Cerebral palsy research news

Monday 23 February 2026

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Interventions and Management

1. Hyperselective Neurectomy for Upper-Limb Spasticity: Clinical Outcomes From a Systematic Review

J Terrence Jose Jerome, G Surendran, Thirumagal Kuppusamy

Abstract

Upper-limb spasticity after stroke, traumatic brain injury, cerebral palsy, multiple sclerosis, or spinal cord injury limits function and care. Hyperselective neurectomy (HSN)—partial resection of selected motor branches at the muscle entry point—aims to lower tone while preserving voluntary strength. Following PRISMA 2020 guidelines, 10 studies (260 adults) were identified, almost all performed under general anesthesia, with 1 small series using wide-awake local anesthesia with no tourniquet (WALANT). Across studies, HSN reduced spasticity by about 1 to 2.5 points on the Modified Ashworth Scale; where data allowed pooling (6 studies), the average improvement was 1.64 points on the 0 to 4 scale (95% CI, 1.36–1.92). These reductions were durable up to 4 to 5 years and were accompanied by better function (higher House scores), improved resting posture and range of motion, and easier care. Recurrence was uncommon and usually manageable with revision or staged treatment of untreated synergists. Complications were rare and transient, and no modern series reported permanent weakness in treated muscles. Early experience with WALANT is limited to a single small case series but suggests that intraoperative testing of tone and voluntary movement is feasible and may help titrate resection. Overall, HSN appears to provide safe, effective, and durable tone reduction with meaningful functional gains; future studies should refine patient selection, use more robust spasticity measures, and formally compare anesthesia strategies, including WALANT.
PMID: 41721700

2. Three-dimensional assessment of finger individuation reveals finger- and joint-specific selective motor control deficits in children with cerebral palsy

Owais A Khan, Divya Rai, Brooklyn Crabtree, Sydni V W Whitten, De'Yana Hines, Gavin Colquitt, Christopher M Modlesky, Jing Xu

Background: Children with cerebral palsy (CP) exhibit impaired selective motor control (SMC) that contributes to poor hand function, but current clinical assessments lack the sensitivity to detect finger- and joint-specific deficits to guide rehabilitation strategies. This study aimed to determine the internal consistency and validity of an objective, instrumented assessment of selective finger control (individuation) in children with CP, and to examine its relationship to clinical measures of upper limb function.
Methods: A custom-designed device recorded three-dimensional isometric forces concurrently from all five fingertips to compute a composite metric of finger SMC (Individuation Index) for each tested finger and force direction. Group differences in individuation ability were quantified using linear mixed-effect models. Relationships between individuation and clinical assessments were assessed with Spearman correlation (rs).
Results: Twenty-eight children with CP and 18 typically developing control children were included. The non-preferred arm was tested in most children with CP (n = 16), with the preferred arm tested in controls and the remaining CP cohort. Individuation Indexes demonstrated excellent internal consistency across groups (all R ≥ 0.97). Children with CP exhibited lower individuation than controls in both the preferred (Cohen's d = 0.73) and non-preferred hands, with deficits in the non-preferred hand more pronounced during finger flexion (d = 1.48), in the index finger (d = 1.52), and in those exhibiting mirror movements (d = 0.56). Exploratory analysis in children with CP tested bilaterally (n = 6) revealed finger-specific differences, with lower individuation observed in the index finger of the non-preferred hand (d = 1.36). In children with CP, higher Individuation Indexes for ab-/adduction forces in the preferred hand were related to better fine and gross manual ability (rs = 0.86 and 0.76, respectively; both p < 0.007). Individuation Indexes were not related to clinical scores in the non-preferred hand, nor in controls (all p > 0.05).
Conclusions: This study provides a consistent, valid, and sensitive method to quantify finger SMC in children with CP, revealing finger-, force direction-, and hand-specific impairments that highlight aspects of dexterity not captured by clinical assessments. Quantifying finger individuation enables more precise characterization of hand dysfunction, advancing mechanistic understanding and targeted intervention design for children with CP.
PMID: 41721406

3. Correction: Noninvasive brain stimulation for upper limb motor activity in children and young adults with cerebral palsy and pediatric stroke: a systematic review and meta-analysis

Juan-José Fernández-Pérez, Alfredo Lerín-Calvo, David Rodríguez-Martínez, Álvaro Reina-Varona, Enrique Carrasco-González

Abstract
No abstract available.
PMID: 41691297

4.The relationship between lower limb proprioception and balance performance in children with cerebral palsy: a multisystem and multi-joint approach

Nina Jacobs, Evi Verbecque, Kaat Desloovere, Els Ortibus, Ann Hallemans, Pieter Meyns

Background: Balance problems are a frequent focus of rehabilitation approaches in children with cerebral palsy (CP). Although proprioceptive impairments, affecting 46–90% of children with CP, are commonly observed, their role in postural control remains insufficiently understood.
Aim: Given the multisystemic nature of postural control, this study aimed to investigate the association between lower-limb proprioception (hip, knee, ankle) and distinct postural control systems in children with CP compared to typically developing (TD) peers.
Design: Cross-sectional case-control study.
Setting: Different outpatient settings and the community.
Population: Children aged 5–12 years with TD (N = 30, 8.6 ± 2.2 y; boys: 15) and spastic CP (N = 32, 8.4 ± 2.1 y; boys: 16; GMFCS I/II/III: 24/7/1; unilateral/bilateral: 17/15).
Methods: Postural control was assessed using the age-specific Kids-Balance Evaluation Systems Test – extended version (Kids-BESTest-2). Hip, knee, and ankle proprioception were assessed using passive-ipsilateral Joint-Position-Reproduction (JPR). Joint Reproduction Error (JRE, °) was calculated from 3D kinematics for dominant (JREd) and nondominant (JREnd) legs. Associations were analyzed using general linear models with correction for multiple testing.
Results: JRE_total was not significantly associated with Kids-BESTest-2 scores in either group ($P > 0.01$). In CP, higher JRE_hip (poorer proprioception) was significantly associated with lower total scores ($\eta p^2 = 0.24$, $P < 0.001$) and 3 of 5 domain scores ($\eta p^2 = 0.14$–0.22, $P < 0.004$). JRE_knee predicted 'Transitions and Anticipatory Postural Adjustments' ($\eta p^2 = 0.13$, $P = 0.008$). Across both groups, poorer hip and ankle proprioception were significantly associated with poorer performance in 'Transitions and Anticipatory Postural Adjustments' ($\eta p^2 = 0.16$, $P = 0.003$) and 'Reactive postural responses' ($\eta p^2 = 0.12$, $P = 0.005$).
Conclusions: Postural control deficits in children with CP affect multiple systems, each associated with joint-specific proprioceptive impairments, particularly at the hip. These findings suggest task-dependent and pathology-dependent associations and highlight limitations in compensatory proprioceptive reweighting.
Clinical rehabilitation impact: Findings underscore the need for system- and joint-specific approaches to improve postural control and guide targeted, proprioceptively informed balance training.
PMID: 41712183

5.Metaphyseal femoral resection with structured myoplasty in non-ambulatory patients with neurologic hip dislocation: long-term outcomes on pain relief and complication rates

Edoardo Costici, Rosa Russo, Sergio De Salvatore, Chiara Vitolo, Pier Francesco Costici

Abstract
No abstract available.
PMID: 41711939

6.Cluster-based muscle synergy analysis scheme for assessing crawling motor function in children with cerebral palsy

Chengxiang Li, Xiang Chen, Xu Zhang, De Wu, Guanglin Li, Peng Fang

J Neuroeng Rehabil, 2026 Feb 14. Online ahead of print.

Objective: To evaluate crawling motor function in children with cerebral palsy (CP) using a cluster-based muscle synergy analysis approach.
Methods: Surface EMG was recorded from 26 muscles in 14 typically developing (TD) children and 10 children with CP during eight crawling modes. EMG signals were preprocessed and muscle synergies extracted using non-negative matrix factorization. Hierarchical clustering with synergy similarity constraints identified common synergies within crawling modes in TD children, then across modes. Using TD synergies as a benchmark, four similarity-based metrics were developed to assess motor function in CP.
Results: Common synergies were successfully extracted within and across crawling modes for TD children. Under auditory cueing, children with CP demonstrated significantly fewer and less similar common synergy structures than TD peers, although the number of common recruitment curves was comparable.
Conclusion: The cluster-based synergy analysis method effectively evaluates crawling motor function in children with CP.
PMID: 41691292

7.Clinical gait analysis use in management of children with cerebral palsy: Qualitative study

Marie Lévesque-Jalbert, Katia Turcot, Marie Rousseau-Demers, Yosra Cherni, Philippe C Dixon, Laurent Ballaz, Louis-Nicolas Veilleux, Maxime T Robert

Dev Med Child Neurol, 2026 Feb 21. Online ahead of print.

Aim: To identify the barriers and facilitators that shape how clinical gait analysis (CGA) informs family decision-making in different contexts.
Method: A qualitative descriptive study design was chosen to explore the current clinical landscape. Semistructured interviews were conducted with 15 healthcare professionals and eight caregivers (n = 23) from three pediatric rehabilitation centers in Quebec, Canada, that provide CGA to children with cerebral palsy. Data were analyzed thematically with an inductive approach using NVivo software.
Results: Key barriers include a lack of structure, limited financial and human resources, and restricted access to CGA. The primary facilitators are healthcare professionals and caregivers who aim to enhance the care process by more effectively integrating CGA. Other common topics include the benefits of care management with CGA and the need to clarify the expertise required to ensure the optimal functioning and clinical application of a gait laboratory.
Interpretation: Participants emphasized the importance of addressing disparities, securing institutional support, and promoting intercenter collaboration to achieve sustainable improvements in the care of ambulatory children with cerebral palsy.
PMID: 41721585

8.Comparison of compensatory strategies and gait deviations in unclassified and type 1 unilateral cerebral palsy

Stefanos Tsitlakidis, Nicholas A Beckmann, Johannes Weishorn, Sebastian I Wolf, Pit Hetto, Paul Mick

Sci Rep, 2026 Feb 20. Online ahead of print.

Abstract
No abstract available.
PMID: 41720856

9. Dynamic radiographic angle changes in planovalgus foot correction among children with cerebral palsy

Ana Laura Arenas-Díaz, Agustín Barajas-Monterrey, Silvestre Fuentes-Figueroa, Erika Alejandrina Barrón-Torres, Clemente Hernández-Gómez, Carlos A Guzmán-Martín

Background: Planovalgus foot is the most frequent foot deformity in children with cerebral palsy (CP), often impairing gait and functional mobility. Radiographic angular measurements are essential tools for assessing deformity severity and monitoring postoperative outcomes, yet their dynamic behavior after correction remains poorly characterized.
Objective: To analyze pre- and postoperative variations of radiographic angles in spastic planovalgus feet surgically treated using Mosca's calcaneal lengthening technique within a retrospective cohort, and to provide an educational reference for orthopedic residents regarding angular behavior and measurement interpretation.
Methods: A retrospective, longitudinal, descriptive study was performed on 132 feet (128 patients; 4 bilateral cases) with CP (GMFCS I–V) undergoing calcaneal lengthening with or without adjunctive procedures. Standardized weight-bearing radiographs were analyzed at five time points. Evaluated angles included AP talocalcaneal, AP talo–first metatarsal, talonavicular coverage, calcaneus–fifth metatarsal (C5M), Costa–Bartani, Meary's, lateral talocalcaneal, and calcaneal inclination. Descriptive statistics assessed temporal evolution.
Results: All radiographic parameters showed immediate postoperative improvement, confirming effective correction. AP talocalcaneal angle decreased from 31.6° preoperatively to 24.0° postoperatively, while calcaneal pitch increased from 7.1° to 19.1°. Mild regression occurred in several angles, particularly C5M and Meary's at 2 years.
Conclusion: Calcaneal lengthening provides measurable, durable correction in CP-related planovalgus foot. Partial regression over time highlights the dynamic nature of deformity. Radiographic angles remain reliable monitoring tools and valuable educational metrics for residents.
PMID: 41711920

10. Does mental fatigue influence the accuracy of paralympic boccia players?

Diego Francisco da Silva, André Dos Santos Costa, Leonardo de Sousa Fortes, Saulo Fernandes de Melo Oliveira

Abstract
Mental fatigue (MF) is characterized by prolonged low cognitive demand or short periods of high cognitive demand and may decrease sports performance. This study examined the impact of MF on accuracy in Paralympic boccia (PB) athletes. Eleven athletes participated (six with cerebral palsy and five without). Each completed three conditions: MF, low cognitive effort (LCE), and control. Accuracy was assessed using standard protocols. A generalized estimating equations model evaluated time and condition effects. Significant time effects were found for both LCE ($p < 0.05$) and MF ($p < 0.05$). Mental demand differed between LCE and MF ($p < 0.05$). Accuracy showed no condition effect at 3, 6, or 9 meters, nor for total score ($p > 0.05$). In conclusion, LCE and MF do not negatively affect accuracy in PB athletes.
PMID: 41710774

11. A Commentary on "The effects of extracorporeal shock wave therapy in children with cerebral palsy: a systematic review"

Qingfeng Cai, Hongyu Cai

Abstract
No abstract available.
PMID: 41706607

12. Collaborative practice to support community-based physical activity for young people with childhood-onset physical disability: A scoping review

Karen Brady, Jennifer Ryan, Aoife Cooper, Nora Shields, Maram Sofiany, Ailish Malone

Aim: To identify evidence on implementation strategies that promote collaborative practice between healthcare and community physical activity providers to support participation of young people with childhood-onset physical disability.
Method: Five databases (2000–2025) were searched. Eligible studies included young people aged 10–24 with childhood-onset physical disabilities (e.g., cerebral palsy, spina bifida, spinal cord injury, acquired brain injury, neuromuscular disorders). Strategies were extracted, synthesized, and mapped to the Family of Participation Related Constructs (fPRC) framework and participation stages.
Results: Sixteen studies (eight interventions) were included. Nine implementation strategies were identified and mapped to the fPRC. The environmental "accommodation" dimension was most often addressed. Reporting of strategies often lacked detail for replication.
Interpretation: Improved reporting of implementation strategies is needed to guide collaborative practice and community participation for young people with physical disabilities.
PMID: 41699938

13.Oral Baclofen Toxicity in a Pediatric Patient Managed Without Invasive Intervention: A Case Report and Literature Review

Bandar Alqahtani, Muhammad N Nizamuddin, Syed Rayees

Abstract
Baclofen is utilized for the management of spasticity associated with neurological disorders such as cerebral palsy, multiple sclerosis, and spinal cord injuries. It acts as an agonist for the gamma-aminobutyric acid (GABA)-B receptor. Although baclofen proves to be effective, it presents a significant risk of toxicity and withdrawal symptoms, particularly among pediatric patients, where pharmacokinetics and clinical presentations may diverge from those observed in adults. Furthermore, baclofen is generally not detected in standard toxicology screening, underscoring the need for heightened clinical awareness. We report a case involving a five-year-old boy who inadvertently received a toxic dose of baclofen. He was admitted to the Pediatric Intensive Care Unit via the pediatric emergency room, exhibiting signs and symptoms of convulsions, drowsiness, and bradycardia. The convulsions were managed with intravenous diazepam, and the child made a full recovery within 24 hours with appropriate supportive care. This case report emphasizes that prompt intervention in the case of baclofen overdose prevented the need for invasive procedures such as mechanical ventilation and hemodialysis. Effective supportive therapy yields favorable outcomes, given that there has been no hypoxic or ischemic injury before receiving medical assistance. This literature review focuses on oral baclofen toxicity, without delving deeply into the topics of intrathecal baclofen toxicity and withdrawal. This case contributes to the expanding literature on pediatric baclofen toxicity and highlights the potential for favorable outcomes with prompt intervention.
PMID: 41717193

14. Communicative Development Inventories (CDIs) in etiologically diverse developmental conditions: A systematic review

Zuzanna Laudańska, Patrice van der Venne, Helena Preis, Steffi Sachse, Christian P Schaaf, Jeremy I Borjon, Hana D'Souza, Daniel Holzinger, Ewa Haman, Nivedita Mani, Luise Poustka, Dajie Zhang, Peter B Marschik

Abstract
The MacArthur-Bates Communicative Development Inventories (CDIs) are parent-report tools widely used to assess early language development. Although developed for typically developing children aged 8–36 months, CDIs are increasingly used to study neurodevelopmental and genetic conditions in which language trajectories differ substantially. This review synthesizes CDI applications across conditions including autism, Down syndrome, Williams syndrome, cerebral palsy, Angelman syndrome, DDX3X syndrome, 5p deletion syndrome, fragile X syndrome, and others. The review highlights condition-specific expressive vocabulary profiles, the value of longitudinal CDI data, and visualized age trends showing variability in developmental pathways. Methodological considerations include cross-linguistic adaptations, reporting biases, and limitations of single-time-point assessments. While CDIs show promise for tracking language trajectories and informing early support, challenges remain in ensuring their validity and suitability as screening tools. The authors emphasize the importance of longitudinal, cross-condition, and cross-cultural research to improve understanding of atypical language development and strengthen the utility of CDIs in both research and applied settings.
PMID: 41707555

15. Effects of feeding behavior training on sensory processing and developmental areas in children with cerebral visual impairment: a randomized controlled study

Özge Cemali, Aybüke Yurteri Tiryaki, Mustafa Cemali, Berkan Torpil

Abstract
No abstract available.
PMID: 41691324

16. Wheeled Mobility, Seating, and Bathroom Device Use by Children With Cerebral Palsy

Roslyn W Livingstone, Debra A Field

Background: Little is known about assistive device use by young children with cerebral palsy (CP) classified as Gross Motor Function Classification System (GMFCS) III–V.
Purpose: This secondary analysis examined use of mobility, adaptive seating, bathing, and toileting devices in young children participating in a larger power mobility study.
Method: Data from 42 participants aged 18–87 months were gathered using the parent-report Home Use of Technology for CHildren (HUTCH), within the first 3–4 weeks and at the end of the 6-month power mobility loan. Associations were examined between device, time spent in each device and gross motor, manual abilities, and Level of Sitting Scale functional classifications.
Results: Age, gross motor function, and manual abilities were associated with use of either a stroller, tilt-in-space, or upright manual wheelchair, while age, postural, and manual abilities were associated with use of wheelchair seating rather than separate adaptive seating or a typical high chair or booster seat. Children with greater impairments were more likely to use bathing devices, while few used toileting devices. More time was spent by children using tilt-in-space wheelchairs compared with upright wheelchairs or strollers.
Conclusion: Statistically significant associations were identified between child profile and use of manual mobility, seating, and bathroom devices.
PMID: 41719113

17. Ankle Exoskeleton Assistance Reduces Knee Contact Force during Walking in Individuals with Cerebral Palsy

Ying Fang, Katherine M Steele, Zachary F Lerner

Abstract
Musculoskeletal health is essential for overall well-being, and most individuals with cerebral palsy (CP) experience gait disorders associated with increased joint loading, pain, and degeneration. Wearable assistive devices have shown promise for improving mobility, yet their effects on joint loading are not well understood. This study quantified the effects of ankle exoskeleton assistance on knee contact force in 11 children and young adults with CP walking on a treadmill under two conditions: shoes alone (Shod) and ankle exoskeleton assistance (Exo). Muscle forces were estimated using an EMG-informed modeling approach incorporating EMG from eight lower-limb muscles. Ankle assistance reduced peak late-stance knee contact force by 9.3% (±7.3%) and average stance-phase force by 7.2% (±4.6%) compared with Shod (p ≤ 0.003). Quadriceps muscle force during stance decreased by 9.1% (±10.9%) with assistance (p = 0.015), and reductions were strongly associated with reduced knee contact force (p < 0.001). Despite no group-level differences in gastrocnemius force or kinematics, greater knee extension, greater ankle plantarflexion, and lower gastrocnemius force were correlated with lower knee contact force (p ≤ 0.022). Findings suggest that ankle assistance may reduce knee loading in CP by altering knee extensor muscle forces.
PMID: 41697829

18. Rehabilitation for children with cerebral palsy in a lower-middle income country: A qualitative phenomenological study

Stewart Drew, Shafiul Islam, Israt Jahan, Mohammad Muhit, Nadia Badawi, Gulam Khandaker, Mahmudul Hassan Al Imam

Aim: To examine the persistent barriers and facilitators to rehabilitation uptake among children with cerebral palsy (CP) in rural Bangladesh, with focus on engagement in therapy and self-management, and beyond the context of attendance.
Method: This qualitative phenomenological study was conducted in four subdistricts of Sirajganj, Bangladesh. In-depth interviews were conducted with caregivers of children with CP registered in the Bangladesh CP Register and rehabilitation professionals recruited purposively from Sustainable Model of eARly intervention and Telerehabilitation for children with Cerebral Palsy (SMART-CP) centres. Interviews were transcribed, translated, and analysed thematically using an inductive approach.
Results: Between November and December 2022, 45 caregivers and eight rehabilitation professionals were interviewed. Three key themes emerged: (1) financial and logistical resources, including poverty, transport difficulties, and competing demands; (2) emotional burden, intensified by social stigma and negative family attitudes, and caregiver loss of hope in adequately supporting their child; (3) self-efficacy, where caregiver education, coaching, and belief in therapy facilitated engagement. Local, affordable services, family and peer support, and community awareness further enabled rehabilitation uptake, which varied across families and over time.
Interpretation: Children with CP and their caregivers in rural Bangladesh face persistent barriers to accessing rehabilitation. Interventions that enhance local service provision, staff training, and caregiver support may improve rehabilitation engagement and health outcomes. Enhanced livelihood support and expanded training opportunities may further strengthen rehabilitation uptake.
PMID: 41717672

19.Frequency and nature of sleep disturbances amongst children with cerebral palsy in Northern Ireland: A cross-sectional study

Mary-Elaine McCavert, Oliver Perra, Karen McConnell, Claire Kerr

Background: Children with cerebral palsy (CP) are at elevated risk of sleep disturbances, yet UK-specific prevalence data are limited.
Objectives: To describe frequency and nature of sleep disturbances in children with CP in Northern Ireland and explore associations with child or sociodemographic characteristics.
Methods: Online survey of parents of children aged 3–18 years with CP using the Sleep Disturbance Scale for Children (SDSC) and demographic items. Sample compared with NI CP Register. Analyses included descriptive statistics, t-tests, and multivariate regression.
Results: Responses from 111 families showed high sleep disturbance prevalence: 43% met clinical criteria using contemporary norms and 74% using historical norms. Most common problems were Disorders of Initiating and Maintaining Sleep and Sleep-Wake Transition Disorders. No significant associations were found with age, sociodemographic factors, or CP-related variables.
Conclusions: This first UK study using the SDSC in CP indicates substantial sleep disturbance burden, supporting routine clinical inquiry and targeted support.
PMID: 41702278

20.Neurological outcomes beyond epilepsy following electroencephalographically verified neonatal seizures: A Swedish nationwide cohort study

Hanna Westergren, Helena Marell Hesla, Maria Altman, Ronny Wickström

Introduction: Neonatal seizures affect 1–3 per 1000 term newborns and require EEG/aEEG verification. This study investigated risks of developmental delay (DD), intellectual disability (ID), autism, ADHD, and cerebral palsy (CP) after EEG/aEEG-verified neonatal seizures.
Methods: National register-based cohort of infants born 2009–2020 with EEG/aEEG-verified seizures matched to controls without neonatal seizures. Outcomes were assessed through 2021 using cumulative incidence and adjusted hazard ratios (aHR).
Results: 1062 infants with neonatal seizures were matched with 5310 controls. All outcomes had higher cumulative incidence in seizure-exposed infants. CP showed the highest incidence at 10 years (21.9% vs 0.42% in controls). CP had the largest aHR (42.6). ID also showed high risk (aHR 18.9). Over half of seizure-exposed infants (57.1%) had identifiable etiologies.
Conclusion: Neonatal seizures are associated with substantially increased risks of DD, ID, autism, ADHD, and CP. Findings highlight the importance of standardized follow-up and early clinical intervention.
PMID: 41697907

21. Associations between deprivation and postneonatal cerebral palsy over 35 years: a population-based longitudinal study

Oliver Perra, Róisín Keenan, Claire Kerr

Introduction: Cerebral palsy (CP) is a non-progressive condition involving movement and muscle tone difficulties due to injury to the developing brain. While most cases arise around birth, a smaller proportion (postneonatal CP) occur due to brain injuries between 29 days and 2 years of age. Causes of postneonatal CP are often modifiable and may be more common in socioeconomically deprived areas, yet few studies have examined this. This study addressed this gap using a population-wide CP register in Northern Ireland.
Methods: A retrospective study linked births from 1981–2016 with area-level deprivation data. Bayesian regression models examined associations between deprivation, postneonatal CP, and related outcomes.
Results: Postneonatal CP declined steadily over the study period (IRR = 0.89; 89% UI 0.85–0.93), particularly among individuals from the most deprived areas. Odds of infection-related postneonatal CP decreased overall but did not decline among those from deprived backgrounds, who also had higher odds of CP due to head injuries (OR = 2.72; 89% UI 1.09–5.30). Postneonatal CP was associated with greater odds of severe motor impairment (OR = 1.47; 89% UI 1.07–2.00), intellectual delay (OR = 2.54; 89% UI 1.83–3.55), and seizures (OR = 2.55; 89% UI 1.84–3.56).
Discussion: Although prevalence has declined, socioeconomic inequalities remain in the causes and consequences of postneonatal CP. Findings highlight the need for targeted public health interventions and further research to reduce disparities and prevent modifiable causes of CP.
PMID: 41690700

22. Transition readiness assessment in cerebral palsy: A qualitative descriptive study

Cristina A Sarmiento, Hannah Friedman, Chloe Glaros, Christine Petranovich, Lisa A Brenner, Brooke Dorsey

Aim: To explore the utility of a commonly used transition readiness assessment tool (Transition Readiness Assessment Questionnaire [TRAQ]) among adults with cerebral palsy (CP) and caregivers.
Method: This was a qualitative descriptive study using 21 semi-structured interviews (seven adults with CP, nine caregivers, five dyads) and matrix analysis.
Results: Participants had many suggested edits to comprehensively assess transition readiness. Several adults with CP expressed that the tool appropriately assessed important skills for entering adulthood. Questions on managing medications and activities of daily living were identified as most relevant. However, caregivers found it difficult to answer questions as a caregiver and not the patient and felt that the tool was less applicable because they had been managing their child's needs for years. Distinguishing physical versus cognitive abilities presented another challenge because several participants noted that they or their child cognitively knew how to do certain tasks but were limited physically.
Interpretation: Assessing transition readiness is an important part of the transition to adulthood. Individuals with CP have a wide range of abilities that may not be adequately captured by TRAQ. A CP-specific tool should be sure to distinguish between these varied abilities and clearly delineate the caregiver role for young people with varying levels of support needs.
PMID: 41721586

23.Fertility Rates Among Women With Intellectual and Developmental Disability Enrolled in Medicaid and/or Medicare, 2011–2022

Josue Antonio G Estrada, Nina Cesare, Katherine Barger, Emily Q Sisson, Megan B Cole, Laura Graham Holmes, Samantha E Parker, Alianna Higgins, Collette N Ncube, Samuel B Rosenberg, Ashley Scott, Sowmya R Rao, Martha Werler, Eric Rubenstein

Background: Women with intellectual and developmental disability (IDD) have historically been sterilised and institutionalised to limit reproductive rights. Although protective legislation has increased, stigma persists and may be evolving.
Objectives: To describe fertility rates among women with identified IDD using 11 years of Medicaid and/or Medicare data.
Methods: A cohort of women with IDD aged 18–45 was identified between 2011 and 2022. ICD-9 and ICD-10 codes identified pregnancies and IDD diagnoses. General fertility rate (GFR), age-specific fertility rate (ASFR), and total fertility rate (TFR) with 95% confidence intervals were calculated annually.
Results: From 2011 to 2022, 50,562 live births occurred among 33,457 women. There were 38,983 births to women with intellectual disability, 9360 with autism, and 2219 with both. Additionally, 1403 pregnancies occurred among women with CP plus autism or intellectual disability. GFR remained stable (9.3 per 1000 in 2011 to 9.9 per 1000 in 2022). ASFR was highest at ages 21–25 for women with autism-only and intellectual-disability-only. TFR ranged from 0.22–0.40 (autism-only) and 0.25–0.27 (intellectual disability-only). Fertility rates increased in most states.
Conclusion: Fertility trends among women with IDD remained consistent over time, with slight increases among women with autism. Findings highlight the need to examine access, quality, and continuity of reproductive healthcare.
PMID: 41711183

24.Comparative Effects of Deep Breathing and Vagus Nerve Stimulation on Psychosocial and Autonomic Outcomes in Mothers of Children with Cerebral Palsy: A Randomized Controlled Trial

Kemal Ozen, Gamze Demircioglu

Background: This randomized controlled trial compared deep breathing exercises (DBEs) and transcutaneous auricular vagus nerve stimulation (VNS) in mothers of children with cerebral palsy.
Methods: Thirty-nine participants were randomized to DBE (n = 20) or VNS (n = 19) for three sessions per week over three weeks. Outcomes included sleep quality (PSQI), depression (BDI), caregiver burden (ZBI), autonomic symptoms (COMPASS-31), heart rate variability (HRV), and musculoskeletal pain (NMQ-E).
Results: Both interventions improved sleep, depressive symptoms, caregiver burden, and autonomic symptom burden. HRV did not significantly change. Between-group analyses showed greater reduction in BDI with VNS, while other measures improved similarly across groups. Musculoskeletal pain reductions were observed in multiple regions in both groups but did not differ significantly between groups.
Conclusion: Both DBE and VNS were effective supportive interventions, with VNS showing stronger antidepressant effects. DBE remains a low-cost, accessible option for caregiver wellbeing.
Plain language summary
Integrative noninvasive interventions such as deep breathing exercises (DBEs) and vagus nerve stimulation (VNS) may offer valuable support for addressing the complex psychosocial and physiological challenges experienced by mothers of children with cerebral palsy (CP).DBE represents a low-cost, easily accessible strategy suitable for implementation in community-based or home settings, offering improvements in stress, sleep quality, caregiver burden, and musculoskeletal pain. VNS may be especially beneficial for individuals with elevated depressive symptoms or widespread pain, given its broader neuromodulatory effects and potential to regulate autonomic and emotional functioning. Tailoring rehabilitation protocols based on individual symptom profiles (e.g., stress-dominant vs. pain-dominant presentations) could enhance therapeutic outcomes and ensure more efficient, targeted intervention planning. Incorporating autonomic regulation strategies alongside conventional physiotherapy may help promote holistic care in populations experiencing chronic caregiving-related burden, thereby supporting long-term caregiver resilience and well-being.
PMID: 41704158

25. The modified Care and Comfort Questionnaire score in children with severe cerebral palsy: reference values and the associated floor and ceiling effects

Katie Hughes, Navnit S Makaram, Callum Hughes, Nick D Clement, Mark S Gaston

Aims: The modified Care and Comfort Hypertonicity Questionnaire (mCCHQ) is a validated caregiver-reported outcome measure for children with GMFCS IV/V cerebral palsy (CP). This study aimed to establish reference values for the mCCHQ and determine whether a floor or ceiling effect exists.
Methods: Population-based cross-sectional study of GMFCS IV/V children enrolled in the CP Integrated Pathway Scotland (CPIPS) programme. Age, sex, GMFCS level, CP subtype, and Scottish Index of Multiple Deprivation were collected. Caregivers completed the mCCHQ at each assessment.
Results: mCCHQ scores were available from 685 assessments of 405 children (mean age 8.3 years). Forty percent were GMFCS IV and 60% GMFCS V. Mean total score was 52.1 (SD 12.7). Subdomain means: personal care 17.2, positioning/transferring 11.4, comfort 8.7, interaction/communication 14.9. No floor or ceiling effect for total score; however, moderate floor effects were noted in positioning/transferring (13%) and comfort (15%). Demographic variables had minimal influence.
Conclusion: The mCCHQ is a valuable outcome measure for GMFCS IV/V CP, demonstrating sensitivity and reliability, though floor effects in two subdomains suggest areas for refinement.
PMID: 41704093

26. Video-feedback intervention to promote positive parenting, study for Cerebral Palsy (VIPP-CP): a randomized control trial

Demet Gülaldı, Hacer Nermin Celen

Abstract
The present study aimed to enhance positive parenting and maternal sensitivity among mothers of children with cerebral palsy by examining the effects of the Video Feedback Intervention to Promote Positive Parenting adapted for Cerebral Palsy (VIPP-CP) on mother–child interaction. This pre-test–post-test randomized controlled trial included 40 mother–child dyads randomly assigned to intervention or control groups. The intervention group received VIPP-CP; the control group received phone calls and face-to-face interviews. Maternal sensitivity and interaction behaviours were assessed using the Maternal Sensitivity Scale (MSS) and the Parent–Child Interaction Observation Form (PICCOLO). Repeated-measures ANOVA and Pearson correlations were used. VIPP-CP significantly improved the "Supporting the Child" subdimension of MSS and the "Sensitivity" and "Encouragement" dimensions of PICCOLO.
PMID: 41699999

Prevention and Cure

27.Early postnatal changes in thyroid-stimulating hormone and subsequent neurodevelopment in preterm infants

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Introduction: Thyroid hormones are crucial for brain maturation during late gestation and early infancy. In preterm infants, immaturity of the hypothalamic–pituitary–thyroid axis often leads to transient or delayed dysfunctions undetected by standard newborn screening. As these atypical thyroid patterns have been associated with neurodevelopmental outcomes, serial assessments are warranted to better characterize risk. This study investigated whether thyroid trajectories between birth and discharge predict neurodevelopment at two years and their neural correlates on diffusion tensor imaging (DTI).
Methods: This prospective cohort study included 222 preterm infants born at ≤32 weeks who underwent serial thyroid function tests at 1–2 weeks and at term-equivalent age or discharge. Thyroid status was classified into quartile-based groups, and neurodevelopment at two years was assessed using the BSID-III. Neurodevelopmental impairment (NDI) was defined as cerebral palsy, blindness, hearing loss, or BSID-III scores <85. DTI at term-equivalent age was analyzed for network properties. Associations between longitudinal TSH quartile patterns and NDI were evaluated using logistic regression with inverse probability weighting.
Results: Infants with NDI had significantly higher TSH at birth and peak levels during hospitalization (P = 0.017 and P < 0.002). Cross-sectional quartile analyses did not show independent associations with NDI, but TSH trajectories were informative: infants with persistently low TSH, or declining from interquartile to lowest quartile by discharge, had markedly lower NDI risk (OR 0.24, P = 0.020; OR 0.23, P = 0.035). DTI indicated altered network centrality in the anterior cingulate and superior frontal gyri among infants with higher neonatal TSH.
Conclusion: Preterm infants with persistently low or decreasing TSH trajectories showed reduced odds of neurodevelopmental impairment, while persistently high or increasing TSH may reflect atypical hypothalamic–pituitary–thyroid axis adaptation. Neural differences identified on DTI support a mechanistic link between thyroid status and neurodevelopment.
PMID: 41710163

28. Severe maternal morbidity is associated with increased risk of cerebral palsy in offspring

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Background: Severe maternal morbidity (SMM) has been linked to maternal mortality and perinatal complications, but evidence on its associations with children's neurodevelopment is limited.
Objectives: To assess associations between SMM and cerebral palsy (CP) in offspring, overall and by major SMM subtypes.
Study design: Longitudinal cohort study of all live births in Ontario, Canada (2003–2019; n = 2,136,816). SMM (n = 41,396) was identified using validated diagnostic and procedural codes during pregnancy through 42 days postpartum. SMM subtypes included severe hypertensive disorders, severe hemorrhage, sepsis, and other morbidity. CP was defined as ≥1 inpatient or ≥2 outpatient diagnoses at least two weeks apart during follow-up (ages 1–17 years). Poisson regression estimated associations.
Results: Over a median 9.5-year follow-up, 5,352 children were diagnosed with CP (0.3%). CP incidence was 7.5 per 10,000 child-years among those exposed to SMM vs 2.5 per 10,000 unexposed. After adjustment, SMM was associated with increased CP risk (RR 2.71, 95% CI 2.39–3.06). All subtypes showed increased risk, strongest for severe hypertensive disorders (adjusted RR 3.29).
Conclusion: SMM was associated with higher risk of CP across multiple morbidity categories. Findings highlight the importance of optimizing maternal health and suggest that enhanced surveillance for CP may be warranted in children exposed to SMM.
PMID: 41707893

29.Cerebral Palsy Risk by Combined Apgar Score and Umbilical Cord Blood pH Levels

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JAMA Netw Open, 2026 Feb 2;9(2):e2559359.

Importance: Perinatal hypoxia is a key cause of cerebral palsy (CP). Although criteria involve both clinical and biochemical markers such as Apgar score and umbilical cord pH, most studies have used only one measure.
Objective: To investigate the association between combined Apgar score and cord blood pH with CP.
Design, setting, and participants: Nationwide registry-based cohort in Denmark of singleton births ≥35 weeks between 2004 and 2018 with ≥1 year of follow-up.
Exposure: Joint categories of 5-minute Apgar score (0–3, 4–6, 7–10) and cord pH (<7.00, 7.00–7.09, 7.10–7.19, ≥7.20). Reference group: Apgar 7–10 & pH ≥7.20.
Main outcomes and measures: CP diagnosed by hospital records. Associations estimated using multivariable log-binomial regression.
Results: The cohort included 825,159 newborns. Among those with the lowest Apgar (0–3) and lowest pH (<7.00), 22 of 145 (15.2%) developed CP (adjusted RR 159.0). Even with normal Apgar (7–10), infants with pH <7.00 had elevated CP risk (aRR 6.1). Low Apgar with normal pH (≥7.20) was also associated with increased risk (aRR 22.0). Severe CP was more common among infants with both abnormal markers.
Conclusion: CP risk was substantially higher when both Apgar score and cord pH were abnormal. Combined assessment may improve identification of infants requiring early surveillance.
PMID: 41706451

30.Early ultrasound-based assessment of preterm white matter injury: association with MRI and neurological outcomes

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Pediatr Radiol, 2026 Feb 18. Online ahead of print.

Background: White matter injury (WMI) is a major contributor to neurodevelopmental impairment in preterm infants. Earlier identification is essential for emerging therapies.
Objective: To determine whether WMI severity on head ultrasound at 7 and 30 days of life (DOL) is associated with WMI severity on term-equivalent MRI and neurological outcomes at age 2 years.
Materials and methods: Retrospective cohort of infants born ≤32 weeks with WMI noted on imaging reports. Ultrasounds and MRIs were scored using established systems. Ordinal logistic regression tested associations between ultrasound severity and MRI severity, adjusting for gestational age and intraventricular hemorrhage. Neurological outcomes were obtained from medical records.
Results: Fifty infants (median GA 27.1 weeks) were included. WMI severity on ultrasound at 7 DOL (OR 1.8) and 30 DOL (OR 1.5) was independently associated with MRI severity. Higher severity at 7 DOL was associated with CP (OR 2.4). Higher severity at 30 DOL was associated with CP and neurosensory impairment.
Conclusion: Early ultrasound findings at both 7 and 30 days predict MRI-confirmed WMI and neurological outcomes, supporting the value of serial ultrasound screening in preterm infants.
PMID: 41706155

31.Mendelian randomization analysis of labor anesthesia and adverse neonatal outcomes

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Background: Observational studies suggest possible associations between labor anesthesia and neonatal asphyxia, respiratory distress, and neurological outcomes. This study conducted a two-sample Mendelian randomization analysis to evaluate potential causal relationships.
Method: GWAS data were analyzed for spinal, epidural, and other anesthesia methods and outcomes including neonatal asphyxia, neonatal respiratory distress syndrome (NRDS), cerebral palsy, ADHD, and intellectual disability. Inverse-variance weighted MR was the primary method, with sensitivity tests for pleiotropy and heterogeneity.
Results: No strong associations were found between anesthesia type and neonatal asphyxia, NRDS, cerebral palsy, intellectual disability, or ADHD. Sensitivity analyses indicated minimal heterogeneity and no directional pleiotropy.
Conclusion: Genetic evidence does not support a causal relationship between labor anesthesia methods and adverse neonatal outcomes. Labor pain-relief methods may be selected based on maternal needs without increasing neonatal risk.
PMID: 41702668