# Cerebral palsy research news

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## Interventions and Management

**Interventions and Management**

**1.Enhanced Recovery With Combined Epidural and General Anesthesia in Children With Cerebral Palsy Undergoing Hip Reconstructive Surgery: A National Cohort Study**

David Momtaz, Parker Mitchell, Jad Lawand, Blaire Peterson, Abdullah Ghali, Sean Tabaie, Shrader M Wade, Benjamin J Shore, Rachel Thompson, Pooya Hosseinzadeh

J Pediatr Orthop . 2025 Apr 21. doi: 10.1097/BPO.0000000000002984. Online ahead of print.

Background: Pediatric patients with cerebral palsy (CP) undergoing hip reconstruction face significant postoperative pain challenges. This study aimed to assess the efficacy and safety of epidural anesthesia combined with general anesthesia compared with general anesthesia alone in reducing postoperative opiate usage, postoperative complications, and length of hospital stay in this vulnerable population.
Methods: A retrospective cohort study was conducted, analyzing medical records of pediatric CP patients who underwent bilateral proximal femoral osteotomy between 2003 and 2023, using a large national US health care database. Patients were dichotomized into 2 groups based on anesthesia technique: general anesthesia only (General) and general anesthesia with adjunct epidural anesthesia (Epidural). The primary outcome measured was the use of IV opiates within the first 3 days postoperation. Secondary outcomes included the use of per os (PO) opiates, length of stay (LOS), and postoperative complications such as ICU admission, mortality, pneumonia, respiratory failure, urinary retention, and urinary tract infections within 90 days postoperatively. Patient characteristics, including age, BMI percentile, gastrostomy and tracheostomy status, as well as concomitant hamstring lengthening and pelvic osteotomy, were propensity matched between groups.
Results: In total, 1303 CP patients were identified, including 502 patients with general plus epidural anesthesia and 801 patients with general anesthesia only. After matching, there remained 361 patients in each group (a total of 722 patients who were included for analysis). The Epidural group demonstrated a significantly lower proportion of IV opiate usage within the first 3 days postoperation. There were no significant differences in the rates of ICU admissions, mortality, pneumonia, respiratory failure, urinary retention, or urinary tract infections between groups. However, the general plus epidural anesthesia group demonstrated lower usage of PO opiates 90 days postoperatively compared with the general anesthesia only group. The epidural group further demonstrated a 1.3-days shorter LOS.
Conclusions: The addition of epidural anesthesia to general anesthesia in pediatric CP patients undergoing proximal femoral osteotomy reduces hospital stay and IV opioid use postoperatively, without increasing complications. These findings support considering epidural anesthesia to enhance recovery and reduce opioid-related side effects in these patients.
PMID: 40256873

**2.Association between movement impairments and glymphatic system dysfunction in spastic diplegic cerebral palsy using DTI-ALPS**

Mengyi Wang, Xiaochen Jiang, Binbin Nie, Han Meng, Hao Song, Ying Liu, Jiqiang Liu, Xuetao Mu

Neuroradiology . 2025 Apr 25. doi: 10.1007/s00234-025-03628-8. Online ahead of print.

Background: The role of the glymphatic system in occult cerebral palsy (CP) remains unclear. In this study, glymphatic system function and its association with motor impairment in occult CP patients was investigated using diffusion tensor image analysis along the perivascular space (DTI-ALPS).
Methods: This retrospective study used DTI to calculate the diffusivity values along the x-, y-, and z-axes in 27 occult CP patients and 27 matched controls. A correlation analysis the ALPS index, derived from perivascular, projection, and association fibres, and with the Gross Motor Function Classification (GMFSC) grade was performed.
Results: We found significant differences in the ALPS index between occult CP patients and healthy controls (HCs). The ALPS index of the lateral hemisphere was lower in occult CP patients than in HCs (left: 1.51 ± 0.20 vs. 1.68 ± 0.24, p = 0.011; right: 1.51 ± 0.20 vs. 1.65 ± 0.24, p = 0.019). Correlation analysis revealed a negative correlation between the ALPS index in the lateral hemisphere and the GMFSC grade (left: r = -0.61, p = 0.004; right: r = -0.48, p = 0.015).
Conclusion: Our findings show that occult CP patients have reduced ALPS indices, suggesting glymphatic system dysfunction. Lower ALPS indices were associated with higher motor function grades, indicating a potential link between glymphatic system dysfunction and motor impairment in CP patients.
PMID: 40278845

**3.A protocol to evaluate the effect of Modified Scooter Board Therapy on Trunk Control and Hip muscles Activation in children with Cerebral Palsy**

Shreekanth D Karnad, Amitesh Narayan, Nutan Kamath, Bhamini K Rao, Monika Sharma, Vijaya Kumar K

MethodsX . 2025 Apr 5:14:103301. doi: 10.1016/j.mex.2025.103301. eCollection 2025 Jun.

Abstract
Cerebral palsy (CP) is a condition caused due to damage to a developing brain, leading to various motor, sensory and cognitive impairments. Being one of the leading cause of developmental disability among children worldwide, CP warrants a rehabilitation technique which is feasible and engaging for the child, cost effective for the family and based neurophysiological principles. Among the various impairments, the children with CP exhibit difficulty in sitting and ambulation due to abnormal tone and poor control in the muscles around the hip joint and the trunk. The previous literature supports the prone positioning and its effect in improving the girdle and trunk control, however there is lack in the studies which evaluate the type of interventions which consider the child and parent participation in intervention being delivered. Thus, the current double blinded randomized control trial aims to evaluate the effect of exercises done using Modified scooter board device in addition to conventional therapy in improving the hip muscle activation and trunk control in children with CP.•A study evaluating the effectiveness of a novel scooter board device in children with CP.•An intervention which is simple, self-engaging and cost effective to prevent most secondary complications seen in children with CP.•An intervention which is aimed at reducing the hardship experienced by parents of children with CP towards improving their functional outcome.
PMID: 40255464

**4.Lower limb orthopedic surgery in children and adolescents with cerebral palsy is well captured using individualized Goal Attainment Scale (GAS) and Canadian Occupational Performance Measure (COPM) goals**

Sarah Carman, Sarah Wall, Kirsty Stewart, Anita Mudge, Matthias Axt

Disabil Rehabil . 2025 Apr 21:1-6. doi: 10.1080/09638288.2025.2493227. Online ahead of print.

Purpose: To investigate individualized goals set and goal attainment following lower limb orthopedic surgery for children and adolescents with cerebral palsy (CP).
Materials and method: Retrospective chart review. Individualized goals set prior to orthopedic surgery using the Canadian Occupational Performance Measure (COPM) and/or Goal Attainment Scaling (GAS) with follow-up within 18 months post-surgery were analyzed. Goals were categorized into functional mobility, leisure, self-care and productivity.
Results: 44 children met the inclusion criteria, mean age 12.5 years (range 4.8-18.2yrs, SD 3.9), GMFCS I = 6, II = 19, III = 6, IV = 9, V = 4. In total 111 goals were analyzed, n = 79 COPM goals and n = 32 GAS goals. Clinically and statistically positive change was demonstrated in the COPM post-surgery, with mean changes of 3.74 (<0.0001) for performance and 4.26 ($p < 0.0001$) for satisfaction with performance. Of the 32 GAS goals set, 22 had an expected to much greater than expected outcome.
Conclusions: COPM goals demonstrated clinically and statistically significant improvement in performance and satisfaction with performance for children of all GMFCS levels post-surgery. GAS goals were not universally met. This study highlights the importance of individualized goal setting and recommends further evaluation into non-achievement of goals and the relationship between goal outcomes and surgery type.
Plain language summary
Lower limb orthopedic surgery for children and adolescents with cerebral palsy is resource and time intensive. Patient reported outcome measures are important in measuring outcomes post- surgery to determine if surgery has been successful and to guide further surgical indications Goal attainment scale (GAS) and Canadian Occupational Performance Model (COPM) goals are effective individualized outcomes measures for children and adolescents with cerebral palsy across all Gross Motor Functional Classification (GMFCS) levels.
PMID: 40257191

**5.Medialization at the Site of Varus Derotational Osteotomy of the Proximal Femur May Reduce Instability Recurrence in Cerebral Palsy**

Frederico C M Vallim, Marcello H Nogueira-Barbosa, João A M Guimarães, Henrique A Cruz, Juliana M B Lyra, H Kerr Graham

J Bone Joint Surg Am. 2025 Apr 24. doi: 10.2106/JBJS.24.01265. Online ahead of print.

Background: Osseous reconstructive surgery for hip displacement in children with cerebral palsy (CP) consists of proximal femoral reorientation by varus derotational osteotomy (VDRO) combined with pelvic osteotomy when indicated. The rate of recurrent hip instability after the index surgery can be as high as 77%. We evaluated the association between femoral diaphyseal medialization at the VDRO site and recurrent instability. We hypothesized that medialization may modify the hip joint reaction force (HJRF), reducing the femoral remodeling that leads to recurrent coxa valga and instability.
Methods: A retrospective evaluation of the clinical and radiographic records of 140 patients (280 hips) with CP, Gross Motor Function Classification System (GMFCS) Level IV or V, who had been treated with bilateral VDRO as the index surgery for hip displacement between 1998 and 2012 (mean follow-up, 11.3 years) was conducted. Radiographic measurement of medialization was performed using the medialization index (MeI) preoperatively, at 6 weeks and 12 months postoperatively, and at skeletal maturity. Recurrent instability was defined as the need for revision surgery before skeletal maturity or a final migration percentage (MP) of >40%.The influence of the MeI was determined by Poisson regression with multiple variances. The inter- and intra-observer reliability of the MeI, measured by 4 different observers, was assessed using the Cohen d test.
Results: Groups with and without relapse were comparable preoperatively regarding femoral and acetabular parameters. The baseline MP was higher in the relapse group ($p < 0.001$). The MeI at 6 weeks postoperatively was significantly lower in the relapse group ($p = 0.004$, relative risk [RR] = 0.07, 95% confidence interval [CI] = 0.01 to 0.42) than in the no-relapse group in multivariable analysis. The MeI showed good inter- and intra-observer reliability, with a Cohen d of <0.5.
Conclusions: Patients with greater medialization had lower rates of recurrent hip instability at long-term follow-up. The MeI proved to be reliable as a radiographic measurement, and medialization did not increase mechanical instability.
Level of evidence: Therapeutic Level IV. See Instructions for Authors for a complete description of levels of evidence.
PMID: 40273207

**6.Relationship Between Infrared Thermography and Functional Parameters in the Lower Limbs of Hemiplegic Patients**

Alessio Cabizosu, Alberto López-López, Daniele Grotto, Josefina Maria Vegara-Meseguer

Life (Basel). 2025 Mar 26;15(4):542. doi: 10.3390/life15040542.

Introduction: Reliable objective and non-invasive assessments of myotendinous alterations in patients with muscle tone disorders secondary to brain damage represent an important challenge in health science. The aim of this study was to observe the relationship between the skin temperature and the functional response in the triceps suralis of hemiplegic patients in relation to the healthy control group.
Methods: A descriptive observational study was conducted based on the STARD recommendations. A total of 26 volunteers, 13 participants with unilateral motor impairment and 13 healthy patients, participated and completed the study. Intragroup and intergroup clinical thermography tests were performed, and the results were compared in relation to the timed up and go test, pain threshold to pressure, and modified Ashworth scale.
Results: Statistically relevant differences ($p < 0.01$) could be observed between the two groups in each test performed. Thermographic analysis revealed a difference in temperature between the healthy and affected sides in the inter- and intra-group comparisons. It was possible to observe statistically significant differences ($p < 0.01$) between limbs in the brain damage group (the side affected was at a lower temperature), while no such differences were observed between limbs in the healthy control group ($p > 0.05$).
Conclusions: Our results confirmed that clinical thermography could be a potentially useful tool in the assessment of both structural and functional alterations of the musculoskeletal system in patients with chronic brain damage.
PMID: 40283098

**7.Quantifying altered oxygen kinetics and reducing metabolic test times for children with cerebral palsy: A dual-exponential Bayesian modeling approach**

Pavreet K Gill, J Maxwell Donelan, Katherine M Steele, Michael H Schwartz, Andrew J Ries

J Appl Physiol (1985) . 2025 Apr 21. doi: 10.1152/japplphysiol.01013.2024. Online ahead of print.

Abstract
Prior research using indirect calorimetry has shown that children with cerebral palsy (CP) exhibit significantly increased energetic costs during walking. However, metabolic testing to obtain oxygen cost is challenging. As a result, differences in oxygen uptake kinetics ($\dot{V}O_2$) in CP compared with their typically developing peers remains unexplored. Step changes in work rate have been shown to result in an exponential $\dot{V}O_2$ response with three distinct phases: cardiodynamic, primary, and steady-state. Here, we applied a dual-exponential Bayesian model to assess the time constant of the primary phase $\dot{V}O_2$ response from resting to walking in children with CP. Additionally, we evaluated the model's ability to estimate steady-state $\dot{V}O_2$ using shorter test durations. From a sample of 263 children with CP, the median $\dot{V}O_2$ time constant was 33.1 seconds (5th- 95th percentile range: 14.5-69.8 seconds), significantly longer than reported values for typically developing children (range of means: 10.2 - 31.6 seconds). Furthermore, the model accurately estimated steady-state $\dot{V}O_2$ using only the first three minutes of metabolic data compared to the typical six minutes used in current clinical practice. The three-minute estimate explained more than 95% of the six-minute estimate variance, with less than 5% mean absolute error. Slower oxygen kinetics in children with CP suggest impairments in metabolic control, potentially contributing to their higher energy demands. While the exact mechanisms remain unclear, this study provides valuable insights into the walking energetics of children with CP and presents a more efficient method for analyzing $\dot{V}O_2$ for this population.
PMID: 40257462

**8.Restoring Functional Connectivity in Hemiplegic Cerebral Palsy: A Study of Low-Frequency rTMS Intervention**

Azadeh Ghalyanchi-Langeroudi, Elahé Yargholi, Maryam Soleimani, Amin Shahrokhi, Mohammad-Mehdi Mirbagheri

J Biomed Phys Eng . 2025 Apr 1;15(2):173-184. doi: 10.31661/jbpe.v0i0.2410-1840. eCollection 2025 Apr.

Background: Hemiplegic Cerebral Palsy (HCP) causes significant motor impairments, due to disrupted Functional Connectivity (FC) between brain regions. Low-Frequency Repetitive Transcranial Magnetic Stimulation (LF-rTMS) has emerged as a potential therapeutic technique for restoring FC and motor recovery.
Objective: This study aimed to evaluate the effects of LF-rTMS on FC in children with spastic HCP.
Material and methods: This Randomized Controlled Trial (RCT) included ten children with spastic HCP, aged 4 to 13 years. Six children received 12 sessions of LF-rTMS, while four in the control group underwent 12 sessions of sham stimulation. Functional Magnetic Resonance Imaging (fMRI) was used to assess intra- and interhemispheric FC during passive knee movements of the affected limb.
Results: LF-rTMS induced region-specific reductions in interhemispheric FC, particularly between the contralesional ventral premotor area (cPMv) and both the ipsilesional primary somatosensory cortex (iS1) (for effect size T=-2.60, P-value=0.048, FDR-corrected) and the ipsilesional primary motor area (iM1) (T=-2.45, P-value=0.048, FDR-corrected). These findings suggest modulation of interhemispheric motor-sensory pathways. Concurrently, localized increases in FC were observed in contralesional regions, and FC decreased between the ipsilesional Supplementary Motor Area (SMA) and the secondary somatosensory cortex (S2) (T=-3.11, P-value=0.041, FDR-corrected).
Conclusion: LF-rTMS may modulate FC and hold promise as a rehabilitative intervention for improving motor function in children with HCP.
PMID: 40259943

**9.Effects of transcranial direct current stimulation on motor and cognitive function in paediatric brain damage: a systematic review and meta-analysis**

Almudena Cerezo-Zarzuelo, Marcos Rios-Lago, Francisco Jose Sanchez-Cuesta, Beatriz Gavilan-Agusti, Alfonso Hurtado-Martinez, Juan Pablo Romero-Muñoz

Review Disabil Rehabil . 2025 Apr 26:1-19. doi: 10.1080/09638288.2025.2496783. Online ahead of print.

Purpose: Transcranial direct current stimulation (tDCS) emerges as a secure therapy in paediatric brain damage rehabilitation. Our purpose is to acknowledge its evidence in motor and cognitive variables, examine correlations between tDCS effects and parameters, and identify associations between motor and cognitive outcomes.
Methods: A systematic review and meta-analysis were conducted, registered in PROSPERO (CRD42023448441). 5 databases were consulted in September 2024. Randomised controlled trials evaluating tDCS effectiveness on motor or cognitive outcomes in paediatric brain injuries were included. Methodological quality was assessed using PEDro scale and ROB-2. Certainty of evidence was assessed by GRADE.
Results: Nineteen studies were selected (447 participants). tDCS seems to be beneficial in gait (SMD: 0.83-0.90 ($p < 0.0001$)), balance (COP oscillations SMD: -0.51 - -1.13 ($p < 0.02$), PBS SMD: 0.48-0.56 ($p < 0.0001$)), functionality (SMD: 0.40 ($p < 0.01$)). Effects on cognition showed promising results. Effects in upper limb are controversial, due to fewer publications.
Conclusions: tDCS seems beneficial in motor and cognitive functions in paediatric brain damage. Motor and cognitive functions appears to be interconnected, so combined protocols could be an effective approach. Meta-analysis results are promising but may be considered carefully as few articles could be included. Further research is needed.
Plain language summary
Paediatric brain damage causes a broad spectrum of impairments that lead to long-term disability.Transcranial direct current stimulation (tDCS) emerges as a complementary therapy to enhance rehabilitation results.Current evidence shows positive effects with tDCS interventions in gait, balance and functional performance and effects on cognitive function are promising.tDCS effects on upper limb function remains uncertain due to limited publications.
PMID: 40285734

**10.Match-Running Differences Among International Regional Tournaments and the World Cup in Male Para-Footballers With Cerebral Palsy**

Daniel Castillo, Aitor Iturricastillo, Javier Yanci, Raul Reina, Matías Henríquez

Adapt Phys Activ Q . 2025 Apr 25:1-17. doi: 10.1123/apaq.2024-0081. Online ahead of print.

Abstract
The aim of this study was to provide a comparative analysis of running responses in official matches in different sport classes of football players with cerebral palsy considering the contextual factors of geographical competition and level. One hundred ninety-one international footballers with cerebral palsy divided according to the tournament geographical competition and level participated in this study. Higher medium- and high-intensity match-running responses were found for the Asia-Oceania tournament in comparison with the American, European, and world competitions. Similarly, players from the World Cup performed more moderate accelerations and decelerations compared with the players in the America's Cup, and players competing in the Asia-Oceania region realized more moderate decelerations than in the America's Cup. Thus, classifiers and coaches may consider the tournament level due to possible differences in the match's physical demands regarding the class status allocation and the physical preparation for those competitions.
PMID: 40280550

**11.Dystonia: pathophysiology and the role of acupuncture in treatment**

Wang Kefei, Huang Zhisheng, Yang Shunzhen, Yin Yin

Review Wien Med Wochenschr . 2025 Apr 24. doi: 10.1007/s10354-025-01083-x. Online ahead of print.

Dystonia is a complex neurological disorder characterized by involuntary muscle contractions, abnormal postures, and repetitive movements, which can lead to significant functional impairment and reduced quality of life. The disorder's pathophysiology involves a range of factors including genetic mutations, neurochemical imbalances, and structural abnormalities in the brain. Acupuncture has emerged as a promising complementary treatment for various types of dystonia, including post-stroke, cerebral palsy (CP)-related, limb, and cervical dystonia, as well as other hyperkinetic movement disorders. Clinical studies indicate that acupuncture may help to alleviate symptoms, decrease muscle spasticity, and improve overall patient outcomes. However, the effectiveness of acupuncture can vary depending on the specific type and severity of dystonia, with some studies reporting significant improvements, while others show more modest results. The variability in treatment response highlights the need for more robust research to better understand the mechanisms underlying acupuncture's effects and to develop standardized treatment protocols. The aim of this review is to provide a comprehensive overview of dystonia's pathophysiology and to assess the current evidence on the role of acupuncture in its treatment, identifying areas in which further research is needed to optimize therapeutic approaches.
PMID: 40272639

**12.Commentary on the Pilot Study of Acupuncture Combined with Rehabilitation for Children with Spastic Hemiplegic Cerebral Palsy**

Xue Chen, Dianpu Zhang

J Evid Based Integr Med . 2025 Jan-Dec:30:2515690X251334436. doi: 10.1177/2515690X251334436. Epub 2025 Apr 21.

No abstract available
PMID: 40259543

**13.Beyond the Label: Antipsychotic Prescribing Practices at a Paediatric Neurodisability Service in Australia**

Ella May Huber, Monica Sophie Cooper

Child Care Health Dev. 2025 May;51(3):e70085. doi: 10.1111/cch.70085.

Background: The use of antipsychotic medications in children has been increasing in Australia and abroad. Children with complex physical and neurodevelopmental disability remain understudied in the prescribing literature, and we do not have a nuanced understanding of why and to whom antipsychotic medications are prescribed.
Methods: We conducted a retrospective review of records to characterise antipsychotic prescription patterns for children with neurodisability at the Royal Children's Hospital, Melbourne, Australia. We used the Electronic Medical Record to identify children under 19 years, newly prescribed an antipsychotic medication by Department of Neurodevelopment and Disability clinicians between 24/09/2018 and 26/09/2022. We identified 167 encounters for 147 patients, representing 4% (147/3673) of the patients seen in that period. Main outcome measures were the frequency of antipsychotic medication prescription by drug, age category and sex; indication frequency; proportion of off-label use; and frequency and level of psychotropic polypharmacy.
Results: In our cohort, 71% of children had intellectual disability (104/147), 42% autism spectrum disorder (61/147) and 42% cerebral palsy (61/147). Risperidone was the most prescribed antipsychotic medication, in 64% (107/167), followed by olanzapine in 18% (32/167). Off-label prescription was 62% (66/107) for risperidone, 97% (31/32) for olanzapine. The indication for antipsychotic medication was challenging behaviour in 74% (123/167), including aggression in 31% (52/167), agitation in 20% (33/167) and self-injury in 17% (28/167). Nonbehavioural indications included anxiety symptoms in 19% (32/167) and sleep disorders in 14% (24/167). Psychotropic polypharmacy (two or more concurrent psychotropic medications) was present in 78% (130/167), with sedatives (69%, 115/167) and antidepressants (31%, 52/167) most common.
Conclusions: A small proportion of children with neurodisability were prescribed antipsychotic medications, most frequently risperidone for challenging behaviours. Off-label prescription and psychotropic polypharmacy were common. Prescription occurred in a variety of clinical scenarios that sit outside the current field of evidence.
PMID: 40256974

**14.Depressive Symptoms and Behavioral Manifestations in Children and Adolescents with Cerebral Palsy: A Parent-Child Perspective Study**

Daiki Asano, Masaki Takeda, Hirokazu Abe, Satoshi Nobusako, Hirotaka Gima

Behav Med . 2025 Apr 23:1-10. doi: 10.1080/08964289.2025.2494535. Online ahead of print.

Abstract
Individuals with cerebral palsy (CP) often exhibit mental health problems, including depressive symptoms. This study investigated self-reported depressive symptoms in children and adolescents with and without CP and associated factors. Herein, 52 and 38 children and adolescents with and without CP were enrolled in the CP and typically developing (TD) groups. Depressive symptoms were assessed using the Birleson Depression Self-Rating Scale for Children. Parents of the participants completed the Strengths and Difficulties Questionnaire. Self-reported depressive symptoms were more severe in the CP group than in the TD group, which was primarily attributed to declining activities and enjoyment in daily life. Depressive symptoms in the CP group were not correlated with age, the severity of CP, or parent-reported behavioral features. However, in the overall cohort, the cluster with high levels of depressive symptoms had significantly higher proportions of individuals with CP and participants with conduct, emotional, and peer problems. Multivariate analyses revealed that only peer problems were associated with increased depressive symptoms. Furthermore, peer problems fully mediated the relationship between the presence of CP and depressive symptoms. Our study suggests that providing opportunities for activities involving social interactions with peers and offering support to enable the enjoyment of such activities from an early age are imperative to prevent an increase in depressive symptoms in children with CP.
PMID: 40265948

**15.Pilot study for a preconception educational intervention for people with mobility disabilities**

Melina A McCabe, Amelia Gabor, Jennifer Stephens, Michael M McKee, Hilary K Brown, Kara B Ayers, Anne Valentine, Willi Horner-Johnson, Monika Mitra, John A Harris

Sex Reprod Healthc . 2025 Apr 17:44:101101. doi: 10.1016/j.srhc.2025.101101. Online ahead of print.

Objectives: To assess the feasibility and acceptability of our newly designed, tailored preconception educational intervention for people with mobility disabilities.
Methods: A prospective pre-post pilot study to measure the feasibility and acceptability of an educational intervention for people with mobility disabilities who could become pregnant in the next five years. Before and after general health and preconception knowledge were compared using paired t-tests.
Results: 26 participants completed the study from November 2023 - July 2024. The most common diagnoses related to mobility disability were spinal cord injury (n = 9), spina bifida (n = 4), and cerebral palsy (n = 4). The intervention increased general health knowledge by 0.9 points (p = 0.13) and preconception health knowledge by 2.7 points (p = 0.025). A significant increase (1.8 points (95 % CI 0.9-2.6 points), p < 0.001) in preconception health knowledge compared to general health knowledge suggests the intervention successfully improved the targeted knowledge area.
Conclusions: This pilot study demonstrated the feasibility and acceptability of a preconception educational intervention tailored to individuals with mobility disabilities. This intervention holds the potential to improve health literacy, increase preconception health knowledge, and ultimately improve pregnancy outcomes among people with mobility disabilities.
PMID: 40267582

**16.BCI move: exploring pediatric BCI-controlled power mobility**

Leah Hammond, Danette Rowley, Corinne Tuck, Erica Danielle Floreani, Amy Wieler, Vella Shin-Hyung Kim, Hosein Bahari, John Andersen, Adam Kirton, Eli Kinney-Lang

Front Hum Neurosci . 2025 Apr 9:19:1456692. doi: 10.3389/fnhum.2025.1456692. eCollection 2025.

Introduction: Children and young people (CYP) with severe physical disabilities often experience barriers to independent mobility, placing them at risk for developmental impairments and restricting their independence and participation. Pilot work suggests that brain-computer interface (BCIs) could enable powered mobility control for children with motor disabilities. We explored how severely disabled CYP could use BCI to achieve individualized, functional power mobility goals and acquire power mobility skills. We also explored the practicality of pediatric BCI-enabled power mobility.
Methods: Nine CYP aged 7-17 years with severe physical disabilities and their caregivers participated in up to 12 BCI-enabled power mobility training sessions focused on a personalized power mobility goal. Goal achievement was assessed using the Canadian Occupational Performance Measure (COPM) and Goal Attainment Scaling (GAS). The Assessment for Learning Powered Mobility (ALP) was used to measure session-by-session power mobility skill acquisition. BCI set-up and calibration metrics, perceived workload, and participant engagement were also reported.
Results: Significant improvements in COPM performance (Z = -2.869, adjusted p = 0.012) and satisfaction scores (Z = -2.809, adjusted p = 0.015) and GAS T scores (Z = -2.805, p = 0.005) were observed following the intervention. ALP scores displayed a small but significant increase over time (R 2 = 0.07-0.19; adjusted p = <0.001-0.039), with 7/9 participants achieving increased overall ALP scores following the intervention. Setup and calibration times were practical although calibration consistency was highly variable. Participants reported moderate workload with no significant change over time (R 2 = 0.00-0.13; adjusted p = 0.006-1.000), although there was a trend towards increased frustration over time(R 2 = 0.13; adjusted p = 0.006).
Discussion: Participants were highly engaged throughout the intervention. BCI-enabled power mobility appears to help CYP with severe physical disabilities achieve personalized power mobility goals and acquire power mobility skills. BCI-enabled power mobility training also appears to be practical, but BCI performance optimization and skill acquisition may be needed to translate this technology into clinical use.
PMID: 40270567

**17.Umbilical cord length and neurodevelopmental disorders, a national cohort study**

Cathrine Ebbing, Anne Halmoy, Svein Rasmussen, Karen K Mauland, Jørg Kessler, Dag Moster

PLoS One . 2025 Apr 23;20(4):e0322444. doi: 10.1371/journal.pone.0322444. eCollection 2025.

Introduction: Adversities in fetal life are known risk factors for neurodevelopmental disorders (NDD). Despite the pivotal role of the umbilical cord, little is known about its associations to later NDD.
Objective: To estimate the associations between umbilical cord length and NDD (Attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder (ASD), intellectual disability (ID), cerebral palsy (CP), epilepsy, impaired vision or hearing), and whether associations differed by sex.
Materials and methods: A prospective population-based cohort study including all liveborn singletons in Norway from 1999, through 2013 and followed up through 2019. Data were retrieved from The Medical Birth Registry of Norway and linked with other national health and administrative registries. Exposures were extreme umbilical cord length (empirical percentile <5th or ≥ 95th percentiles). Main outcome measures were NDD (ADHD, ASD, ID, CP, epilepsy, impaired vision or hearing). Associations with umbilical cord length were assessed using logistic regression.
Results: The cohort consisted of 858,397 births (51.3% boys). We identified 33,370 persons with ADHD (69.8% boys), 10,818 had ASD (76.0% boys), 5538 ID (61.4% boys), 2152 with CP (59.9% boys), 8233 epilepsy (55.0% boys), 900 impaired vision (boys 55.0%), and 11,441 impaired hearing (boys 52.8%). Cord length was positively associated with ADHD (OR 1.15; 95%CI 1.09-1.22), i.e., the risk increased with long cord and decreased with short cord, regardless of sex. A short cord was positively associated with ID (OR 2.42; 95%CI 2.17-2.69), impaired hearing (OR 1.41; 95%CI 1.29-1.54), and epilepsy (OR 1.31; 95%CI 1.18-1.46). CP was associated with both short and long cord (OR 1.31; 95% CI 1.07-1.61 and 1.34, 95%CI 1.13-1.60, respectively). There was no association between cord length and impaired vision.
Conclusions: This first population study finds that umbilical cord length is associated with NDD. The findings support the hypothesis that neurodevelopment and development of the umbilical cord share pathways.
PMID: 40267150

**18.Prenatal exposure to fine particulate matter composition and risk of cerebral palsy: A population-based retrospective cohort study in Ontario, Canada**

Amrin Ahmed, Steven Hawken, Anna Gunz, Robert Talarico, Chengchun Yu, Carmen Messerlian, Yu Zhang, Hong Chen, Scott Weichenthal, Aaron van Donkelaar, Randall V Martin, Éric Lavigne

Environ Pollut . 2025 Apr 23:126302. doi: 10.1016/j.envpol.2025.126302. Online ahead of print.

Background: Existing literature suggests an association between prenatal exposure to fine particulate air pollution (PM2.5) and cerebral palsy (CP). However, the impact of individual PM2.5 components (SO42-, NH4+, NO3-, SS, BC, dust, OM) on CP risk remains unknown.
Objective: To examine the associations between prenatal exposure to PM2.5 components, and risk of CP among term births in Ontario, Canada.
Methods: This was a retrospective cohort study that examined term births (gestational age ≥ 37 completed weeks) from April 2002 to December 2020. PM2.5 total mass and composition measures were assigned to maternal residence at birth using satellite-based estimates and ground-level monitoring data. Cohort data were compiled using health administrative databases. Single-pollutant distributed lag cox proportional hazard models, with and without additional adjustment for PM2.5 residuals, were used to investigate the associations between gestational exposures to PM2.5 total mass and its components.
Results: 2,193,427 mother-infant pairs were identified, of which 3,907 were diagnosed with CP during the follow-up period. Increased risk of CP was found for SO42- exposure during early pregnancy in both residual-adjusted (HR: 1.052, 95% CI: 1.009-1.097, per IQR=0.94 ug/m3), and non-adjusted models (HR: 1.050, 95% CI: 1.007- 1.095, per IQR=0.94 ug/m3). The concentration-response relationship between the sensitive window found for SO42- and CP risk (weeks 4 to 9 of gestation) showcased a supralinear pattern.
Conclusions: Prenatal exposure to SO42- may be associated with increased CP risk during the early pregnancy period. Associations between prenatal PM2.5 total mass and composition exposure and CP risk should be further investigated.
PMID: 40280264

**19.Antenatal diagnosis of early-onset small-for-gestational age: absolute and relative risks of adverse outcomes**

Jessica Liauw, Sanne J Gordijn, Wessel Ganzevoort, Chantal Mayer, Jennifer A Hutcheon

Am J Obstet Gynecol . 2025 Apr 20:S0002-9378(25)00248-0. doi: 10.1016/j.ajog.2025.04.041. Online ahead of print.

Objective: To determine the absolute and relative risks of adverse maternal, perinatal, and longer-term child outcomes for pregnancies with antenatally-detected early-onset small for gestational age fetuses, compared with baseline population rates.
Study design: We linked ultrasound data from pregnancies with antenatally-detected, non-anomalous, early-onset SGA fetuses (estimated fetal weight and/or abdominal circumference <10th percentile at 16+0 to 31+6 weeks) from our tertiary referral centre with provincial health and education databases. We compared risks of adverse pregnancy (e.g., stillbirth, gestational hypertension/ preeclampsia, caesarean section) and child outcomes (e.g., infant death, intensive care unit admission, composite neonatal morbidity, cerebral palsy, Early Development Index score and Ministry of Education Special Needs designation at school entry age) among pregnancies with early-onset SGA fetuses to the general population of births in British Columbia, Canada. We calculated relative risks and absolute risk differences with 95% confidence intervals (CI).
Results: Among 581 pregnancies with non-anomalous early-onset SGA fetuses, risk ratios for adverse pregnancy outcomes ranged from 4-fold higher for gestational hypertension/ preeclampsia [95% CI: 3.8 to 5.1], to 10-fold higher for stillbirth [95% CI: 5.6 to 16.6], compared with the rest of the 359,602 non-anomalous births in the province. These relative risks corresponded to 16.5 per 100 excess cases [95% CI: 13.1 to 19.8] and 2.2 per 100 excess cases [95% CI 0.9 to 3.6], respectively. Risks of neonatal complications were similarly elevated (e.g. composite neonatal morbidity was 31-fold higher). While Ministry Special Needs designation was 3-fold higher [95% CI: 2.1 to 5.6], corresponding to 7 per 100 excess cases [95% CI: 2.0-11.5], there was only a trend towards a higher risk of cerebral palsy.
Conclusion: Risks of adverse maternal and childhood outcomes are elevated in pregnancies with early-onset SGA fetuses. Presenting these risks in relative and absolute terms from baseline population risks may facilitate clinical counselling and risk comprehension.
PMID: 40262728

**20.Long-Read Sequencing: The Third Generation of Diagnostic Testing for Dystonia**

Thomas Wirth, Kishore R Kumar, Michael Zech

Review Mov Disord . 2025 Apr 23. doi: 10.1002/mds.30208. Online ahead of print.

Abstract
Long-read sequencing methodologies provide powerful capacity to identify all types of genomic variations in a single test. Long-read platforms such as Oxford Nanopore and PacBio have the potential to revolutionize molecular diagnostics by reaching unparalleled accuracies in genetic discovery and long-range phasing. In the field of dystonia, promising results have come from recent pilot studies showing improved detection of disease-causing structural variants and repeat expansions. Increases in throughput and ongoing reductions in cost will facilitate the incorporation of long-read approaches into mainstream diagnostic practice. Although these developments are likely to transform clinical care, there is currently a discrepancy between the potential benefits of long-read sequencing and the application of this technique to dystonia. In this review we highlight current opportunities and limitations of adopting long-read sequencing methods for the investigation of patients with dystonia. We provide examples of long-read sequencing integration into diagnostic evaluation and the study of pathomechanisms in individuals with dystonic disorders. The goal of this article is to stimulate research into the application and optimization of long-read analysis strategies in dystonia, thus enabling more precise understanding of the underlying etiology in the future. 
PMID: 40265723

**21.Doing Everything We Can to Help Our High-Risk Newborns: A Qualitative, Lifeworld-Led Study of What Early Risk Assessment for Cerebral Palsy Means to Parents**

Kristin Bjørnstad Åberg, Karin Dahlberg, Gunfrid Vinje Størvold, Ragnhild Støen, Lars Adde

J Clin Med. 2025 Apr 16;14(8):2740. doi: 10.3390/jcm14082740.

Abstract
Background/Objectives: Early predictive assessments for CP are recommended for infants with medical risk factors after birth. For parents of children with CP, receiving an early diagnosis is important. But most children with risk factors who have not yet developed CP are labeled "high-risk infants" and repeatedly assessed for abnormal signs. We aim to investigate the experience of parents of high-risk infants and describe the meaning that "early predictive assessments for CP" has for them before they know whether their children have CP. Methods: This was a qualitative study conducted using a phenomenological, reflective lifeworld approach. Fourteen individual in-depth interviews were conducted with parents who received different GMA results to learn about their experiences involving early predictive assessments. The interviews were analyzed for meaning. Results: Early predictive assessments take place over time while parents process the traumatic experience of becoming parents to an infant at risk. "Early predictive assessment" is perceived as any examination or assessment intended to unveil signs of illness or disability. The child's future well-being and fulfillment, and the demands of parenthood, are at stake. Essential meaning structures are (1) on a spectrum from death to insignificancies, (2) living with uncertainty of what the parental role will entail, and (3) seeing one's own child through the eyes of strangers, just in case. Conclusions: For months following the birth of a high-risk child, parents experience uncertainty and worrying, affecting the parent-infant relationship. Predictive assessments reduce their sense of alarm when the GMA result indicates a low risk of CP. But when the GMA result is uncertain, the burden of uncertainty is amplified and prolonged.
PMID: 40283570

**22.Frequency, characteristics, and reasons for termination of cerebral palsy clinical trials**

Michael J Gouzoulis, Dennis L Caruana, Ally Ae Lim Yang, Anthony E Seddio, Jonathan N Grauer, David B Frumberg

PM R. 2025 Apr 25. doi: 10.1002/pmrj.13398. Online ahead of print.

Background: Cerebral palsy is a common neurodevelopmental disease. Clinical trials are essential to improve care for these patients, and trial termination can have a significant effect on progress.
Objective: To investigate the frequency, characteristics, and reasons for termination for cerebral palsy clinical trials.
Design: Retrospective review.
Setting: Database.
Main outcome measures: The ClinicialTrials.gov database was queried for all completed and terminated studies surrounding cerebral palsy. Trial characteristics and the reasons for termination were determined. Univariable and multivariable analysis was performed to determine independent predictive factors for termination of these clinical trials.
Results: A total of 717 clinical trials were identified, of which 49 (6.8%) were terminated. The most common reasons for termination were recruitment/retention issues (26.5% of terminated trials), administrative/conduct reasons (20.4% of terminated trials), and scientific data from the trial (12.2% of terminate trials). On multivariable analysis, industry sponsorship was independently associated with termination (odds ratio, 3.25; p = .047). No other factors were associated with trial termination.
Conclusions: Cerebral palsy clinical trials are terminated at a rate of 6.8%. The primary reason for trial termination was related to recruitment/retention issues, and the only factor that was predictive of termination was industry sponsorship. These reasons and factors should be considered when starting a clinical trial to minimize potential risk of premature termination.
PMID: 40278003

**23.Synergies, Discrepancies, and Action Priorities: A Statewide Engagement Study to Strengthen Clinical Research in Cerebral Palsy**

Melissa M Murphy, Gavin T Colquitt, Paige S Ryals, Katie Shin, William C Kjeldsen, Allison McIntyre, Sydni V W Whitten, Christopher M Modlesky, Nathalie L Maitre

Health Expect . 2025 Jun;28(3):e70257. doi: 10.1111/hex.70257.

Background: Cerebral palsy (CP) clinical research is fraught with challenges, in part due to health-related disparities common among people with disabilities. Perspectives of people with lived experience of CP, clinicians and researchers vary on how to address these disparities. The present initiative explores synergies and discrepancies among stakeholders (n = 212) representing these partner groups in perceived barriers and facilitators to high-quality clinical CP research and robust trainee pathways. The overarching goal is to generate priority actions to empower meaningful partner group engagement in CP research and, ultimately, improve health outcomes for people with CP.
Methods: Grounded in empowerment theory, mixed methods needs assessments were conducted separately with partner groups to capture perspectives on barriers and facilitators to high-quality CP research and strong trainee pathways. Thematic analysis was applied to focus groups and interviews to identify themes and subthemes.
Results: Discrepancies among partner groups emerged related to informational needs, community connection, ethical research and equitable representation in research, and fair compensation for lived experience partner engagement in the research process.
Conclusions: Ongoing opportunities for researcher action to empower partner group engagement include building shared purpose, nurturing social connection within and among groups and intentional efforts to build trust and codesign studies.
Patient or public contribution: The initiative described here was informed by caregivers of children with CP from Georgia, USA, using a community-based participatory research (CBPR) approach. CPBR is a collaborative approach, designed to give communities, which here include people with lived experience of CP, control over research processes and outcomes. Their perspectives were essential to the premise of this study and guided data interpretation, especially with regard to how their perspectives may or may not correspond to those of CP researchers and clinicians. To ensure inclusion of all perspectives, individuals with CP were also represented in these latter two engagement groups. Finally, the design, conduct, analysis and interpretation of data were informed by a researcher and a clinician-scientist, both of whom have lived experience as caregivers of children with CP.
PMID: 40275596

**24.Predictors of community participation from preschool to school age in children with cerebral palsy**

Daniela A Testani, Heather Shearer, Gillian King, Sarah Munce, Kevin E Thorpe, Jan Willem Gorter, Bisman Mangat, Fatema Khimji, Darcy Fehlings; CP-NET GROUP

Dev Med Child Neurol . 2025 Apr 22. doi: 10.1111/dmcn.16322. Online ahead of print.

Aim: To investigate participation frequency patterns and child and family predictors of community participation in young children with cerebral palsy (CP).
Method: We prospectively assessed participation frequency at preschool (Young Children's Participation and Environment Measure) and again at school age (Participation and Environment Measure-Children and Youth). Linear regressions examined preschool predictors of community school-age participation: preschool child age; sex; gross motor function (Gross Motor Function Classification System [GMFCS]); manual function (Manual Ability Classification System); pain; prosocial behaviour; conduct; family ethnicity; income; and residence type.
Results: Children with CP (n = 155, 44% females, 64% classified in GMFCS level I or II), mean baseline age = 4 years 4 months (SD = 1 year 1 month) and at school age = 6 years 7 months (SD = 7 months) had a median community participation frequency at preschool age of 2.8 (interquartile range [IQR] = 1.3) and 2.8 (IQR = 1.6) at school age. Preschool community participation was 2.02 (confidence interval [CI] = -2.20 to -1.83) units lower than at home; at school age, it was 2.40 (CI = -2.59 to -2.22) units lower. Greater prosocial behaviour (child model: R2 = 0.26, p = 0.001) predicted higher school age community participation.
Interpretation: In young children with CP, community participation was infrequent at preschool age (a few times in the last 4 months) and this persisted into school age. Higher preschool prosocial behaviour predicted community participation at school age. Enhanced awareness of infrequent community participation of preschool children with CP and supporting a child's social behaviours may help facilitate community participation.
PMID: 40263642

**25.Genetic testing in the diagnosis of cerebral palsy: First-tier for all versus a 'choosing wisely' approach**

Ingeborg Krägeloh-Mann

Dev Med Child Neurol. 2025 Apr 19. doi: 10.1111/dmcn.16327. Online ahead of print.
No abstract available
PMID: 40251930

**26.Neurodevelopmental disorders at Chris Hani Baragwanath Academic Hospital: a 4-year retrospective database review**

Sarah Jane Lowick, Sibongile Mbatha

BMJ Paediatr Open . 2025 Apr 20;9(1):e003373. doi: 10.1136/bmjpo-2025-003373.

Background: Developmental paediatrics is a growing field both globally and locally with increasing demand for medical and educational resources.
Methods: This retrospective, developmental database review is a baseline description of the Chris Hani Baragwanath Academic Hospital neurodevelopmental clinic population, and the service offered over the past 4 years. The population comprises all patients seen at the clinic from May 2020 to December 2024. Outcomes measured were total patient numbers, demographic, clinical and management variables.
Results: The cohort comprised 1877 patients. An increase in total patient numbers was observed over the past 4 years. The ratio of male to female patients was 3:1. Median age at referral was 48.8 months with an average waiting period of 12 months. The median, mean and age range at first visit were 60, 66 and 5-192 months, respectively. Autism was diagnosed in 37.1%, non-syndromic intellectual disability in 16.6%, a confirmed genetic diagnosis in 11.8% and a 'likely genetic disorder' in 18% of patients. 98 different genetic conditions were identified. Comorbidity included cerebral palsy (11.4%), epilepsy (16.1%), hearing (5.2%) and visual impairment (5.5%). Associated behavioural disorders occurred in 52.8% of patients, predominantly attention deficit hyperactivity disorder (ADHD) (30%). At least one medication was prescribed in 58.2% of children. Over 40% of children were either at home or at crèche; 14.0% were attending mainstream school; 10.5% an autism school; 26.3% a special needs school. Of the 841 (44.8%) children in supported schooling, 47.8% were placed after 7 years of age.
Conclusions: This study provides insights into the regional burden and clinical presentation of neurodevelopmental disorders. Trends in this region reflect broader global patterns, with increasing numbers of children presenting with complex conditions. Greater resources are needed for earlier diagnosis and therapy, access to all tiers of genetic testing and upscaling of inclusive and special needs education.
Trial registration number: NHRD GP_202510_105.
PMID: 40254340

**27.Editorial for "MRI Assessment of Geometric Microstructural Changes of White Matter in Infants With Periventricular White Matter Injury and Spastic Cerebral Palsy"**

Ravikanth Balaji, Bejoy Thomas, Neena Radhakrishnan

Editorial J Magn Reson Imaging . 2025 Apr 18. doi: 10.1002/jmri.29792. Online ahead of print.

No abstract available
PMID: 40251790

# Prevention and Cure

**28.Targeted Cerebral Oxygenation Using Dedicated Treatment Versus Usual Care in Extremely Preterm Infants: Protocol for a Multicentre International Phase II Randomised Controlled Trial**

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J Paediatr Child Health . 2025 Apr 21. doi: 10.1111/jpc.70066. Online ahead of print.

Background: Near infrared spectroscopy (NIRS) allows continuous monitoring of cerebral oxygenation and therefore has the potential to be neuroprotective. Recurrent episodes of cerebral hypo-and/or hyperoxia may result in brain injury. The Safe-BoosC-II study reported stable cerebral oxygenation in extremely preterm infants by combining a dedicated treatment guideline with NIRS monitoring using several devices and adult sensors. The ability to maintain stable cerebral oxygenation with a dedicated treatment algorithm using one type of NIRS device with neonatal sensors has not been previously investigated.
Methods: In this multicentre, 2-arm, parallel, single-blinded, phase II RCT, stratified by gestation and hospital site, 100 participants born < 29 weeks' gestation (inborn and outborns, singleton and twins) will be randomised to targeted cerebral oxygenation using dedicated treatment or usual care with blinded cerebral NIRS monitoring for the first 5 days of life. We will exclude infants > 6 h of age, those with congenital anomaly requiring major surgery or a genetic disorder, and triples or higher multiple births. The primary outcome is the burden of cerebral hypoxia and hyperoxia for the first 5 days after birth expressed as percent hours.
Discussion: The findings of this trial will provide essential information on (i) validating results from the Safe-BoosC-II study, considering the differences in the study methodology between the two trials (ii) strengthening support for routine use of cerebral NIRS monitoring in this population and (iii) informing the design of future RCTs on the effects of targeted cerebral oxygenation on neurodevelopment in early childhood as the primary outcome.
Trial registration: Australian New Zealand Clinical Trials Registry registration number ACTRN12621000778886.
PMID: 40256933

**29.Neurodevelopmental Outcomes of Very Low Birth Weight Infants Following Extrauterine Placental Perfusion: A Follow-Up Study**

Benjamin Kuehne, Martin Hellmich, Eva Heine, Angela Kribs, Katrin Mehler, André Oberthuer

Acta Paediatr . 2025 Apr 18. doi: 10.1111/apa.70101. Online ahead of print.

Aim: Extrauterine placental perfusion (EPP) may be a feasible cord clamping strategy in very low birth weight (VLBW) infants to support neonatal transition. However, the impact of EPP on neurodevelopment remains unclear. The study aimed to compare the effects of EPP with time-based delayed cord clamping (DCC) on neurodevelopmental outcomes.
Methods: This follow-up study of the randomised controlled EXPLAIN (Extrauterine Placental Transfusion in Resuscitation of Very Low Birth Weight Infants) trial (ClinicalTrials.gov Identifier: NCT03916159) was conducted at a tertiary perinatal centre from 2021 to 2023. Antenatally randomised VLBW infants received either EPP or DCC (> 30 s). Neurodevelopment was assessed at 24 months of corrected age using the Bayley Scales of Infant and Toddler Development, Third Edition. Data analysis was intention-to-treat.
Results: Of 59 infants enrolled, 54 (92%) participated in the follow-up (27 EPP, 27 DCC). Median age at assessment was 24.3 months (range 23.5-25.0); 28 (52%) were male. Infant characteristics and short-term outcomes were similar between groups. No relevant differences were observed in median cognitive, motor or language scores or in rates of cerebral palsy, hearing, or visual impairment.
Conclusion: The neurodevelopment of the VLBW infants who received EPP and DCC was comparable, suggesting that EPP may be a viable alternative.
PMID: 40251781