Cerebral palsy research news

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Interventions and Management

1.A Holistic Approach Towards Evaluating Upper Limb Function in Children with Unilateral Cerebral Palsy: A Narrative Review of Clinical Tools and Promising Technologies for Comprehensive Assessment

Giovanna De Luca, Alexandra Kalkantzi, Lisa Mailleux, Rocío Palomo-Carrión, Hilde Feys, Roslyn N Boyd, Elena Beani, Matteo Cianchetti, Silvia Filogna, Giuseppe Prencipe, Giuseppina Sgandurra, Martina Maselli

J Clin Med. 2025 Sep 17;14(18):6539
Abstract
Optimal upper limb (UpL) function is essential for performing daily activities; however, children with unilateral spastic cerebral palsy (USCP) often experience impairments in UpL function, which can impact their quality of life or independence. While UpL motor impairments are a primary concern, non-motor functions, such as cognition, attention, and visual function, commonly impaired in USCP, may also play a role in UpL performance. Nevertheless, these non-motor functions are often not considered in evaluation protocols that focus on the UpL. Moreover, clinical evaluation is typically conducted in structured and controlled settings and may not accurately reflect the child's abilities in daily life. Non-invasive, novel technologies are a promising solution for filling this gap, by providing additional quantitative and ecologically valid information to clinicians. In this context, this overview aims (i) to present the most frequently used tools for a holistic evaluation in children with USCP, ensuring a thorough understanding of the UpL function, and (ii) to report the evidence of how novel, non-invasive technologies can enhance clinical evaluation in daily life, enabling a more comprehensive evaluation. This work could set a basis for multidimensional evaluation protocols for UpL function in USCP, providing a different approach to the current standards.
PMID: 41010743

2.ACT-ON-DIP: Study Protocol of a Randomized Controlled Trial of a Home-Based ACTion Observation Tele-RehabilitatioN for Upper Limb in Children with DIPlegic Cerebral Palsy

Elena Beani, Elisa Matteucci, Elisa Sicola, Giada Martini, Maria Chiara Di Lieto, Clara Bombonato, Valentina Menici, Annalisa Cotardo, Marta Rizzo, Silvia Filogna, Federica Camuncoli, Laura Biagi, Giovanni Cioni, Francesca Fedeli, Chiara Gelmini, Rita Neviani, Olivia Vecchi, Silvia Perazza, Silvia Faccioli, Antonino Errante, Alessandro Piras, Eleonora Sicuri, Francesca Bozzetti, Roslyn N Boyd, Adriano Ferrari, Leonardo Fogassi, Giuseppina Sgandurra

Children (Basel). 2025 Sep 14;12(9):1229

Background: Children with diplegic Cerebral Palsy often exhibit upper-limb (UL) motor impairments compounded by deficits in visuospatial, sensory, and executive functions. Despite this, research has primarily focused on lower-limb rehabilitation, leaving the treatment of UL function in diplegic Cerebral Palsy underexplored. Action Observation Therapy (AOT), based on Mirror Neuron System activation, has shown promise in promoting motor recovery, but evidence specific to this population is limited. This exploratory randomized controlled trial (RCT) aims to assess the feasibility and effectiveness of a home-based AOT program—ACT ON DIP—for improving upper-limb function in children and adolescents with diplegic Cerebral Palsy. Methods: Fifty-four participants with spastic diplegic Cerebral Palsy (MACS and GMFCS levels I–III, aged 5–16 years) will be randomly assigned to an experimental group (receiving an 8-week home-based AOT program) or a control group (receiving standard care). The ACT ON DIP system includes an ad hoc software, kits of objects for daily tasks, and wearable sensors. The system allows for delivering structured uni- and bimanual AOT activities tailored to the child's profile. Primary outcome is the Both Hands Assessment (BoHA); secondary outcomes include motor (MA-2, BBT, ABILHAND), neuropsychological (NEPSY-II, Corsi Test, BRIEF), and participation measures (COPM, PEM-CY, CP-QOL). A subgroup will undergo fMRI to explore neural correlates of training-related changes.
Results: Feasibility, compliance, and user experience with the home-based system will be assessed. This study will evaluate short-, medium-, and long-term changes in UL performance and related neuropsychological functions.
Conclusions: ACT ON DIP represents a novel, personalized, and accessible tele-rehabilitation intervention for children with diplegic Cerebral Palsy. If effective, it could expand treatment opportunities for UL rehabilitation in this population and support broader implementation of home-based AOT.
PMID: 41007094

3.Longitudinal decline in upper-limb range of motion in adults with cerebral palsy

Dev Med Child Neurol. 2025 Sep 26. Online ahead of print
No abstract available
PMID: 41004520

4.Hands down, early wins: the case for active, play and training based therapies in unilateral cerebral palsy

D Fehlings, I Novak, A C Eliasson

Pediatr Res. 2025 Sep 23. Online ahead of print
No abstract available
PMID: 40987829

5.Surgical and health outcomes of non-ambulatory children with cerebral palsy and severe scoliosis: A population-based, longitudinal study

Dev Med Child Neurol. 2025 Sep 26. Online ahead of print
No abstract available
PMID: 41004392

6.Repeat selective dorsal rhizotomy for residual spasticity: illustrative case

Elizabeth Ledbetter, Aloysia L Schwabe, Heather Sgro, Sarah Slocum, Nisha Gadgil

J Neurosurg Case Lessons. 2025 Sep 22;10(12):CASE25433

Background: Selective dorsal rhizotomy (SDR) is typically a one-time surgical procedure supported by intense rehabilitation to improve ambulatory capability in children with spastic cerebral palsy (CP).
Observations: The authors present the unique case of a teenager with spastic diplegic CP who had undergone L2–S1 SDR as a child and presented with residual focal spasticity in the right plantar flexors. He underwent revision SDR at the right L5 and S1 levels in addition to decompression of canal stenosis. Postoperatively, he had notable improvement in his gait with relief of preoperative right knee and foot pain, improved ease of ambulation, and improved gait mechanics by 3D gait analysis.
Lessons: The authors demonstrate the feasibility of revision focal SDR for persistent spasticity following SDR in the appropriately chosen patient.
PMID: 40982984

7.Spinopelvic alignment and sagittal gait kinematics of adult patients with cerebral palsy

Patrick P Nian, Vishnu Deep Chandran, Colson Zucker, Peter Cirrincione, Zhenkun Gu, Silvia Zanini, Jennifer Jezequel, Bridget Assip, Sherry Backus, Dara Jones, David Scher, Paulo Selber

Spine Deform. 2025 Sep 20. Online ahead of print

Purpose: Sagittal spinopelvic alignment (SPA) is originally calculated by the algebraic expression pelvic incidence–lumbar lordosis (PI–LL), heralded numerous clinically relevant radiographic measures of spine alignment, e.g., T4–L1–pelvic angle. SPA malalignment compromises spine fusion outcomes and quality of life of typically aging persons. This study investigated gait and SPA of patients with cerebral palsy (CP) using multiple sagittal radiographic measures.
Methods: Twenty-three patients, mean age 35 years with CP at GMFCS I–II were included. Radiographic measures included C2PA, T4PA, L1PA. PI–LL and T4–L1PA mismatch were defined as >10°/<–10° and >4°/<–4°, respectively. Trunk, pelvis, hips, and knees kinematics were obtained. Statistical parameter mapping (SPM) assessed kinematic differences throughout the gait cycle. Multivariable linear regression assessed the relationship between gait and radiographic parameters.
Results: Fourteen and eleven patients (60.9% and 47.8%) presented with PI–LL and T4–L1PA mismatch, respectively. PI–LL mismatched patients demonstrated significantly lower knee flexion during gait. T4–L1PA mismatched patients demonstrated increased anterior pelvic tilt, hip flexion, and decreased knee flexion during gait, which was consistent with SPM analysis. Multivariable linear regression showed T4–L1PA, C2PA, and anterior pelvic tilt were associated with knee flexion.
Conclusion: This is the first study to evaluate SPA parameters and gait kinematics in patients with CP. This observational and preliminary data suggested that SPA and knee flexion in gait may be associated. Whether the variations in gait patterns are coping mechanisms or the cause for SPA malalignment requires clarification. The implications of SPA malalignment on the quality of life of this population warrant further investigations.
PMID: 40975725

8.Feasibility of a Markerless Motion Capture System for Balance Function Assessment in Children with Cerebral Palsy

Xiaoxia Yan, Nichola Wilson, Chengyan Sun, Yanxin Zhang

Sensors (Basel). 2025 Sep 21;25(18):5911

Abstract
Children with cerebral palsy (CP) have impaired standing balance ability, caused by increased muscle tone, muscle weakness, and joint deformity. It is necessary to investigate standing balance for children with CP. Compared with postural stability assessment using force plates, OpenCap has the potential to be used utilized as a cost-effective standing balance assessment tool, providing details about the center of mass (CoM) and joint angles. This study aims to evaluate the feasibility of using OpenCap for standing balance assessment in children with CP by (i) examining the validity of OpenCap-based CoM parameters against force plate center of pressure (CoP) measures and (ii) exploring associations between joint angles and CoM displacement. Twenty-two children with CP completed standing balance trials on a force plate-based balance tester while two smartphones recorded synchronized videos for OpenCap processing. For the correlation between CoM parameters and CoP parameters, Pearson's R values were from 0.39 to 0.94 between the two systems. After correcting the CoM parameters, the R^2 values ranged from 0.98 to 1.00. Regarding the relationship between the joint angles and CoM, maximum and minimum sagittal angles in the ankle were corrected with CoM displacement along the x-axis. These findings suggest that OpenCap may be a potential, cost-effective tool for standing balance assessment in children with CP.
PMID: 41013149

9.Physiotherapists' preparedness for a national hip screening program in children with cerebral palsy: a survey study

Süleyman Kozlu, Avni İlhan Bayhan, Evren Akpınar, Osman Nuri Özyalvaç

Acta Orthop Traumatol Turc. 2025 Sep 12;59(5):268–273

Objective: Cerebral palsy (CP) is a prevalent neurological disorder affecting 2–3 per 1000 live births globally. A common orthopedic consequence in CP is hip dislocation, with an incidence ranging from 15% to 30%. This study aimed to assess physiotherapists' (PTs) awareness and knowledge of hip dislocation in CP and identify knowledge gaps in this field.
Methods: A cross-sectional survey was administered to PT working in healthcare institutions across Türkiye. The online anonymous survey, hosted on Google Forms, received responses from 128 PTs. It included questions related to the diagnosis, treatment approaches, and clinical experience concerning hip dislocation/subluxation. The survey consisted of 3 types of questions: demographic questions, yes/no knowledge questions, and opinion-suggestion questions.
Results: The majority of PTs participating in this study work with pediatric patients. Physiotherapists had basic knowledge about hip dislocation although we observed significant gaps in areas related to routine screening programs and advanced treatment modalities. PTs incorrectly answered 3 out of 8 knowledge-based questions. The majority emphasized the importance of early diagnosis and treatment and expressed a need for more education and awareness programs.
Conclusion: Physiotherapist provided important opinion-suggestion insights. The findings indicate a need for improved education and training for PT concerning hip dislocation in children with CP. We believe that the most appropriate screening method for Türkiye is to establish a screening program with a multidisciplinary structure formed between pediatric orthopedists, physical medicine and rehabilitation specialists (PM&R), PT, and family physicians (FPs).
PMID: 40995886

10.Histological analysis of the semitendinosus muscle in young children with cerebral palsy compared to age matched typically developing children

Jorieke M Deschrevel, Anke A Andries, Karen Maes, Nathalie M De Beukelaer, Marlies Corvelyn, Lauraine M Staut, Hannah De Houwer, Domiziana Costamagna, Willem-Jan Metsemakers, Stefaan Nijs, Elga Nijs, Greet Hens, Kaat Desloovere, Anja Van Campenhout, Ghislaine Gayan-Ramirez

J Anat. 2025 Sep 24. Online ahead of print

Abstract
Cerebral palsy (CP) is a neurological disorder caused by a non-progressive lesion in the developing fetal or infant brain associated with structural muscle alterations. Despite its relevant function in walking, the semitendinosus (ST) structure has been poorly investigated in CP, especially in (very) young children, although this could help determine early events and whether these alterations differ between age groups. This study aimed at defining the histological characteristics of the ST muscle in very young (preschool age group: 3–5 years old) and young (school age group: 6–9 years old) ambulant children with CP, in comparison to age-matched typically developing (TD) children. Microbiopsies of ST were collected in 37 children with CP and 33 TD children (preschool: 15 CP, 9 TD; school age: 22 CP, 24 TD). Muscle cross-sections were immunostained with (1) myosin heavy chain (MHC-I, MHC-IIa, and MHC-IIx) to determine fiber cross-sectional area (absolute: afCSA and normalized to total lower leg length: nfCSA), fiber proportion, (2) CD31 combined with MHC to assess capillary density, capillary to fiber ratio, capillary domain, and heterogeneity index, and (3) Pax7 to quantify the number of satellite cells. fCSA intrasubject variation was determined by coefficient of variation (CV). None of the parameters were altered in the preschool age CP compared to TD, except for larger type I afCSA in girls compared to boys. For the school-age group, type IIx afCSA (+21%, $p = 0.019$), nfCSA of all fibers (+48%, $p = 0.03$), and type IIa (+32%, $p = 0.019$) were larger in CP, and type IIx proportion was higher (+91%, $p = 0.016$) compared to TD. There was also an increased CV (all fibers: +30%, $p = 0.005$; type I: +32%, $p < 0.001$; IIa: +38%, $p = 0.025$). Satellite cell number and capillarization remained unaltered. These results indicate that the ST appears unaffected in very young ambulant CP children, but alterations develop with age.
PMID: 40990969

11.Personalized musculoskeletal modeling for gait analysis and decision-making in femoral derotational osteotomy for children with cerebral palsy

Jehyun Yoo, Kun-Bo Park, Juntaek Hong, Junmin Cha, Jeuhee Lee, Yebin Cho, Dong-Wook Rha

J Orthop Surg Res. 2025 Sep 26;20(1):855

Background: Preoperative gait analysis plays a crucial role in determining the necessity and correction angle for femoral derotational osteotomy (FDO). However, conventional musculoskeletal models used in gait analysis often fail to reflect patient-specific musculoskeletal characteristics, such as femoral and tibial deformities. This study evaluates the impact of a personalized musculoskeletal model incorporating these deformities on gait analysis and investigates the surgical outcomes of FDO based on kinematic changes derived from this personalized musculoskeletal model.
Methods: A retrospective analysis was conducted on 254 limbs from 127 children with cerebral palsy (CP) who presented with increased femoral anteversion and underwent pre- and postoperative gait analyses. Kinematic data were generated using general and personalized musculoskeletal models developed in OpenSim. Patients were classified according to FDO status and the presence of excessive hip internal rotation (IR). Surgical outcomes were assessed based on postoperative changes in hip rotation. Subgroup analyses were performed to evaluate the model's impact on surgical outcomes.
Results: Of the 254 limbs, 92 underwent FDO. Patients with increased hip IR in the general model (Group A) had a higher good responder rate (88.2%) than those without (Group B, 17.2%). All limbs in Groups A1 and B1 (increased hip IR using personalized musculoskeletal models) had 100% favorable outcomes, whereas Groups A2 and B2 (not increased hip IR using personalized musculoskeletal models) showed favorable outcomes in 20% and 13.5%, respectively. Increased hip IR was more frequent in patients with external tibial rotation ($p < 0.05$). Surgical outcomes differed significantly between patients with and without increased hip IR in the personalized musculoskeletal model ($\chi^2 = 4.90$, $p = 0.027$).
Conclusion: Gait analysis using personalized musculoskeletal models improved surgical decision-making for FDO, leading to better outcomes in children with CP. Personalized musculoskeletal models better identified suitable FDO candidates and more accurately predict surgical outcomes than general models.
PMID: 41013781

12.Spatiotemporal Gait Variables and Step-to-Step Variability in Preschool-Aged Children Born Very Preterm at Risk for Developmental Coordination Disorder: A Cohort Study

Reem A Albesher, Jennifer L McGinley, Fiona L Dobson, Benjamin F Mentiplay, Tara L FitzGerald, Kate L Cameron, Jeanie L Y Cheong, Alicia J Spittle

Children (Basel). 2025 Sep 19;12(9):1261

Background/objective: The gait pattern of children born very preterm shows gait decrements compared to their full-term peers in dual-task walking. It is essential to identify children at a higher risk for these gait deficits. The aim of this study was to compare spatiotemporal gait variables in preschool-age children born very preterm at risk for developmental coordination disorder (DCD) with those not at risk.
Methods: Preschool-age children born < 30 weeks' gestation. Risk for DCD was defined as (i) ≤16th percentile on the Movement Assessment Battery for Children-Second Edition, (ii) ≥80 on the Wechsler Preschool and Primary Scale of Intelligence-Fourth Edition, and (iii) without cerebral palsy. Spatiotemporal gait variables and variability were assessed using GAITRite® during preferred speed, cognitive and motor dual-task, and tandem conditions. Variables included speed (cm/s), step time (s), cadence (steps/min), step length (cm), base of support (BOS; cm), and single and double support time (%gait cycle).
Results: Of 111 children who were assessed, 26 children were classified as at risk for DCD. Most gait variables were similar between groups at preferred speed walking. Children at risk for DCD had wider BOS and shorter single support time in motor dual-tasking (mean difference [MD] = 0.86 cm, 95% confidence interval [CI] 0.10, 1.61; MD = -1.77%, 95% CI -3.36, -0.19) compared to those not at risk. Similarly, wider BOS and higher cadence were found when tandem walking (MD = 0.63 cm, 95% CI 0.07, 1.20; MD = 0.63 steps/min, 95% CI 0.07, 1.20).
Conclusions: Children born very preterm at risk for DCD had poorer walking performance than those not at risk for DCD at preschool age, especially during dual-task situations. Clinicians may incorporate complex gait assessments into early evaluations to detect subtle impairments in children. Future research is needed to investigate the impact of gait variability on children's daily lives and participation in sports activities.
PMID: 41007126

13.Outcomes of Pediatric Orthopedic Management of Ambulatory Cerebral Palsy Utilizing a Closely Monitored, Lifespan-Guided Approach

Zhe Yuan, Nancy Lennon, Chris Church, Michael Wade Shrader, Freeman Miller

Children (Basel). 2025 Sep 17;12(9):1252

Background: Cerebral palsy (CP) is a static, non-progressive brain pathology that affects mobility and musculoskeletal health.
Objective: This review aims to describe the pediatric orthopedic management strategy at one specialty center with focus on optimal lifelong mobility function for ambulatory CP.
Methods: Beginning in the 1990s, a protocol was developed to proactively monitor children with surgical or conservative interventions. After three decades, we undertook a prospective institutional review, board-approved 25–45-year-old adults callback study. Inclusion criteria were all children treated through childhood who could be located and were willing to return for a full evaluation.
Results: Pediatric orthopedic interventions focused on regular surveillance with proactive treatment of progressive deformities. When function was impacted, we utilized multi-level orthopedic surgery guided by instrumented gait analysis. Childhood outcomes of this approach were evaluated through retrospective studies. Results show high correction rates were achieved for planovalgus foot deformity, knee flexion contracture, torsional malalignments, and stiff-knee gait. Our prospective adult callback study evaluated 136 adults with CP, gross motor function classification system levels I (21%), II (51%), III (22%), and IV (7%), with average ages of 16 ± 3 years (adolescent visit) compared with 29 ± 3 years (adult visit). Adults in the study had an average of 2.5 multi-level orthopedic surgery events and 10.4 surgical procedures. Compared with adults without disability, daily walking ability was lower in adults with CP. Adults with CP had limitations in physical function but no increased depression. A higher frequency of chronic pain compared with normal adults was present, but pain interference in daily life was not different. Adults demonstrated similar levels of education but higher rates of unemployment, caregiver needs, and utilization of Social Security disability insurance.
Conclusions: The experience from our center suggests that consistent, proactive musculoskeletal management at regular intervals during childhood and adolescence may help maintain in gait and mobility function from adolescence to young adulthood in individuals with CP.
PMID: 41007117

14.Fall experiences of ambulatory children and adults with cerebral palsy: A qualitative study using thematic content analysis

Dev Med Child Neurol. 2025 Sep 26. Online ahead of print
No abstract available
PMID: 41004606

15.Listening, learning, and (co-)leading: Addressing the experiences of falls among people with cerebral palsy across the lifespan

Dev Med Child Neurol. 2025 Sep 25. Online ahead of print
No abstract available
PMID: 40999825

16.Effect of Treadmill Gait Training Combined With Balance Exercises on Functional Mobility and Balance in Children With Cerebral Palsy: A Randomized Controlled Trial

Theofani Bania, Maria Sxiza

Pediatr Exerc Sci. 2025 Sep 24:1–6. Online ahead of print

Purpose: To investigate the effects of a gait training program on functional mobility and balance in children with cerebral palsy.
Methods: Twenty-two children 6–12 years old with spastic cerebral palsy (Gross Motor Function Classification System levels I–III) participated. They were randomly assigned to a gait training program or a control group. Both groups received neurodevelopmental treatment over a 12-week period. In addition, the intervention group received treadmill training combined with balance exercises. Walking speed, Gross Motor Function Measure dimension D and E, Pediatric Balance Scale, 1-minute walk test, and ankle range of motion were measured at baseline and at 12 weeks by a blind assessor. Data were analyzed with 2-way analysis of variance with 1 repeated factor (time) and 1 independent factor (group).
Results: The intervention group improved walking speed (10-m walk) by a mean of 7.4 units (95% CI, 1.6–16.4) and the Gross Motor Function Measure-E score by a mean of 16.8 units (95% CI, 3.9–29.7) compared with the control group. No other significant between-group differences were observed. Within-group statistically significant differences were observed primarily for the gait training group. No serious adverse events were reported.
Conclusion: A gait training program appeared to be beneficial for mobility-related outcomes in young children with cerebral palsy. Training focused on gait, and this was increased with less, if any, change in other outcomes, such as balance or range of motion.
PMID: 40992432

17.Anterior cingulate and its role in enhancing gait training outcomes in persons with cerebral palsy

Morgan T Busboom, Kimberley Scott, Brad Corr, Katie L Bemis, Liana S Chinen, Sarah E Baker, Yasra Arif, Tony W Wilson, Max J Kurz

Cereb Cortex. 2025 Sep 15;35(9):bhaf267

Abstract
Persons with cerebral palsy (CP) exhibit diminished somatosensory cortical activity and this has been linked with the extent of their muscular performance and mobility impairments. However, the influence of physical therapy paradigms on such diminished cortical activity remains unclear. The current study evaluated the extent of mobility changes and somatosensory cortical activity in persons with CP (n = 28; Age = 21.57 ± 7.1 yr; Gross Motor Function Classification Score levels I–III) following 8 weeks of a gait training protocol that involved exploratory activities that were directed at enhancing the somatosensory experience through rich/novel movement. A paired-pulse somatosensory paradigm during magnetoencephalography was used to assess the cortical changes after undergoing the physical therapy protocol. Consistent with the literature, the group with CP had weaker somatosensory cortical responses compared to the neurotypical controls. While the participants with CP demonstrated clinically relevant mobility improvements, there were no changes in the somatosensory cortical activity. However, there was a prominent increase in neural activity within the anterior cingulate. This implies that the novel gait training protocol used here may drive beneficial improvements in the ability of persons with CP to monitor their motor errors, attend to the available sensory feedback, and discriminate different sensory intensities during gait.
PMID: 40982481

18.Functional and Neurophysiological Changes After Activities-Based Locomotor Training in Children With Cerebral Palsy: Case Series

Megan B Flores, Elizabeth M Ardolino, Cierra B Ugale, Cory M Smith

Pediatr Phys Ther. 2025 Sep 17. Online ahead of print

Purpose: The purpose of this case series was to explore the feasibility and impact of a 3-week activities-based locomotor training (AB-LT) program on functional activities and neurophysiological adaptations in 5 children with cerebral palsy (CP).
Methods: Children, aged 2–6 years who were classified as Gross Motor Function Classification Scale levels III or IV, participated in the intervention 5 days per week for 3 hours per day. The Gross Motor Function Measure-66 (GMFM-66) and functional near-infrared spectroscopy neuroimaging were performed pre- and post-intervention.
Results: After AB-LT, increases in GMFM-66 scores were observed for Children 1 (Δ3.3), 2 (Δ5.6), 4 (Δ1.8), and 5 (Δ1.3), beyond expected natural progression. A reduction in total hemoglobin activation and increased neural demand was observed. Child 3 had minimal functional changes with no observed neurophysiological adaptations.
Conclusions: The 3-week AB-LT regimen is a short duration, high-intensity program with the potential to benefit children with CP.
PMID: 40982378

19.Transition Aged Individuals With Cerebral Palsy Have Larger Clinical Gains With Visual Performance Feedback During Power Training

Brad Corr, Heidi Reelfs, Michael Trevarrow, Sarah Baker, Max J Kurz

Arch Rehabil Res Clin Transl. 2025 May 9;7(3):100463. eCollection 2025 Sep

Objective: To evaluate if providing visual feedback (VFB) on the speed of the movement during a lower extremity power training treatment protocol results in greater clinical gains in transition aged individuals with cerebral palsy (CP).
Design: Nonrandomized controlled trial.
Setting: Academic medical center.
Participants: Twenty transition aged persons (N = 20) with CP (age range, 11–24y; Gross Motor Function Classification Score [GMFCS], I–IV).
Interventions: Twenty-four (8 weeks; 3 days/week) lower extremity power training sessions while receiving either VFB of their performance or no feedback (NFB) on their performance.
Main outcome measures: Bilateral leg press 1-repetition maximum (1RM), bilateral leg peak power production and walking speed reserve.
Results: The VFB group had greater lower extremity strength gains than the NFB group (P = .026). Additionally, the 1RM clinical gains were dependent on the baseline 1RM (P < .001). The VFB group also had greater lower extremity power production after power training (P = .009). The extent of the power production gains was partially dependent on the baseline power production (P < .001). The VFB group also had a larger walking speed reserve after the treatment (P = .039). However, the extent of the walking speed reserve gains was linked with an individual's GMFCS level (P < .001).
Conclusions: VFB during power training has the potential to result in larger clinical gains for transition aged individuals with CP. Individuals with higher GMFCS levels, lower muscular strength and muscular power at baseline might not demonstrate as large of gains after power training even when VFB is provided. Alternative treatment strategies should be considered for these cases. Nevertheless, our results convey that learning to perform fast lower extremity motor actions likely has clinically relevant benefits for transition aged individuals with CP.
PMID: 40980509

20.Integrating Inertial Sensors to Assess Physical Performance and In-Match Demands for the International Selection of Cerebral Palsy Football Players

Juan F Maggiolo, Raúl Reina, Manuel Moya-Ramón, Iván Peña-González

Sensors (Basel). 2025 Sep 17;25(18):5787

Abstract
This study analyzed the physical performance (via field tests) and in-match physical responses (via wearable inertial sensors) of national and international cerebral palsy (CP) football players competing in Spain's First Division. A total of 80 players (FT1: n = 22; FT2: n = 48; FT3: n = 10) completed sprinting, change of direction, and dribbling tests. In-match data from 74 players were collected across 56 official matches. Players were classified as "international" (candidates for the national team) or "national" (non-candidates). Statistical analyses identified performance differences and predictors of international selection using multiple discriminant analysis. International players outperformed national ones in sprinting, agility, and dribbling, especially in FT1 and FT2 classes ($p < 0.05$; large effect sizes). In-match data (analyzed for FT2 only) showed that international players covered more distance at all intensities and executed more high-intensity actions (e.g., maximal velocity, ball contacts). High-intensity running was the strongest predictor of international status (74.5%, Wilks' $\lambda = 0.86$, $p = 0.01$). Change of direction and dribbling were key discriminators in FT1 and FT2, while no clear predictor emerged in FT3. These findings support the use of physical tests and wearable technology for evidence-based talent identification and selection in CP football.
PMID: 41013025

21.Match vs. Training Physical Requirements and Their Association with Field-Based Physical Tests in International CP Football

Juan Francisco Maggiolo, Alejandro Caña-Pino, Manuel Moya-Ramón, Iván Peña-González

Sports (Basel). 2025 Sep 8;13(9):312

Objectives: This study aimed to (1) describe and compare the external physical requirements of international cerebral palsy (CP) football players during training sessions and official matches at the 2024 IFCPF World Cup, and (2) analyze the relationships between standardized field-based physical performance tests and the physical requirements recorded in both contexts.
Methods: Twelve international outfield players from the Spanish national CP football team were monitored throughout the tournament. Physical performance was evaluated two weeks prior using 5-m and 30-m sprints, a Modified Agility Test (MAT), a dribbling test, and the 30-15 Intermittent Fitness Test (vIFT). Match and training physical requirements were assessed using inertial devices, including total and relative distances, velocity metrics, and acceleration/deceleration outputs.
Results: Matches imposed significantly greater demands than training sessions in terms of peak velocity, total distance per minute, and distance at moderate (>12–18 km/h) and high (>18 km/h) intensities ($t = 2.79$ to 8.06; $p = 0.01$; ES(d) = 0.50 to 1.45). Training sessions exhibited greater variability in load while match requirements were consistent across games. Performance in the MAT and dribbling tests correlated with several physical indicators in both training and competition. In contrast, vIFT and sprint tests showed limited associations, especially with match variables.
Conclusions: Match play elicits higher and more stable physical requirements than training. The MAT and dribbling tests appear to be ecologically valid tools for assessing functional readiness in CP football. These findings support the integration of specific physical tests and tailored training designs to better replicate the competitive requirements of international CP football.
PMID: 41003618

22.Critically appraised papers: The Sustainable Model of Early Intervention and Telerehabilitation for Children with Cerebral Palsy (SMART-CP) results in earlier diagnosis and access to treatment compared with usual care [synopsis]

J Physiother. 2025 Sep 19. Online ahead of print
No abstract available
PMID: 40975626

23.A Survey of Oral Health-Related Quality of Life for Adults with Cerebral Palsy in Australia

Karen Lansdown, Kim Bulkeley, Margaret McGrath, Michelle Irving, Claudia Zagreanu, Hayley Smithers-Sheedy

Dent J (Basel). 2025 Sep 4;13(9):407

Objective: Our aim was to investigate the oral health-related quality of life (OHRQoL) and dental care experiences of adults with Cerebral Palsy (CP).
Methods: In 2023, adults with CP and their caregivers from four Australian states completed questionnaires, including the Oral Health Impact Profile-14 (OHIP-14). Non-parametric tests were conducted to analyze associations between demographic and CP-related variables and OHRQoL.
Results: A total of 69 respondents participated, including $n = 22$ adults with CP and $n = 47$ caregivers of adults with CP. Most adults with CP were diagnosed with a spastic motor type (46/69, 66%), with bilateral spasticity being the most common (30/46, 65%). The mean OHIP-14 score was 10.3 ± 9.3 (mean ± SD). Nearly 70% reported challenges cleaning their teeth, over 25% lacked a dentist, more than 60% found dental exams challenging, and nearly 50% required specialized dental care. In bivariate analysis, OHIP-14 was associated with daily oral care routines ($p = 0.012$) and "simple dental check-up" ($p = 0.017$). There was a statistically significant relationship between socio-economic status and scores for the handicap dimension ($p = 0.040$). Higher OHIP-14 scores were associated with greater levels of impairment regarding gross motor ($p = 0.199$), manual functioning limitations ($p = 0.001$), speech ($p = 0.123$), and communication function scales ($p = 0.319$).
Conclusion: Adults with CP reported challenges participating in and maintaining oral health and accessing dental care, influenced by physical, functional, and socio-economic factors. These findings indicate the need for inclusive care and strategies to support access to services.
PMID: 41002680

24.Letter to the Editor re Lower urinary tract symptoms in children with mild to moderate spastic cerebral palsy: Associations with functional level, trunk and respiratory parameters

J Pediatr Urol. 2025 Sep 12. Online ahead of print
No abstract available
PMID: 40998616

25.Beyond BMI: functional-level based nutritional and body composition assessment in children with cerebral palsy

Aslıhan Atar, Halime Pulat Demir, İrem Nur Şahin Anılgan, Hatice Kübra Aşık

Disabil Rehabil. 2025 Sep 25:1–13. Online ahead of print

Purpose: This cross-sectional study aimed to evaluate the nutritional status and body composition of children with CP by Gross Motor Function Classification System (GMFCS) levels and to examine the relationship between nutrient intake and anthropometric indicators.
Materials and methods: In this cross-sectional study, 25 children aged 1–18 years with CP underwent body composition assessment via bioelectrical impedance (InBody S10) and completed three-day food records analyzed using BeBiS software. Anthropometric z-scores were calculated based on WHO standards, and micronutrient adequacy was assessed using WHO Recommended Daily Allowances.
Results: Children in the GMFCS IV–V group had significantly lower fat-free mass, skeletal muscle mass, and body mineral content compared to those in GMFCS I–III ($p < 0.05$). Regarding dietary intake, children with GMFCS IV–V consumed significantly less energy ($p = 0.036$), protein ($p = 0.015$), and carbohydrates ($p = 0.028$). Micronutrient deficiencies were common, especially in calcium ($p = 0.035$), zinc ($p = 0.046$), vitamin B2 ($p = 0.044$). Magnesium intake showed positive correlations with anthropometric z-scores ($p < 0.05$).
Conclusion: Children with CP, particularly those with greater motor impairment, exhibit significant nutritional challenges. Standard measures like BMI may not adequately reflect their nutritional risk. A comprehensive assessment, including body composition and dietary intake, is essential to guide individualized, function-based nutritional strategies.
PMID: 40994251

26.Heart Rate Variability Responses in Children With Medical Complexity Across Sensory Domains

Cindy Dodds, Brooke Mulrenin, Carrie Cormack, Kimberly Kascak, Nia Mensah, Marianne Gellert-Jones, Keri Heilman, Mat Gregoski, Everette Keller, Jonathan Beall

Int J Pediatr. 2025 Sep 15:2025:5803653

Purpose: Heart rate variability (HRV) is a physiologic marker of autonomic nervous system (ANS) health. Because of multisystem impairments, children with medical complexity (CMC) can be challenging to evaluate and assess. They commonly display ANS dysfunction and subsequently reduced HRV. One purpose of this study was to report respiratory sinus arrhythmia (RSA) values derived from HRV, which may provide a reference and a future method to assess CMC and related treatments.
Methods: Then, 36 CMC between the ages of 5–21 years were assessed within school-based settings. All children demonstrated severe brain impairment, functional limitations, participatory restrictions in life, and high healthcare needs and utilization. A subset of 20 children with cerebral palsy (CP) was identified within the study sample. Each child was assessed by the same assessor for 5 days within a 10-day period. Using Firstbeat Bodyguard 2 monitors, cardiac data were collected prior to and during the administration of the newly developed Pediatric Assessment of Sensory Motor Awareness. CardioEdit and CardioBatch software were used to edit cardiac data and calculate RSA values. Descriptive, repeated measures, and modeling statistics were used to analyze data.
Results: Descriptive RSA values for baseline and across five sensory domains are reported for the total CMC group and its subsets of children with CP and non-CP. Significant differences in RSA values were noted for the gustatory domain as compared to baseline and other sensory domains. Significant differences from statistical modeling were demonstrated between the CP and non-CP groups.
Conclusions and Recommendations for Clinical Practice: This study's HRV findings provide preliminary reference RSA values in CMC. Then, 20 children considered to be CMC with primary diagnoses of CP experienced less autonomic dysfunction than other CMC diagnostic groups at baseline and across the five sensory domains. The gustatory domain significantly reduced RSA. Modeling across days indicated that CMC experience a learning effect by Day 3 or 4. The measurement of HRV may provide a method to assess health and behavioral responses in CMC and associated treatments. Replication of these study findings will be necessary.
PMID: 40988699

27.Parental perspectives on pain detection, assessment, and management in their highly dependent children with cerebral palsy: A cross-sectional study

Amy Solnica, Rony Schenker, Laura Rosenberg, Caryn Andrews, Barbara Medoff-Cooper, Rachel Yaffa Zisk-Rony

J Pediatr Nurs. 2025 Sep 22;85:517–523

Parents understand their children's pain, which is vital for effective management. Nurses play a significant role in providing parents with pain education. This study aimed to examine the practices and challenges that parents of highly dependent children with cerebral palsy (CP) face when managing pain at home.
Design: A cross-sectional study of ninety-eight parents of children, adolescents and young people with CP completed questionnaires exploring pain intensity, home management, and their knowledge and perceptions.
Results: Parents reported past moderate pain and mild present pain in their children (mean = 4.17 ± 2.8; 2.01 ± 2.79 out of 10, respectively). Parents exhibited moderate knowledge and misconceptions (mean = 27.5 ± 13.5 out of 64). Most utilized numerous non-pharmacological modalities (mean = 9.64 ± 3.7) and found them to be, at most, moderately effective (mean = 6.9 ± 3.2; 0–10). Almost all provided over-the-counter (OTC) analgesics (96%), and 25 offered prescription analgesics. A moderation model revealed that parents who received pain education were more likely to provide prescription analgesics (OR = 14, 95% CI 2.21–276.4), but only in parents of fully verbal children (p = 0.02).
Conclusions: Parents often utilize a multimodal approach to managing their children's pain at home; however, their children frequently remain in pain. This may stem from parental knowledge gaps regarding pain detection and management.
Implications for practice: Effective nursing practice involves a collaborative partnership that integrates parents' knowledge with nurses' specialized skills and current evidence-based practices. Such a partnership can ensure that parents receive reliable information, personalized education, and support to provide their children with CP pain relief measures tailored to their needs.
PMID: 40987116

28.Suvorexant for the treatment of sleep disorders in children with severe cerebral palsy

Reiko Koichihara, Kenjiro Kikuchi, Hirokazu Takeuchi, Yuko Hirata, Ryuki Matsuura, Shin-Ichiro Hamano, Akira Oka

Sleep Breath. 2025 Sep 23;29(5):292

Purpose: Sleep disturbances are frequent among children with severe cerebral palsy, leading to huge burden on caregivers. This study aimed to evaluate the efficacy and safety of suvorexant for treating sleep disorders in children.
Methods: Sixteen patients, aged 2–16, with sleep disorders were administered with suvorexant. Patient characteristics, efficacy, and safety of suvorexant were retrospectively investigated from patients' charts, and the Athens Insomnia Scale (AIS) scores surveyed by caregivers were compared before and after administering suvorexant.
Results: Suvorexant was effective in 13 of 16 patients (81%). Multiple sleep disturbance patterns were observed in all patients. Suvorexant was effective in 81% (n = 13/16) of sleep maintenance disorders, 77% (n = 10/13) of sleep onset disorders, 100% (n = 9/9) of early awakening disorders, and 91% (n = 10/11) of circadian rhythm sleep-wake disorders. The mean maintenance dose in effective cases was 0.3 mg/kg (IQR, 0.28–0.42). AIS scores revealed a significant decrease in all items and total scores, which decreased from a mean of 15.0 to 4.7. No major adverse events were observed.
Conclusions: Our results suggest that suvorexant is safe and provides sufficient improvement in insomnia and circadian rhythm disorders in children with severe cerebral palsy, leading to improved quality of life.
PMID: 40986206

29.Evaluation of Acetabular Defects in Children with Cerebral Palsy: A Comparative Analysis of CT Measurements and Radiographic Parameters

Domenic Grisch, Olivier Weber, Britta K Krautwurst, Franziska L Hatt, Michael Zellner, Christian von Deimling, Tobias Götschi, Bastian Sigrist, Thomas Dreher

Children (Basel). 2025 Sep 17;12(9):1254

Objectives: This retrospective study examines acetabular morphology and defects in children with cerebral palsy (CP). The study discovers the usefulness and reliability of a reconstructed 3D CT measurement technique and compares it to conventional radiographic measurements.
Methods: 33 subjects with CP who underwent hip reconstruction, including Dega osteotomy and varus derotation femoral osteotomy, were included and compared to an age-matched group of 42 typically developing children. We reproduced a three directional acetabular index (3DAI), including anterosuperior, superolateral and posterosuperior indices in CT analysis, and compared them with established radiographic measurements for the migration percentage (MP) and the acetabular index (AI).
Results: The results showed significantly higher 3DAI in every direction of wall deficiency, accentuating the methods sensitivity for acetabular dysplasia. The interrater and test-retest reliability were robust with ICC = 0.939–0.988 for the CP group. Conventional radiographic measurements demonstrated better discriminative power for identifying hip dislocation and correlated strongly with the 3DAI ($p < 0.001$).
Conclusions: The 3DAI method showcases an important addition to the conventional radiographic measurements by enabling a quantification of the defect amount and direction for operative planning. The study supports the potential of a 3D analysis in the improvement of diagnostic precision and suggests a continuous refinement of the CT measurement technique.
PMID: 41007119

30.Utilizing artificial intelligence to increase the readability of patient education materials in pediatric neurosurgery

Yahya Khan, Andrea Shehaj, Loui Othman, Elias Rizk

J Neurosurg Pediatr. 2025 Sep 26:1–6. Online ahead of print

Objective: This study investigates the potential of artificial intelligence (AI), specifically ChatGPT 4o, to revolutionize the readability of patient education materials in pediatric neurosurgery. The American Medical Association and the National Institutes of Health recommend that educational materials be written at a 3rd- to 7th-grade reading level for accessibility. However, existing resources often exceed this range, hindering comprehension for many patients.
Methods: This study analyzed 38 patient education materials on hydrocephalus, spina bifida, tethered cord syndrome, cerebral palsy, Chiari malformation, and craniosynostosis from 7 top-ranked US children's hospitals. The Flesch-Kincaid grade level calculator was used to assess readability before and after AI modification.
Results: ChatGPT effectively reduced the mean reading level from 10.60 (SD 0.57) to 6.18 (SD 0.28; $p < 0.05$), achieving the target 6th-grade level across all conditions.
Conclusions: Despite some limitations in maintaining word count and precise grade-level control, the results demonstrate the promising potential of AI in significantly enhancing the accessibility of pediatric neurosurgical education materials, which may lead to more inclusive patient communication and understanding.
PMID: 41004846

31.Gait phase recognition of children with cerebral palsy via deep learning based on IMU data from a soft ankle exoskeleton

Zhi Pang, Zewei Li, Ying Li, Bingshan Hu, Qiu Wang, Hongliu Yu, Wujing Cao

Front Bioeng Biotechnol. 2025 Sep 10;13:1679812

Abstract
Accurate gait-phase identification in children with Cerebral Palsy (CP) constitutes a pivotal prerequisite for evidence-based rehabilitation. Addressing the precise detection of gait disturbances under natural ambulation, we propose a deep-learning framework that integrates a stacked denoising autoencoder (SDA) with a long short-term memory network (SDA-LSTM) to classify four canonical gait phases. A community-oriented dataset was constructed by synchronizing ankle-mounted inertial measurement units (IMU) with plantar-pressure insoles; natural gait sequences of six children with mild CP were acquired in open environments. The SDA layer robustly extracts discriminative representations from non-stationary, high-noise signals, whereas the LSTM module models inter-phase temporal dependencies, thereby enhancing generalization cross-user. In noise-free conditions the SDA-LSTM framework attained 97.83% accuracy, significantly exceeding SVM (94.68%), random forest (96.05%), and standalone LSTM (95.86%). Under additive Gaussian noise with SNR ranging from 5 to 30 dB, the model preserved stable performance; at 10 dB SNR (Signal-to-Noise Ratio), accuracy remained 90.96%, corroborating its exceptional robustness. These findings demonstrate that SDA-LSTM effectively handles the complex, heterogeneous gait patterns of children with CP and is readily deployable for clinical assessment and exoskeletal assistance systems, indicating substantial translational potential.
PMID: 41000473

32.Effect of Adding Virtual Reality to Individualized Exercise Therapy on Gross Motor Function, Balance, and Functional Mobility in Children with Hemiparetic Cerebral Palsy: A Randomized Single-Blinded Controlled Trial

Ozge Yenilmez, Filiz Altug

Clin Pediatr (Phila). 2025 Sep 24. Online ahead of print

Abstract
The aim was to investigate the effect of adding virtual reality (VR) training to an individualized exercise therapy program in children with hemiparetic cerebral palsy (CP). Thirty-one children with hemiparetic CP were randomly allocated into 2 groups as experimental (n = 16) and control (n = 15). Experimental group received additional VR twice a week for 12 weeks. Gross motor function (Gross Motor Function Measure-66), balance (one leg standing), and functional mobility (timed up and go test) were evaluated. All parameters were improved in the experimental group (P < .05). In the control group, all parameters other than timed up and go test, and eyes closed one leg standing improved (P < .05). When the changes in the groups were compared, greater improvements were detected in the experimental group (P < .05). Adding VR training to the individualized exercise therapy program may have potential additional benefits for improving gross motor function, balance, and functional mobility in children with hemiparetic CP.
PMID: 40990847

33.Epidemiology of cerebral palsy in Malawi

Dev Med Child Neurol. 2025 Sep 26. Online ahead of print
No abstract available
PMID: 41004603

34.Factors associated with cerebral palsy among children in Hawassa University comprehensive specialized hospital: Case-control study

Bethelhem Bashe, Desalegn Dawit Assele, Worku Ketema, Mulugeta Sitot Shibeshi

PLoS One. 2025 Sep 26;20(9):e0333406

Background: Cerebral palsy is a frequent physical disability of childhood, causing motor impairment, sensory impairment, cognitive and behavioral issues, and secondary musculoskeletal deformities, with a global incidence of 1–4 per 1,000 children. It significantly impacts children's quality of life and imposes an economic burden on families and healthcare systems. There is limited evidence of the risk factors of cerebral palsy in Ethiopia, including in the study setting. We investigated factors associated with cerebral palsy among children attending Hawassa University Comprehensive Specialized Hospital.
Methods: An institution-based, unmatched case-control study was conducted among children who visited Hawassa University Comprehensive Specialized Hospital from January 2019 to December 2023. Consecutive cases were recruited until the required sample size was reached, and controls were randomly selected. Data were extracted from 80 cases and 160 control charts. Binary logistic regression analysis was used to identify risk factors for cerebral palsy. An adjusted odds ratio with a 95% confidence interval was reported to show the strength of the association. The significance of the association was declared at a p -value < 0.05. The goodness-of-fit model was checked by the Hosmer and Lemeshow test.
Results: A total of 240 participants (80 cases and 160 controls) were enrolled in the study. Maternal infection during pregnancy [AOR: 4.1; 95% CI: 1.39, 12.1], low birth weight [AOR: 4.1; 95% CI: 1.49, 11.2], prolonged labor [AOR: 3.2; 95% CI: 1.47, 7.00], history of perinatal asphyxia [AOR: 2.65; 95% CI: 1.06, 6.65], and central nervous system infection during infancy [AOR: 3.4; 95% CI: 1.21, 9.64] were risk factors for cerebral palsy.
Conclusion: Perinatal asphyxia, maternal infection, low birth weight, prolonged labor, and CNS infection during infancy are significantly associated with cerebral palsy. Public health education should promote awareness about cerebral palsy, encourage antenatal care, and educate healthcare professionals on emergency obstetrics and newborn care. Appropriate measures should be taken to reduce the incidence of CNS infections during infancy.
PMID: 41004435

35.Predicting neurodevelopmental outcomes in Australian First Nations infants: The transdiagnostic utility of early screening tools

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Dev Med Child Neurol. 2025 Sep 25. Online ahead of print

Aim: To determine the predictive relationship between evidence-based screening tools and neurodevelopmental outcomes in Australian First Nations infants.
Method: This prospective cohort study invited First Nations families to participate in a culturally adapted early developmental screening programme. A total of 156 infants (55.1% male, mean gestational age = 33.6 weeks, SD = 4.6) were screened using the Prechtl's General Movements Assessment, with optimality scoring using the Motor Optimality Score-Revised (MOS-R) at 3 to 5 months and the Hammersmith Infant Neurological Examination (HINE) at 4 to 9 months. Participants completed 'baby movement (BM) checks' at two time points (BM1, 3–5 months corrected age; BM2, 4–9 months corrected age), with final movement and learning checks at 12 months corrected age. At 12 months corrected age, standardized motor, cognitive, and communication assessments, neurodisability-specific symptomology, or a diagnosis made by a paediatrician classified infants as developing typically ('on track') or (1) with a high chance of or confirmed cerebral palsy (CP) or (2) non-CP neurodevelopmental delay (NDD), including autism and fetal alcohol spectrum disorder (FASD). Predictive relationships were investigated using logistic regression and diagnostic statistics.
Results: At 12 months, 127 of 147 (86%) eligible infants (n = 9 withdrawn or deceased) were classified as 'on track' (n = 55, 43%), NDD (n = 59, 47%), or CP (n = 13, 10%). MOS-R (≥ 14 weeks). The HINE distinguished infants as 'on track', CP, or NDD. Each 1-point decrease on both tools increased the odds of NDD (ORMOS-R = 1.40, 95% CI = 1.00–1.96; ORHINE = 1.12, 95% CI = 1.05–1.21) and CP (ORMOS-R = 1.47, 95% CI = 1.08–2.01; ORHINE = 1.41, 95% CI = 1.21–1.65). The MOS -R (cut-off of less than 23) and HINE (moderate to severely reduced) were best for identifying any NDD and CP (MOS-R: sensitivity = 84%, specificity = 38%; HINE: sensitivity = 64%, specificity = 63%). Combined trajectories across both tools were the strongest predictors of CP (sensitivity = 73%, specificity = 96%), autism (sensitivity = 59%, specificity = 95%), and FASD (sensitivity = 89%, specificity = 93%).
Interpretation: Evidence-based screening tools demonstrate promising transdiagnostic prediction of 'on-track' development and not only high chance of CP but also autism, FASD, and other NDDs.
PMID: 40999580

36.Characteristics of Cerebral Palsy in the Midwestern US

Susie Kim, Kelsey Steffen, Lauren Gottschalk-Henneberry, Jennifer Miros, Amy Robichaux-Viehoever, Karen Taca, Bhooma R Aravamuthan

Ann Clin Transl Neurol. 2025 Sep 23. Online ahead of print

Objective: Cerebral palsy (CP) is the most common lifelong motor disability worldwide. Yet, data is limited on how CP manifests in the US. Our objective was to characterize and determine factors affecting functional outcomes in a large population of young people with CP in the Midwestern US.
Methods: We integrated caregiver and clinician-facing standardized data entry into routine clinical care at a tertiary care CP center. We extracted this data for people with an ICD10 diagnosis of CP seen between March 22, 2023 and December 28, 2023 and used it to describe CP characteristics and determine factors affecting the odds of walking, oral feeding, and speech by Age 5.
Results: Of 686 unique individuals with an ICD10 diagnosis of CP, 663 (97%) had caregiver- and clinician-entered data, of whom 633 had a clinician-confirmed CP diagnosis (mean age 9.1, 53.4% Male, 78.5% White). It was common to have quadriplegia (47.0%), both spasticity and dystonia (40.7%), pain (36.6%), poor sleep (30.0%), anxiety (24.8%), walk independently (58.1%), eat food and drink safely by mouth (55.9%), produce understandable speech (42.6%), and/or require anti-seizure medications (42.3%). Cortical gray matter injury, initial critical care stay duration, and CP etiology affected the odds of walking, oral feeding, and speech (binary logistic regression, $p < 0.001$).
Interpretation: Noting that most population data on CP is from outside of the US, analysis of this detailed American dataset may help better inform prognostication and clinical screening for co-existing conditions in people with CP in the US.
PMID: 40985133

37.The Role of Cognitive Functioning in the ICF Framework: A Systematic Review of Its Influence on Activities and Participation and Environmental Factors in People with Cerebral Palsy

María Carracedo-Martín, Paula Moral-Salicrú, Montse Blasco, Marina Fernández-Andújar, Roser Pueyo, Júlia Ballester-Plané

J Clin Med. 2025 Sep 10;14(18):6393

Background/Objectives: Cerebral palsy (CP) is the most common cause of motor disability in childhood and is frequently associated with cognitive impairments that limit autonomy and participation. While motor function is a known predictor of functional outcomes, the specific contribution of cognitive domains within the International Classification of Functioning, Disability and Health (ICF) framework remains unexplored. This systematic review examines the relationship between cognitive domains and the ICF components of Activities and Participation, and Environmental Factors in people with CP.
Methods: Following PRISMA guidelines, a systematic search was conducted across six databases (PubMed, PsycINFO, CENTRAL, CINAHL, ERIC, and WOS) for studies published between 2002 and 2025. Eligible studies included participants with CP ($n = 3056$) and analyzed associations between cognitive functions and ICF domains using standardized tools and statistical methods. Risk of bias was evaluated using the Oxford Centre for Evidence-Based Medicine criteria.
Results: Forty-four studies met inclusion criteria, involving mostly children and adolescents with spastic CP and mild to moderate motor impairment. General intellectual functioning, language, and visual perception were the most studied domains, showing consistent associations with ICF chapters such as Learning and applying knowledge, Communication, and Mobility. Although fewer studies examined Environmental Factors, relevant associations emerged with support systems, attitudes, and services. Heterogeneity in assessment methods and participant profiles was observed, and adult representation was limited.
Conclusions: Cognitive functioning is significantly associated with multiple ICF domains in CP. Environmental Factors remain insufficiently addressed. Further research should consider CP heterogeneity and promote standardized assessments to support ICF-based intervention planning.
PMID: 41010596

38.Investigating Pediatricians' Practice, Knowledge, and Barriers in Diagnosing Cerebral Palsy

Vivian Wong, Stacey D Miller, Olivia Scoten, Mor Cohen-Eilig, Stephanie Glegg, Angie Ip, Chetna Jetha, Kishore Mulpuri, Maureen O'Donnell, Ram Mishaal

Children (Basel). 2025 Sep 22;12(9):1274

Background/Objectives: Data from the Canadian Cerebral Palsy (CP) Registry suggests that children in British Columbia (BC) are diagnosed, on average, at 25 months of age. This is much later than currently recommended. This study aimed to examine current practices and beliefs of pediatricians in the province related to CP and CP diagnosis.
Methods: All pediatricians and subspecialty pediatricians in the province were invited to participate in two consecutive online surveys. The initial survey aimed to assess current practice, knowledge of CP, and beliefs about diagnosis. The second survey, which was distributed to the same group of pediatricians, as well as pediatric neurologists and geneticists, aimed to re-assess current practice and identify specific barriers and facilitators to CP diagnosis.
Results: The two surveys were completed by 76 and 59 respondents, respectively. Less than 60% of general pediatricians, in both surveys, reported diagnosing children with CP. In survey 2, only 50% of respondents felt that pediatricians should provide a diagnosis of CP. Most general pediatricians (93%) identified that pediatricians, with support from a developmental pediatrician or neurologist, should provide a diagnosis. Common barriers to an early CP diagnosis included uncertainty about other potential diagnoses and uncertainty over diagnosing at a young age. Lack of access to education and therapists to help inform the diagnosis were also frequently identified barriers.
Conclusions: While general pediatricians are knowledgeable about CP, a significant proportion in those surveyed were not diagnosing CP, despite believing that early diagnosis is important. Findings from these surveys have identified that general pediatricians have gaps in knowledge, skills, and confidence in diagnosing CP. Support from a developmental pediatrician or neurology colleague was identified as a potential strategy to support earlier diagnosis.
PMID: 41007139

39.Application of the Gross Motor Function Measure in children with conditions other than cerebral palsy: A systematic review

Dev Med Child Neurol. 2025 Sep 26. Online ahead of print
No abstract available
PMID: 41004616

40.The E-words for promoting development and neuroplasticity for infants with or at high risk for cerebral palsy

Dev Med Child Neurol. 2025 Sep 26. Online ahead of print
No abstract avaliable
PMID: 41004430

41.Expanding Hereditary Spastic Paraplegias Limits: Biallelic SPAST Variants in Cerebral Palsy Mimics

Gregorio A Nolasco, Mònica Roldán, Yalda Jamshidi, Ioannis Georvasilis, Rocío Jadraque Rodríguez, Reza Boostani, Ali Shoeibi, Lluís Armengol, Anna Codina, Ehsan Ghayoor Karimiani, Cristina Hernando-Davalillo, Loreto Martorell, María Luisa Ramírez Almaraz, Jordi Muchart, Carlos Ortez, Andrés Nascimento, Roser Urreizti, Daniel Natera-de Benito, Mercedes Serrano

Ann Clin Transl Neurol. 2025 Sep 26. Online ahead of print

Objective: Hereditary spastic paraplegias (HSP) are rare neurodegenerative disorders marked by spasticity and lower limb weakness. The most common type, SPG4, is usually autosomal dominant and caused by SPAST gene variants, typically presenting as pure HSP. We describe five individuals from three unrelated families who meet the clinical criteria for cerebral palsy and carry biallelic SPAST variants. We aim to increase the clinical and genetic understanding of SPAST-related disorders and explore the underlying abnormal cellular mechanisms.
Methods: We performed comprehensive phenotyping and genetic analysis. In silico and functional studies were conducted using confocal microscopy on fibroblast cultures derived from carriers of the biallelic SPAST variants, a monoallelic SPAST variant, and a healthy control.
Results: Individuals exhibited early-onset complex HSP with a diverse range of encephalopathy severity, spasticity, and neuronoaxonal involvement, occasionally leading to the diagnosis of cerebral palsy. Whole-exome sequencing identified homozygous and compound heterozygous SPAST variants. Functional studies demonstrated reduced spastin and tubulin levels, mitochondrial fragmentation, and abnormal filopodia morphology in patient-derived fibroblasts, supporting the pathogenicity of the variants.
Interpretation: We provide the first evidence of biallelic inheritance in SPAST-related disorders, supported by functional analysis, expanding the clinical spectrum to include moderate-to-severe early-onset encephalopathy. Our findings emphasize the importance of genetic diagnosis in cerebral palsy for prognosis, counseling, and personalized therapy. The identified variants reveal the genetic complexity of SPAST-related disease and suggest a threshold effect of spastin levels in phenotypic variation. Cellular mechanisms such as mitochondrial dynamics and membrane morphology may contribute to pathogenesis and warrant further investigation.
PMID: 41000004

42.Assessment of quality of life in children with cerebral palsy: A parent-reported questionnaire-based study

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J Oral Biol Craniofac Res. 2025 Nov-Dec;15(6):1485–1489

Abstract
The quality of life (QoL) of children with cerebral palsy (CP) needs to be assessed using a CP-specific questionnaire, such as the CP-QoL questionnaire. This study was conducted to assess the QoL of children with CP using the CP-QoL questionnaire and correlate QoL scores with patient demographics. The caregivers of 155 children (3–15 years) attending the NITTE centre of AB Shetty Memorial Institute of Dental Sciences were enrolled in the study. The caregivers were given the Kannada translation of the parent-proxy version of the CP-QoL questionnaire. Analysis and scoring were carried out using the prescribed methodology. For validation, Cronbach's alpha was computed for every question. Analysis was done on the impact of demographic profile on QoL. A CP-QoL survey was given 155 caregivers of children with cerebral palsy (96 male and 61 female). The youngsters under study had an overall QoL score of 25.24 ± 6.14. The children's QoL was significantly impacted by age ($P < 0.05$). The QoL was not substantially impacted by gender ($P > 0.05$). Overall, reliability and internal consistency were determined to be good (Alpha Cronbach's > 0.7). Children with CP have a lower quality of life as assessed using the CP-QoL questionnaire.
PMID: 40995585

43.Estimating QALYs in adults with cerebral palsy: mapping the San Martin scale to the EQ-5D-5L for economic evaluation

Diana Marcela Nova Díaz, Aritz Adin, Eduardo Sánchez-Iriso

Eur J Health Econ. 2025 Sep 24. Online ahead of print

Background: Responses on health-related quality of life measured by disease-specific instruments can be mapped onto the EQ-5D to estimate utility values for economic evaluation. San Martin´s Quality of Life Scale (St. MQoL-S) is a preferred measure to obtain health outcomes in adults with cerebral palsy. Nevertheless, it lacks a preference-based health utility score for estimating quality-adjusted life years (QALYs).
Objective: To develop algorithms for mapping from the St. MQoL-S to allow future prediction of the EQ-5D-5L, in adults with cerebral palsy, when utility data have not been collected.
Methods: Direct mapping models were developed using ordinary least squares, a generalized linear model, and Tobit regression analysis to estimate EQ-5D-5L utilities, with St. MQoL-S total and domain scores as explanatory variables, in a cross-sectional study of adults with cerebral palsy in Spain. Goodness-of-fit was assessed using mean absolute error (MAE) and root mean square error (RMSE). Repeated k-fold cross-validation was employed to select the optimal mapping model demonstrating superior predictive performance.
Results: The best-performing model for predicting EQ-5D-5L utilities includes the St. MQoL-S total scores, age, gender, and types of cerebral palsy as explanatory variables in a stepwise ordinary least squares regression, making it the most robust model for use as a mapping algorithm with external data.
Conclusion: This is the first study to present mapping algorithms between the St. MQoL-S and EQ-5D-5L. The mapping functions preferred in this study seem adequate for estimating the utilities of the EQ-5D-5L for economic evaluation and to obtain QALYs in adults with cerebral palsy.
PMID: 40991164

44.Proteome-wide Mendelian randomization and colocalization analysis identify CD5 as a plasma protein associated with cerebral palsy

Chao Bai, Mingbo Hu, Hong Zhao, Jingxuan Xu, Junjie Wu, Xinping Luan, Song-Hai Biedelehan

Medicine (Baltimore). 2025 Sep 19;104(38):e44693

Abstract
Cerebral palsy (CP), a neurodevelopmental disorder in children, remains incompletely understood, particularly regarding its etiology. The proteome offers potential therapeutic targets for a range of neurodevelopmental conditions. This investigation sought to explore the causal relationship between plasma proteins and CP risk through genome-wide Mendelian randomization (MR). Genetic instruments for 2923 plasma proteins were derived from extensive proteomic studies. Data on CP were obtained from publicly accessible datasets. Proteome-wide MR and colocalization analyses were employed to explore the causal impact of circulating proteins on CP. Protein-protein interaction and druggability assessments were performed to prioritize candidate therapeutic targets. Additionally, systematic MR analyses of healthy lifestyle factors and CP-associated proteins were executed to ascertain proteins that could serve as targets for intervention via lifestyle modifications. Genetically determined circulating levels of the plasma protein CD5 demonstrated significant associations with CP risk. Among the identified drug targets, baclofen has been used in the treatment of spastic CP, and CD5 levels can be modulated through healthy lifestyle interventions. This study identified CD5 as a circulating protein biomarker with strong causal evidence linking it to CP risk and highlighted it as a potential target for both pharmaceutical and lifestyle interventions, providing fresh perspectives on the mechanisms, prophylaxis, and management of CP.
PMID: 40988181

45.Occlusal features in individuals with cerebral palsy: a systematic review and meta-analysis

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Eur J Orthod. 2025 Sep 17;47(5):cjaf070

Background: Cerebral palsy (CP) results from developmental abnormalities or brain lesions that impair movement, posture, and motor function, thereby affecting skeletal development, including craniofacial structures.
Objectives: This study aimed to evaluate occlusal characteristics in individuals with and without CP.
Search methods: This systematic review followed Meta-Analysis of Observational Studies in Epidemiology guidelines. A comprehensive search was conducted in Embase, PubMed, Web of Science, Ovid, and Scopus, with additional screening of Google Scholar and OpenGrey.
Selection criteria: Observational studies were included, and the risk of bias was assessed using Newcastle-Ottawa Scale.
Data collection and analysis: Meta-analyses were performed to estimate odds ratios (ORs) with 95% confidence intervals (CIs) and prediction intervals. The GRADE approach was used to evaluate the certainty of the evidence.
Results: Of the 584 records identified, 24 cross-sectional studies met the inclusion criteria. Risk-of-bias assessment revealed concerns related to exposure appraisal, nonrespondent characterization, and study comparability. The meta-analysis indicated that individuals with CP had a higher likelihood of Class II malocclusion (OR = 2.56, 95% CI: 1.49–4.38, k = 18) and open bite (OR = 4.27, 95% CI: 1.95–9.37, k = 9).
Conclusions: Individuals with CP are at increased risk of developing Class II malocclusion and open bite, possibly due to neuromuscular dysfunctions and extrinsic factors. Effective management requires a multidisciplinary approach that addresses both biological and behavioral determinants.
PMID: 40985880

46.Families' perspectives of transitioning young adults with cerebral palsy to independent living

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Disabil Rehabil. 2025 Sep 23:1–16. Online ahead of print

Purpose: Adolescents and Young Adults (AYAs) with cerebral palsy (CP) face health and social inequities when transitioning to independent living. This study aimed to (1) understand the meaning of the transition to independent living for family members, and (2) identify barriers and enablers within family, community and service systems that may impact on this transition.
Materials and methods: Exploratory research design. Family members of AYAs with CP were surveyed through two health services. Responses were analysed using reflexive thematic and inductive content analysis and descriptive statistics.
Results: Thirty-two family members of 31 AYAs with CP took part in the study. Four themes were identified in relation to the meaning of the transition to independent living: (1) the opportunity for AYAs to experience adult life, (2) freedom for all parties, (3) uncertainty and worry about safely transferring care, and (4) future planning for ageing family members. Six themes related to barriers and enablers were: AYAs health and wellbeing; proximity to the AYA; navigating complex service systems; timely access to funding and equipment; finding suitable accommodation; and confidence in care quality.
Conclusions: Findings provide insights for health and disability services supporting AYAs and families transitioning to independent living.
PMID: 40985458

47.Evaluating the Causal Effects of Serum and Cerebrospinal Fluid Metabolites on Cerebral Palsy: A Whole-Metabolome Mendelian Randomization Study

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Brain Behav. 2025 Sep;15(9):e70864

Purpose: This study aimed to investigate the causal relationships between serum and cerebrospinal fluid (CSF) metabolites and cerebral palsy (CP) risk, leveraging genetic insights to identify potential biomarkers and metabolic pathways implicated in CP pathogenesis.
Method: A two-sample Mendelian randomization (MR) approach was employed to analyze 1400 serum metabolites and 338 CSF metabolites. Genetic variants associated with metabolite levels were used as instrumental variables (IVs) to infer causal effects on CP risk.
Findings serum metabolites: Sixty-nine metabolites showed significant associations with CP risk, including 1-(1-enyl-stearoyl)-2-linoleoyl-GPE (protective effect: OR = 0.84, p = 0.001) and 1,2-dipalmitoyl-GPC (risk effect: OR = 1.12, p = 0.003).
CSF metabolites: Thirteen metabolites were significantly linked to CP, most notably 1-palmitoyl-2-palmitoleoyl-GPC (OR = 0.57, p = 0.001).
Shared biomarker: Methionine sulfone exhibited protective effects in both serum and CSF.
Pathway analysis: Glyoxylate/dicarboxylate metabolism and butyrate metabolism emerged as key pathways potentially influencing CP pathogenesis.
Conclusion: This MR study provides novel evidence supporting the causal role of serum and CSF metabolites in CP, highlighting methionine sulfone and specific metabolic pathways as biologically significant factors. Although limitations such as sample size constraints and lack of experimental validation warrant caution, these findings underscore the therapeutic potential of targeting metabolic pathways in CP.
PMID: 40976972

48.Umbrella Review and Meta-Analysis: Screening Tools for the Identification of Developmental Delay in Early Childhood

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J Am Acad Child Adolesc Psychiatry. 2025 Sep 18. Online ahead of print

Objective: This systematic review and meta-analysis aimed to identify the range of developmental screening tools used globally and assess their pooled accuracy in identifying developmental delay among children aged 0 to 6 years.
Method: PubMed, MEDLINE, PsycINFO, and Google Scholar were searched up to March 2025, with no language restrictions. Systematic or scoping reviews published within the last 10 years were included if they reported any information on the accuracy of a screening tool designed to identify delay in >2 domains. Meta-analyses were conducted to pool estimates of sensitivity, specificity, and area under the curve (AUC). Certainty of evidence for each tool was assessed using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach. Quality was assessed using A MeaSurement Tool to Assess systematic Reviews (AMSTAR 2) tool.
Results: Thirteen reviews reporting on 38 distinct tools were identified. Nine tools had sufficient data for meta-analysis, of which only the Ages and Stages Questionnaire (ASQ), Parents' Evaluations of Developmental Status (PEDS), and Denver Developmental Screening Test (DDST) were informed by more than two independent samples. While most tools demonstrated good discriminative ability (AUC 0.66–0.89), the majority failed to meet minimal accepted thresholds for both sensitivity (0.8) and specificity (0.8). Wide confidence intervals and high heterogeneity were observed for most tools across both estimates.
Conclusion: None of the currently available screening tools demonstrate sufficient accuracy for clinical use or population screening, underscoring the need for more nuanced implementation strategies that account for the known limitations of accuracy.
PMID: 40975434

Prevention and Cure

49.Comparative analysis of magnesium sulfate and atosiban in fetal neuroprotection during high-risk pregnancies

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Pak J Pharm Sci. 2025 Sep-Oct;38(5):1685–1693

Abstract
Preterm births could increase the risk of neonatal conditions like cerebral palsy and neurodevelopmental delays. This trial aimed to evaluate the efficacy of magnesium sulfate and atosiban in providing neuroprotection to preterm infants. A clinical trial was conducted between 2020 and 2024, involving 102 high-risk pregnant women at multiple tertiary clinics in China. We studied the neonatal neurodevelopmental delay at 6 months and 12 months whilst also focusing on factors such as maternal side effects, gestational age, mode of delivery, and Neonatal Intensive Care Unit (NICU) admission rates. Unlike magnesium sulfate, Atosiban could reduce the fetus' breathing problems that can, in turn, lead to baby brain protection. It also has fewer maternal side effects, such as nausea and hypertension ($p = 0.03$). Magnesium sulfate had comparably higher risks of maternal and fetal complications, 49.02% and 68.63% respectively. This study's results suggest that while atosiban is not a commonly used intervention, it is a promising agent for fetal neuroprotection. It is also observed that considering maternal safety, it has fewer side effects. Future larger population studies should be carried out to corroborate the results for higher efficient and safer intervention for fetal neuroprotection.
PMID: 40996184

50.Caffeine to improve neurodevelopmental outcomes in infants born late preterm (The Latte Trial): study protocol for a randomised controlled trial

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Trials. 2025 Sep 24;26(1):346

Background: Late preterm infants (34+0 to 36+6 weeks' gestation) account for 7% of births in well-resourced nations. In Aotearoa New Zealand, Māori (Indigenous peoples) make up 20% of late preterm births. Late preterm infants are at higher risk of adverse outcomes, including mortality, cerebral palsy and cognitive impairment. Yet, there has been little focus on prophylactic interventions to address these risks. Late preterm infants have more frequent episodes of intermittent hypoxaemia than term infants in the first few postnatal weeks. Caffeine citrate, a routine intervention for apnoea of prematurity in extremely preterm infants, improves long-term neurodevelopmental outcomes in very low birth weight infants and reduces the incidence of intermittent hypoxaemia in late preterm infants. The Latte Trial aims to determine whether prophylactic caffeine citrate given to late preterm infants from birth to term corrected age improves neurodevelopmental outcomes.
Methods: This phase III multi-centre, parallel two-arm, double-blind, placebo-controlled randomised superiority trial will randomise 478 late preterm infants or twin pairs to receive caffeine citrate (loading dose 40 mg/kg, then 20 mg/kg daily) or placebo until 40+0 weeks' postmenstrual age. There is an intentional focus on the recruitment of infants of Māori ethnicity to aspire to Mana Whakamārama (equal explanatory power for the Māori population) given their over-representation in late preterm births. Randomisation will be stratified by centre, gestation at birth (34, 35 or 36 completed weeks) and ethnicity (Māori or non-Māori). The primary outcome is the Bayley Scales of Infant Development 4th Edition cognitive score at 2.5 years' corrected age. Primary analysis will be performed on a modified intention-to-treat basis, comparing outcomes between intervention groups using generalised mixed models with adjustment for stratification, potential confounding by socio-economic status and sex, and non-independence of multiples (random effect).
Discussion: Of early developmental domains, cognition is the most predictive of later neurodevelopmental outcome and intelligence quotient. Prioritisation of the Indigenous population within trials is important. If prophylactic caffeine citrate is found to improve neurodevelopment in late preterm infants, this could have a significant impact on the long-term quality of life and health and wellbeing of this large population of infants.
Trial registration: ANZCTR ACTRN12622001344785. Registered on 19 October 2022.
PMID: 40993821

51.[Optimization of intensive therapy in neonatal hypoxic-ischemic encephalopathy]

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Orv Hetil. 2025 Sep 21;166(38):1483–1489

Abstract
Hypoxic-ischemic encephalopathy (HIE) due to perinatal asphyxia is a well-recognized clinical condition, marked by a relatively high early mortality rate (5–10%) and frequent late neurological complications (40%), including cerebral palsy, cognitive impairment, and learning difficulties in school-aged children in the Western world. Current guidelines recommend whole-body therapeutic hypothermia as a neuroprotective treatment for all neonates with moderate to severe HIE. While this intervention has improved outcomes, several critical aspects remain unresolved, making HIE a key focus of ongoing clinical research. This review gives a summary of our recent clinical studies conducted in this subject. These studies, focused on neonates with moderate to severe HIE, aimed to optimize intensive care in three key areas: (1) the feasibility and safety of controlled active hypothermia during transport; (2) the association between therapeutic hypothermia and hypocapnia, challenges in respiratory management, and the potential role of inhaled CO_2 in enhancing neuroprotection; (3) hemodynamic instability, hypotension, relative adrenal insufficiency, and the therapeutic role of hydrocortisone.
PMID: 40986386

52.Long-Term Neurodevelopmental Outcomes at 5 Years in Preterm Infants Born <27 Weeks' Gestational Age following Preterm Premature Rupture of Membranes

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Am J Perinatol. 2025 Sep 22. Online ahead of print

Abstract
This study aimed to determine the association between preterm premature rupture of membranes (PPROM) and neurodevelopmental outcomes at 5 years of age in infants born before 27 weeks of gestation. Infants born before 27 weeks of gestational age (GA) between 2005 to 2014 and 2017 to 2018 and evaluated at the neonatal follow-up clinic at age 5 years were included. Outcomes were assessed based on abnormal muscle tone, hearing and vision assessments, and cognitive assessment on standardized testing. Perinatal/neonatal characteristics and outcomes were compared between the PPROM (ruptured membranes >1 hour prior to onset of contractions) and No PPROM groups using univariate tests and multivariable regression models. The primary outcome was a composite of death or neurodevelopmental impairment (NDI) at 5 years of age. NDI was considered present if a child had any of cerebral palsy, full-scale intelligence quotient >1 standard deviation below the mean, sensorineural hearing loss, or corrected visual acuity < 20/60 in the better eye. A total of 566 eligible infants were followed up in our regional follow-up clinic at 5 years of age. A total of 226 (40%) were in the PPROM group and 340 (60%) were in the No PPROM group. Infants in the PPROM and No PPROM groups had mean birth weights of 758 (±141) and 740 (±159) grams, respectively, and a median GA of 25 (range: 22–26) weeks for both groups. After adjusting for confounders, the odds ratio of death or NDI in the PPROM group were 1.14 (95% confidence interval: 0.82–1.58). The study also provided comprehensive evaluations of the primary and secondary outcomes through propensity score-matched analyses.
Conclusion: Our study suggests that PPROM may not be associated with an increased risk of a composite outcome of death or NDI at 5 years of age in preterm infants born before 27 weeks of GA.
PMID: 40983094

53.The proportion of birth asphyxia associated with maternal heart rate artifact during electronic fetal monitoring in labor

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J Obstet Gynaecol Can. 2025 Sep 18. Online ahead of print

Objective: To estimate the proportion of birth asphyxia cases associated with delay in delivery (DD) due to maternal heart rate artifact (MHRA).
Methods: Retrospective review of Canadian Medical Protective Association closed medico-legal cases of birth asphyxia from 2011–2020 in term labor, leading to hypoxic ischemic encephalopathy, cerebral palsy or stillbirth. The final two hours of electronic fetal monitoring (EFM) were analyzed in 10-minute time epochs by three independent experts using a template for evidence of MHRA judged to have resulted in DD. Records were also assessed for EFM classification, documentation of maternal pulse / MHRA and labor factors.
Results: Thirty-four cases of birth asphyxia were identified. Thirteen cases (38%) were found to have DD due to MHRA of which 9 (69%) were in the second stage of labor. The average estimated DD was 44.2 minutes ±21.9. There was a lower proportion of time epochs with abnormal EFM in the 13 cases with DD versus 21 cases without DD [14.7% vs. 47.3%, OR 0.19 (0.11–0.33), $P < 0.002$]. Conversely, there was a higher proportion of MHRA [62.9% vs. 5.4%, OR 29.8 (15.5–57.3), $P = 0.002$]. The maternal pulse was documented in 34% vs. 30% respectively. Chart review revealed no recognition by the caregivers of the occurrence of MHRA.
Conclusion: Unrecognized MHRA resulting in a falsely reassuring fetal heart rate, mainly in the active second stage, led to DD in more than one third of birth asphyxia cases. These outcomes may be preventable by education and the routine use of technologies to detect MHRA.
PMID: 40975394