submitted to SDR presented less burden related to feeling of the amount of given care than those without previous surgery. The impression that they could do a better job with their kids was higher in the control group. The severity of CP and low economic status were related to more burden in both groups. After pairing groups by age, the control group had a significant higher BIQ index compared to the SDR group. Clinical trial registration: Trial registration number: CAAE 73407317.6.0000.0068 (Ethical and Research Committee of University of Sao Paulo, Sao Paulo, Brazil, approved on 08/06/2021). All the subjects were freely given an informed consent to participate in the study that was obtained from all participants. Non-consented ones were excluded from the study.

PMID: [38252157](#)

### 34. The effect of structured supportive approach based on Kolcaba's comfort theory applied to parents of children with cerebral palsy on child's comfort, quality of life, and parent's self-efficacy: A randomised controlled trial

Bircan Kahraman Berberoğlu, Hüsnüye Çalışır

J Pediatr Nurs. 2024 Jan 20:S0882-5963(23)00390-1. doi: 10.1016/j.pedn.2023.12.032. Online ahead of print.

Aim: This study aims to assess how a structured supportive approach applied to the parents of children living with cerebral palsy according to how the Theory of Comfort affects the child's comfort, quality of life, and parent's self-efficacy. Design: A single-blind, randomised, controlled experimental trial. Methods: The study was conducted with parents of children with cerebral palsy aged between 8 and 16 years who presented to the rehabilitation centers between October 2021 and November 2022. The sample consisted of a total of 73 parents from the experimental ( $n = 35$ ) and control ( $n = 38$ ) groups. While a care programme based on the Theory of Comfort was applied to the intervention group, the practises included in the routines of the centres were applied to the control group. The researcher collected data using the Comfort Behaviours Checklist (CBCL), the Parent Form of the Quality-of-Life Scale for Children (QoLC), and the Self-Efficacy Scale. Results: The children in the intervention group had significantly higher CBCL and QoLC mean scores and the parents in the intervention group had significantly higher self-efficacy mean scores of parents when compared to the control group. Conclusions: The structured supportive approach based on the Theory of Comfort enhanced children's comfort and quality of life and increased parents' self-efficacy. Relevance to clinical practice: It is recommended to implement the structured supportive approach applied according to the Theory of Comfort with the parents of children with cerebral palsy in special training and rehabilitation centres. Paediatric nurses can perform preventive and rehabilitative nursing management with a holistic approach to meet the needs of children with cerebral palsy and their families.

PMID: [38246818](#)

### 35. Providing holistic care to children with cerebral palsy treated with transnasal neural stem cell transplantation

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**Objective:** Holistic care is a key element in nursing care. Aiming at the heterogeneous disease of cerebral palsy, researchers focused on children with cerebral palsy who received transnasal transplantation of neural stem cells as a specific group. Based on establishing a multidisciplinary team, comprehensive care is carried out for this type of patient during the perioperative period to improve the effectiveness and safety of clinical research and increase the comfort of children. **Methods:** Between January 2018 and June 2023, 22 children with cerebral palsy underwent three transnasal transplants of neural stem cells. **Results:** No adverse reactions related to immune rejection were observed in the 22 children during hospitalization and follow-up. All children tolerated the treatment well, and the treatment was superior. One child developed nausea and vomiting after sedation; three had a small amount of bleeding of nasal mucosa after transplantation. Two children had a low fever ( $\leq 38.5^{\circ}\text{C}$ ), and one had a change in the type and frequency of complex partial seizures. Moreover, 3 children experienced patch shedding within 4 h of patch implantation into the nasal cavity. **Conclusion:** The project team adopted nasal stem cell transplantation technology. Based on the characteristics of transnasal transplantation of neural stem cells in the treatment of neurological diseases in children, a comprehensive and novel holistic care plan is proposed. It is of great significance to guide caregivers of children to complete proper care, further improve the safety and effectiveness of treatment, and reduce the occurrence of complications.

PMID: [38250587](#)

### 36. Temporal evolution of electrographic seizures in newborn infants with hypoxic-ischaemic encephalopathy requiring therapeutic hypothermia: a secondary analysis of the ANSeR studies

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**Background:** Despite extensive research on neonatal hypoxic-ischaemic encephalopathy, detailed information about electrographic seizures during active cooling and rewarming of therapeutic hypothermia is sparse. We aimed to describe temporal evolution of seizures and determine whether there is a correlation of seizure evolution with 2-year outcome. **Methods:** This secondary analysis included newborn infants recruited from eight European tertiary neonatal intensive care units for two multicentre studies (a randomised controlled trial [NCT02431780] and an observational study [NCT02160171]). Infants were born at 36+0 weeks of gestation with moderate or severe hypoxic-ischaemic encephalopathy and underwent therapeutic hypothermia with prolonged conventional video-electroencephalography (EEG) monitoring for 10 h or longer from the start of rewarming. Seizure burden characteristics were calculated based on electrographic seizures annotations: hourly seizure burden (minutes of seizures within an hour) and total seizure burden (minutes of seizures within the entire recording). We categorised infants into those with electrographic seizures during active cooling only, those with electrographic seizures during cooling and rewarming, and those without seizures. Neurodevelopmental outcomes were determined using the Bayley's Scales of Infant and Toddler Development, Third Edition (BSID-III), the Griffiths Mental Development Scales (GMDS), or neurological assessment. An abnormal outcome was defined as death or neurodisability at 2 years. Neurodisability was defined as a composite score of 85 or less on any subscales for BSID-III, a total score of 87 or less for GMDS, or a diagnosis of cerebral palsy (dyskinetic cerebral palsy, spastic quadriplegia, or mixed motor impairment) or epilepsy. **Findings:** Of 263 infants recruited between Jan 1, 2011, and Feb 7, 2017, we included 129 infants: 65 had electrographic seizures (43 during active cooling only and 22 during and after active cooling) and 64 had no seizures. Compared with infants with seizures during active cooling only, those with seizures during and after active cooling had a longer seizure period (median 12 h [IQR 3-28] vs 68 h [35-86],  $p < 0.0001$ ), more seizures (median 12 [IQR 5-36] vs 94 [24-134],  $p < 0.0001$ ), and higher total seizure burden (median 69 min [IQR 22-104] vs 167 min [54-275],  $p = 0.0033$ ). Hourly seizure burden peaked at about 20-24 h in both groups, and infants with seizures during and after active cooling had a secondary peak at 85 h of age. When combined, worse EEG background (major abnormalities and inactive background) at 12 h and 24 h were associated with the seizure group: compared with infants with a better EEG background (normal, mild, or moderate abnormalities), infants with a worse EEG background were more likely to have seizures after cooling at 12 h (13 [54%] of 24 vs four [14%] of 28; odds ratio 7.09 [95% CI 1.88-26.77],  $p = 0.0039$ ) and 24 h (14 [56%] of 25 vs seven [18%] of 38; 5.64 [1.81-17.60],  $p = 0.0029$ ). There was a significant relationship between EEG grade at 12 h (four categories) and seizure group ( $p = 0.020$ ). High total seizure burden was associated with increased odds of an abnormal outcome at 2 years of age (odds ratio 1.007 [95% CI 1.000-1.014],  $p = 0.046$ ), with a medium negative correlation between total seizure burden and BSID-III cognitive score ( $r_s = -0.477$ ,  $p = 0.014$ ,  $n = 26$ ). **Interpretation:** Overall, half of infants with hypoxic-ischaemic encephalopathy had electrographic seizures and a third of those infants had seizures beyond active cooling, with worse outcomes. These results raise the importance of prolonged EEG

monitoring of newborn infants with hypoxic-ischaemic encephalopathy not only during active cooling but throughout the rewarming phase and even longer when seizures are detected.

PMID: [38246187](#)

### **37. Mesenchymal Stem Cell-Induced Neuroprotection in Pediatric Neurological Diseases: Recent Update of Underlying Mechanisms and Clinical Utility**

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Pediatric neurological diseases refer to a group of disorders that affect the nervous system in children. These conditions can have a significant impact on a child's development, cognitive function, motor skills, and overall quality of life. Stem cell therapy is a new and innovative approach to treat various neurological conditions by repairing damaged neurons and replacing those that have been lost. Mesenchymal stem cells (MSCs) have gained significant recognition in this regard due to their ability to differentiate into different cell types. MSCs are multipotent self-replicating stem cells known to render promising results in the treatment of stroke and spinal cord injury in adults. When delivered to the foci of damage in the central nervous system, stem cells begin to differentiate into neural cells under the stimulation of paracrine factors and secrete various neurotrophic factors (NTFs) like nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), and neurotrophin-3 (NT-3) that expedite the repair process in injured neurons. In the present review, we will focus on the therapeutic benefits of the MSC-based therapies in salient pediatric neurological disorders including cerebral palsy, stroke, and autism.

PMID: [38261236](#)

### **38. The use of creative case studies to explore non-verbal and non-ambulant children and young people's well-being**

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**Background and purpose:** The aim of this paper is to describe and critically analyse creative research methods, exploring how these can offer ways to enable non-verbal and non-ambulant children and young people with cerebral palsy, to express their views about their well-being. The context of this research explored their choices for recreational activities, seeking to understand how their level of participation impacted upon their well-being. **Methods:** A qualitative comparative case study design was chosen comprising of two interviews, using photographs and diaries to elicit discussion, supported by observations. These observations provided evidence of well-being indicators that were interpreted by the researcher, alongside their parents. Seven participants volunteered, aged nine to sixteen years. Data were analysed utilising Braun and Clark's six stages. Firstly, each case's data sources were coded, themes identified, then across cases comparisons, arriving at three final themes. Triangulation of data sources which made up each case, enhanced the trustworthiness in this study. **Results:** Observations were key to providing insight into their well-being. Interpretation of this rich data, supported by their parents, revealed that the participants could self-advocate, as shown by their intentional behaviours, to choose their level of participation. **Discussion:** The researcher's ability to be creative in the data collection methods is original in physiotherapy. It was important to work in partnership with parents, to ensure the correct interpretation of their intentional behaviours from the observations. The diaries and photographs added a unique contribution to knowledge, which enabled the non-verbal participants inclusion, empowering them to express their well-being. **Study registration:** This study is registered with the International Study + Clinical Trials Network Register (ISRCTN) Number:42717948. **CONTRIBUTION OF PAPER.**

PMID: [38244485](#)