Cerebral palsy research news

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CP Alliance Chair of Cerebral Palsy Research

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Interventions and Management

1.An instrumented approach to quantify wrist and finger flexor spasticity: A study protocol

Anna Pennekamp, Ursula Trinler, Julia Janine Glaser, Mirjam Thielen

PLoS One . 2025 Jul 31;20(7):e0328528. doi: 10.1371/journal.pone.0328528. eCollection 2025.

Abstract
Spasticity in the upper limb is a common condition observed in individuals with Cerebral Palsy, post-stroke or following traumatic brain injury. Affected patients present with significant functional and care challenges. Advances in both conservative and surgical treatments necessitate improved assessment tools. This study aims to develop and validate an instrumented measurement procedure combining 3D motion analysis, surface electromyography (sEMG), and musculoskeletal modeling to assess wrist and finger spasticity and function. The goal is to create a preoperative assessment tool for surgical strategy determination and a postoperative outcome measurement. We hypothesize that this combination of technologies will offer superior assessment accuracy compared to traditional methods and provide predictive insights into therapeutical outcomes.
PMID: 40743233

2.The effectiveness of modified constraint-induced movement therapy on upper limb function in children with cerebral palsy: a systematic review and meta-analysis

Haiyan Wang, Jilan Zhou, Xiaojing Shan, Li Zhang

BMC Sports Sci Med Rehabil . 2025 Jul 23;17(1):211. doi: 10.1186/s13102-025-01259-3.

Objective: Modified constraint-induced movement therapy (m-CIMT) has been increasingly employed in the rehabilitation of upper limb function in children with cerebral palsy (CP). However, its effectiveness remains inconclusive. This study aimed to evaluate the therapeutic impact of m-CIMT on upper limb function in children with CP.
Methods: A systematic search was performed across six electronic databases-China National Knowledge Infrastructure (CNKI), Wanfang, PubMed, Web of Science, the Cochrane Library, and Embase-from their inception to May 6, 2025. Only randomized controlled trials (RCTs) examining the effects of m-CIMT on upper limb function in children with CP were included. All outcomes related to upper limb function-regardless of the specific measurement tools used-were treated as indicators of the same functional improvement goal, and modeled using a three-level meta-analytic approach, which accounts for sampling variance, within-study variance, and between-study variance. The study design was specified in this section to avoid redundancy in the objective. The Cochrane Risk of Bias 2.0 (RoB 2.0) tool was used to assess methodological quality, and the GRADE approach was employed to evaluate the certainty of the evidence. Data synthesis was conducted using the metafor package in R, generating forest plots, funnel plots, and conducting sensitivity analyses, subgroup analyses, and Egger's test for publication bias.
Results: A total of ten studies met the inclusion criteria. The overall risk of bias was low for most outcomes, with eleven outcomes rated as low risk across all assessed domains. A few outcomes were rated as having some concerns or high risk, primarily due to unblinded subjective outcome reporting. The meta-analysis indicated that m-CIMT may have a positive effect on upper limb function in children with CP ($g = 0.58$, 95% CI [0.02, 1.14], $P = 0.043$; 95% PI [- 1.17, 2.33]). However, evidence of publication bias was detected ($t = 5.58$, $P < 0.001$), and the overall quality of evidence was rated as very low. Subgroup analysis revealed that the "type of constraint used" significantly moderated the intervention effect ($F(2, 51) = 3.69$, $P = 0.032$).
Conclusion: Based on the current evidence, m-CIMT may improve upper limb function in children with CP, but due to the very low certainty of evidence and potential publication bias, these findings should be interpreted with caution. Further high-quality randomized controlled trials with standardized protocols and longer follow-up are needed. Future research should also focus on individualized treatment approaches to support the implementation of m-CIMT as an evidence-based precision rehabilitation strategy.
PMID: 40702515

3.An Orthopedic Perspective on the Management of Spasticity

Mary Lou, Ashley Knebel, Jacob Eberson, Craig P Eberson

Review R I Med J (2013) . 2025 Aug 1;108(8):32-37.

Abstract
Neurologic conditions such as brain injuries, cerebral palsy, stroke and multiple sclerosis involve injury of upper motor neurons, which can manifest as spasticity. The resulting hypertonicity and imbalance of forces between muscle groups leads to deformities that impair patient function and can cause significant long-term complications. Symptoms of spasticity can be managed with nonoperative techniques such as physiotherapy, bracing, or medications. Other approaches such as intrathecal baclofen pumps and selective dorsal rhizotomy have also demonstrated efficacy in controlling spasticity. Spasticity that has failed nonoperative management can be treated with orthopedic surgeries that correct deformities by either restoring joint anatomy or re-balancing the forces of spastic muscle groups. Improved mobility and reduced pain after these procedures can help patients with their rehabilitation, function, and independence.
PMID: 40720685

4.Novel Intradural Endoscopic Lumbosacral Ventral-Dorsal Rhizotomy: A Technical Note With Operative Video

Dominick C Richards, Dillan Prasad, Robin Trierweiler, Kaitlin Rourke, Elizabeth Berton, Benjamin Katholi, Jeffrey S Raskin

Oper Neurosurg . 2025 Jul 22. doi: 10.1227/ons.0000000000001717. Online ahead of print.

Background and importance: Movement disorders in children, particularly medically refractory hypertonia caused by cerebral palsy, often require surgical intervention. Lumbosacral ventral-dorsal rhizotomy (VDR), which includes sectioning both ventral and dorsal nerve roots, is a viable treatment for dyskinesias like dystonia. However, severe scoliotic spinal rotation can make traditional open rhizotomy and other minimal access approaches technically impractical. We report the first endoscopic VDR, offering a minimal access and non-destabilizing alternative for patients with severe spinal rotation.
Clinical presentation: We present a 21-year-old nonambulatory male with spastic, dystonic cerebral palsy, neuromuscular rotatory kyphoscoliosis, and spinal fusion who was nonrespondent to intrathecal baclofen bolus test dose of 100 µg. Severe spinal rotation and a large fusion mass made open and radiofrequency ablation approaches infeasible; we performed a 233-minute endoscopic VDR using flexible neuroendoscopy, mechanical nerve stimulation with free running electromyography, fluoroscopy, and bugbee electrocautery. Lessons learned include visualization, root selection, and extent of ablation. Postoperative modified Ashworth Scale was reduced to 0 in all muscle groups, and physical examination video shows improved sitting position with neutral spinal alignment and enhanced sitting balance.
Conclusion: This first-ever endoscopic VDR demonstrates a safe and effective tone reduction methodology for patients without alternative surgical options. We are encouraged by these results and hope that this operative technique may be expanded through continued surgical innovation.
PMID: 40693784

5.Towards universal early screening for cerebral palsy: a roadmap for automated General Movements Assessment

Alicia J Spittle, Peter B Marschik, Lars Adde, Nadia Badawi, Rachel Byrne, Arend F Bos, Alain Chatelin, John Coughlan, Francesca Fedeli, Andrea Guzzetta, Edmond S L Ho, Michelle J Johnson, Amanda Kwong, Alistair McEwan, Catherine Morgan, Anderson Mughogho, Deirdre M Murray, Silvia Orlandi, Colleen Peyton, Laura A Prosser, Anina Ritterband-Rosenbaum, Truyen Tran, Dajie Zhang, Elyse Passmore

Review EClinicalMedicine . 2025 Jul 22:86:103379. doi: 10.1016/j.eclinm.2025.103379. eCollection 2025 Aug.

Abstract
Cerebral palsy (CP) is the most common lifelong physical disability, affecting millions globally. Early detection and intervention are crucial for improving outcomes, yet many children are diagnosed late. The General Movements Assessment (GMA) is a highly accurate clinical tool for detecting infants at high probability of CP, but access to health professionals trained in the GMA limits its use. Artificial intelligence (AI) has the potential to automate the GMA, increasing accessibility worldwide. We established an interdisciplinary, international consortium for the purpose of developing a roadmap for the ongoing development and implementation of an AI-enabled GMA system for universal CP screening worldwide. The consortium included clinicians (children neurologists, paediatricians, neonatologists, allied health), researchers, engineers, computer scientists, legal experts, and individuals with lived experience, from around the globe (across Africa, Australia, Europe, and North America). The roadmap identifies the following steps and key requirements within: (1) development of standards for AI validation; (2) development of AI-GMA from large and diverse validation sets; (3) development of software tools and clinical pathways; (4) regulatory requisites; and (5) implementation. With the roadmap, AI-enabled screening for CP incorporating state-of-the-art technology can be made possible. Future work will require international collaboration to allow for scaling of data sets, refining automated solutions and translation into practice.
Funding: Cerebral Palsy Foundation, Cerebral Palsy Alliance, European Union Born to Get There, the National Health and Medical Research Council.
PMID: 40735348

6.An Animal-Assisted Physiotherapy Intervention with a Rehabilitation Dog for Walking and Balance Training: A Case Series of Children Living with Cerebral Palsy

Valerie Caron, Alison Oates, Romany Pinto, Joel L Lanovaz, Colleen A Dell, Sarah Oosman, Sarah J Donkers

NeuroRehabilitation . 2025 Jul 28:10538135251353467. doi: 10.1177/10538135251353467. Online ahead of print.

Abstract
Purpose Physiotherapy (PT) is an essential part of care for improving function and increasing community participation in children with cerebral palsy (CP). Combining animal-assisted intervention (AAI) with PT (AA-PT) offers a unique approach, potentially boosting motivation and participation in ambulatory children with CP. This case series piloted AA-PT integrating a rehabilitation dog for children with CP, to enhance walking and balance training. Methods Four ambulatory children with CP (7-16 y.o.a, GMFCS I-II, 3 girls, 1 boy) participated in an 8-week individualized AA-PT intervention. Assessments at baseline (0 weeks), pre-intervention (8 weeks), post-intervention (16 weeks), and follow-up (24 weeks) included Kids Mini BESTest, timed up and go (TUG), dual task cost (DTC), and spatiotemporal parameters. The AA-PT included weekly 60-min sessions integrating a rehabilitation dog in walking and balance training. Visual analog scales (VAS) assessed perceived comfort, safety, enjoyment, and confidence while walking with and without the rehabilitation dog. Results Individual-responder analysis showed improvements in Kids Mini BESTest scores, reduced DTC, and increased walking speed for all. Children reported higher enjoyment, confidence, safety, and comfort when walking with the rehabilitation dog. Conclusion AA-PT integrating a rehabilitation dog may enhance balance, dual-task cost, walking speed, and confidence in ambulatory children with CP.
PMID: 40725987

7.Function and Health in Adults with Dyskinetic Cerebral Palsy-A Follow-Up Study

Kate Himmelmann, Meta N Eek

J Clin Med . 2025 Jul 10;14(14):4909. doi: 10.3390/jcm14144909.

Abstract
Background/Objectives: Dyskinetic cerebral palsy (DCP) often implies severe motor impairment and risk of health problems. Our aim was to follow up a group of young adults with DCP that we previously examined as children, to describe health, function, and living conditions. Methods: Interviews regarding health issues, treatments, and living conditions, and quality of life (RAND-36) and fatigue questionnaires were completed. Gross and fine motor function, communication, and speech ability were classified, and weight, height, spasticity, and dystonia were assessed and compared to previous data. Joint range of motion (ROM) was compared to older adults with DCP. Results: Dystonia was present in all fifteen participants, and spasticity in all but two. A decrease was found mainly in those who received intrathecal baclofen (ITB). ROM limitations were most pronounced in shoulder flexion, abduction and inward rotation (while outward rotation was hypermobile), hip abduction, hamstrings, and knee extension. The majority had frequent contact with primary and specialist healthcare. Seven participants were underweight, eight had a gastrostomy, and seven had ITB. Upper gastrointestinal and respiratory problems were frequent. Orthopedic surgery for scoliosis was reported in five, and lower extremity in nine, while fractures were reported in six participants. RAND-36 revealed physical functioning, general health, and vitality as the greatest problem areas. Fatigue was significant in 64%. Eight participants lived with their parents. Participants at more functional levels completed tertiary education and lived independently. Conclusions: Most participants had severe impairment and many health issues, despite decreased dystonia and spasticity due to ITB. Sleep problems and pain were uncommon.
PMID: 40725605

8.The Pathway Is Clear but the Road Remains Unpaved: A Scoping Review of Implementation of Tools for Early Detection of Cerebral Palsy

Álvaro Hidalgo-Robles, Javier Merino-Andrés, Mareme Rose Samb Cisse, Manuel Pacheco-Molero, Irene León-Estrada, Mónica Gutiérrez-Ortega

Review Children (Basel) . 2025 Jul 17;12(7):941. doi: 10.3390/children12070941.

Abstract
Background/Objectives: International guidelines recommend the combined use of the General Movement Assessment (GMA), Hammersmith Infant Neurological Examination (HINE), and magnetic resonance imaging (MRI) to support early and accurate diagnosis of cerebral palsy (CP). However, their implementation remains inconsistent. This study aimed to map their reported global use and identify associated enablers and barriers. Methods: A scoping review was conducted following JBI and PRISMA-ScR guidelines. Systematic searches were performed in PubMed, Cochrane, PEDro, ProQuest, Web of Science, and Scopus. Eligible studies were charted and thematically analyzed, focusing on tools use and implementation factors at individual, organizational, and system levels. Results: Fourteen articles (seven surveys, seven implementation studies) from seven countries met the inclusion criteria. While awareness of GMA, HINE, and MRI was generally high, routine clinical use was limited-particularly outside structured implementation initiatives. Major barriers emerged at the system level (e.g., limited training access, time constraints, lack of standardized referral pathways) and social level (e.g., unclear leadership and coordination). Conclusions: The limited integration of GMA, HINE, and MRI into routine practice reflects a persistent "know-do" gap in early CP detection. Since implementation is shaped by the dynamic interplay of capability, opportunity, and motivation, bridging this gap demands sustained and equitable action-by addressing system-wide barriers, supporting professional development, and embedding early detection within national care pathways.
PMID: 40723133

9.Gait alterations following a one-year surgical deferral in children with cerebral palsy exhibiting flexed knee gait

Ching-Ru Chen, Brian Po-Jung Chen, Shu-Mei Wang, Chia-Hsieh Chang

Gait Posture . 2025 Jul 18:122:199-203. doi: 10.1016/j.gaitpost.2025.07.322. Online ahead of print.

Background: Orthopedic surgery is commonly used to slow the progressive deterioration of body structure and motor function in children with cerebral palsy (CP). While parents may delay surgery for non-medical reasons, concerns about functional decline persist. However, limited data exist to guide informed decision-making. This study aimed to determine whether delaying orthopedic surgery for spastic knee flexion gait by one year leads to significant changes in body structure, function, and kinematics.
Methods: Independent ambulators with spastic CP at GMFCS levels I and II, with a minimum mid-stance knee flexion of 20°, were recruited. Parents opted to defer surgery, and participants underwent two prospective assessments one year apart. Joint motion, muscle spasticity, gross motor function, and three-dimensional gait analysis were recorded.
Results: Twenty-three individuals (mean age 12.2 years) completed both assessments. No significant changes were observed in joint motion, spasticity, or gross motor function. Kinematic changes included increased stride length, decreased step width, reduced pelvic inclination, increased hip adduction and internal rotation, increased knee external rotation, and greater ankle dorsiflexion; however, none reached statistical significance.
Conclusion: A one-year delay in surgery for children eligible for knee flexion gait correction did not result in significant changes in contracture or knee flexion during walking. Although our findings are not firmly conclusive, gait patterns appeared generally stable during the deferral period, with some indications of potential progression toward crouch gait.
PMID: 40706298

10.Selective Control Assessment of the Lower Extremity for Infants and Toddlers (Mini-SCALE): Development and validation of a clinical assessment

Loretta A Staudt, Barbara Sargent, Lillian Chen, Eileen G Fowler

Dev Med Child Neurol . 2025 Aug 2. doi: 10.1111/dmcn.16415. Online ahead of print.

Aim: To investigate the validity of Selective Control Assessment of the Lower Extremity for Infants and Toddlers (Mini-SCALE), an adaptation of Selective Control Assessment of the Lower Extremity (SCALE), in young children aged from 3 months to less than 4 years.
Method: Mini-SCALE was modified from SCALE and reviewed by 16 experienced clinicians to establish content validity. For convergent validity, Mini-SCALE was compared to the Developmental Assessment of Young Children, Second Edition, Gross Motor subdomain (DAYC-2 GM) for 50 participants (aged 4-46 months, 29 males) with cerebral palsy (CP) (n = 20), at risk for CP (n = 9), and typically developing participants (n = 21) using a prospective cross-sectional design. For known-group validity, the scores of children with or at risk for CP were compared to typically developing children using the Welch's two-sample t-test.
Results: Content validity was strong with 96.6% (range = 75%-100%) expert agreement on 54 statements about content, administration, and grading. Convergent validity was strong between Mini-SCALE and the DAYC-2 GM (Spearman's rank correlation coefficient, rs = 0.80; $p < 0.001$). Mini-SCALE discriminated between children with or at risk for CP and typically developing children ($p < 0.001$).
Interpretation: Mini-SCALE is a valid measure of selective motor control for young children with or at risk for CP.
PMID: 40751442

11.Effectiveness and safety of abobotulinumtoxinA in pediatric lower limb spasticity: A phase IV, prospective, observational, multicenter study

Mark E Gormley, Edward Dabrowski, Mauricio R Delgado, Ann Tilton, Asare Christian, Sarah Helen Evans, Anne-Sophie Grandoulier, Jumaah Goldberg

Dev Med Child Neurol . 2025 Jul 31. doi: 10.1111/dmcn.16428. Online ahead of print.

Aim: To assess the longitudinal attainment of patient-centered, function-related Goal Attainment Scaling Total (GAS T)-score after repeated abobotulinumtoxinA (AboBoNT-A) injections over a period of up to 30 months and up to 10 cycles.
Method: In this prospective observational study, the investigators' clinical practices recruited patients aged 2 to 17 years with pediatric lower limb spasticity (PLLS). GAS T-scores were assessed for each injection, and goals could be redefined at each visit; scores of 50 reflected goal achievement. Adverse events were recorded.
Results: Of 210 patients in the effectiveness population, 171 had cerebral palsy and 163 were previously treated with a botulinum neurotoxin. Available Gross Motor Function Classification System levels showed that 31.3% (61 out of 195) of patients were non-ambulatory. Mean (SD) cumulative GAS T-score was 51.1 (9.3) across the study duration; 75.2% achieved their primary goals. GAS T-scores were comparable between BoNT-naïve and previously treated patients and between age groups, but higher in the ambulatory than the non-ambulatory subgroup. Injection guidance techniques were used in more than 70% of patients in cycles 1 to 6. Of 242 patients in the safety population, 102 reported 392 treatment-emergent adverse events, including 15 reporting 35 treatment-related adverse events. Adverse events were generally mild to moderate.
Interpretation: Overall, goals were achieved as, or better than, expected in most patients. AboBoNT-A was well tolerated, with a low incidence of treatment-related adverse events. These results indicate that AboBoNT-A is an effective treatment option, with a positive risk-benefit profile, for patients with PLLS across disability levels.
PMID: 40745401

12.Assessing Gross Motor and Gait Function Using Hip-Knee Cyclograms in Ambulatory Children with Spastic Cerebral Palsy

Jehyun Yoo, Juntaek Hong, Jeuhee Lee, Yebin Cho, Taekyung Lee, Dong-Wook Rha

Sensors (Basel) . 2025 Jul 18;25(14):4485. doi: 10.3390/s25144485.

Abstract
Weakness, spasticity, and muscle shortening are common in children with cerebral palsy (CP), leading to deficits in gross motor, gait, and selective motor functions. While traditional assessments, such as the Gross Motor Function Measure (GMFM-66), instrumented gait analysis, and the Selective Control Assessment of the Lower Extremity (SCALE), are widely used, they are often limited by the resource-intensive nature of hospital-based evaluations. We employed cyclogram-based analysis, utilizing simple hip and knee joint kinematics to assess clinical measures, including GMFM-66, normalized gait speed, the gait deviation index (GDI), and the gait profile score (GPS). Principal component analysis was used to quantify the cyclogram shape characteristics. A total of 144 children with ambulatory spastic CP were included in the study. All the cyclogram parameters were significantly correlated with GMFM-66, gait speed, the GDI, and the sagittal plane subscore of the GPS for the hip and knee, with the swing phase area showing the strongest correlation. Regression models based on the swing phase area were used to estimate the GMFM-66 ($R2 = 0.301$) and gait speed ($R2 = 0.484$). The PC1/PC2 ratio showed a moderate correlation with selective motor control, as measured by the SCALE ($R2 = 0.320$). These findings highlight the potential of hip-knee cyclogram parameters to be used as accessible digital biomarkers for evaluating motor control and gait function in children with bilateral spastic CP. Further prospective studies using wearable sensors, such as inertial measurement units, are warranted to validate and build upon these results.
PMID: 40732612

13.Comparison of the Aquatic Therapy Protocols on Gait of Children With Cerebral Palsy: A Randomized Controlled Trial

Caio Roberto Aparecido de Paschoal Castro, Lais Cardoso de Oliveira, Alessandra Mitie Kakihata, Jose Luis Rodrigues Barbosa, Rafael Santos Ferreira da Silva, Márjory Harumi Nishida, Marina Araujo Pereira, Douglas Martins Braga

Pediatr Phys Ther . 2025 Jul 16. doi: 10.1097/PEP.0000000000001220. Online ahead of print.

Objective: To analyze and compare the effects of 2 aquatic exercise protocols on the gait of children with cerebral palsy (CP), aged 6 to 8 years.
Methods: A randomized, controlled, and blind clinical trial, carried out with 16 children with CP classified to Gross Motor Function Classification System (GMFCS) II and III bilateral spastic, divided into a group of aquatic balance exercises group (BG) and a group of aquatic trunk exercises group (TG). The following assessments were completed before and after the intervention: 6-Minute Walk Test (6MWT), Trunk Control Measurement Scale, Pediatric Balance Scale, Timed Up and Go, Dynamic Gait Index, and Child Health Questionnaire-Parent form 50.
Results: BG was superior to TG in 6MWT after the intervention. Improvement was observed in most outcomes in both groups.
Conclusion: The protocols demonstrated positive effects on the outcomes analyzed, and BG performed better in the distance covered in 6MWT.
PMID: 40729688

14.Exploring the Perceived Value of Standing in Individuals with Lower Limb Impairments

Yukiyo Shimizu, Hideki Kadone, Yosuke Eguchi, Kai Sasaki, Kenji Suzuki, Yasushi Hada

J Clin Med . 2025 Jul 21;14(14):5161. doi: 10.3390/jcm14145161.

Abstract
Background: Standing has medical and psychosocial benefits for people with lower limb impairments; however, systemic, logistical, and economic barriers often limit opportunities to stand in daily life. This study explored how users perceive standing and standing-assistive technologies. Methods: This study used a mixed-methods approach: in-person interviews (n = 18) and a nationwide web-based survey (n = 125; 74.4% male, mean age 52.2 ± 13.9 years, diagnoses: spinal cord injury 37.6%, cerebrovascular disease 27.2%, and cerebral palsy 16.8%). Results: Participants described the psychosocial values of standing, such as feeling more confident and being able to interact with others at eye level. The web survey revealed that most participants believed that standing was beneficial for health (76.8%) and task efficiency (76.0%), although only 49.6% showed an interest in standing wheelchairs. The multivariate analysis revealed that ongoing standing training was the strongest predictor of positive perceptions of health benefits, task efficiency, and interest in standing wheelchairs. Younger participants showed a greater interest in standing wheelchairs. The reported barriers include a lack of awareness, high costs, and difficulty in accessing training. Conclusions: These findings suggest the need for a user-centered design and improved support systems to integrate standing into the daily lives of people with mobility impairments.
PMID: 40725852

15.Symmetry of body posture among children with hemiplegic cerebral palsy using ankle foot orthoses (AFO): a case-control study

Robert Staszkiewicz, Anna Strus

Acta Bioeng Biomech . 2025 Jul 28. doi: 10.37190/abb/205649. Online ahead of print.

Abstract
Purpose: The aim of this study was to determine how solid ankle-foot orthoses (AFO) influence the symmetrization of free standing posture in children with hemiplegic cerebral palsy (CP). Methods: In the analysis, we examined the body posture of children (n = 43, mean age of 7 years) who did not wear any orthopedic equipment on a daily basis (Group 1). We also studied those who used unilateral (Group 2) or bilateral AFOs (Group 3). The BTS SMART D-140 6 TVC optoelectronic system was implemented in the research. Results: There were no significant differences between the study groups in terms of obliqueness, rotation or pelvic inclination in standing position, or in hip joint angle on the (un)affected sides with and without AFOs. However, differences could be observed in obliqueness and rotation after applying AFOs ($0.1 > p > 0.05$). In all study groups, knee flexion angle on the affected side was greater. After putting on the orthoses (Groups 2 and 3), knee joint flexion decreased. Analysis of measurements without orthoses showed significantly less dorsiflexion and greater external rotation of the ankle joint on the affected side ($p < 0.05$). After putting on the orthoses (Groups 2 and 3), the differences in dorsiflexion noted in the ankle joints of both feet did not exceed 1°. In such conditions, the rotation in these joints also became equal. Conclusions: The results of the study made it possible to indicate that the use of AFOs in children with hemiplegic CP demonstrates a beneficial effect on the joint to which they are directly applied. They also aid other joints of the lower limbs and pelvis. The use of bilateral AFOs provides greater positive changes in standing symmetry compared to unilateral AFO implementation.
PMID: 40720201

16.Gait alterations following a one-year surgical deferral in children with cerebral palsy exhibiting flexed knee gait

Ching-Ru Chen, Brian Po-Jung Chen, Shu-Mei Wang, Chia-Hsieh Chang

Gait Posture . 2025 Jul 18:122:199-203. doi: 10.1016/j.gaitpost.2025.07.322. Online ahead of print.

Background: Orthopedic surgery is commonly used to slow the progressive deterioration of body structure and motor function in children with cerebral palsy (CP). While parents may delay surgery for non-medical reasons, concerns about functional decline persist. However, limited data exist to guide informed decision-making. This study aimed to determine whether delaying orthopedic surgery for spastic knee flexion gait by one year leads to significant changes in body structure, function, and kinematics.
Methods: Independent ambulators with spastic CP at GMFCS levels I and II, with a minimum mid-stance knee flexion of 20°, were recruited. Parents opted to defer surgery, and participants underwent two prospective assessments one year apart. Joint motion, muscle spasticity, gross motor function, and three-dimensional gait analysis were recorded.
Results: Twenty-three individuals (mean age 12.2 years) completed both assessments. No significant changes were observed in joint motion, spasticity, or gross motor function. Kinematic changes included increased stride length, decreased step width, reduced pelvic inclination, increased hip adduction and internal rotation, increased knee external rotation, and greater ankle dorsiflexion; however, none reached statistical significance.
Conclusion: A one-year delay in surgery for children eligible for knee flexion gait correction did not result in significant changes in contracture or knee flexion during walking. Although our findings are not firmly conclusive, gait patterns appeared generally stable during the deferral period, with some indications of potential progression toward crouch gait.
PMID: 40706298

17.Effect of Central Motor and Neuromuscular Impairments on Front Crawl Body Roll Characteristics of Para Swimmers

Yu-Hsien Lee, Dawn Nicola O'Dowd, Luke Hogarth, Brendan Burkett, Carl Payton

Sports Med Open . 2025 Aug 1;11(1):88. doi: 10.1186/s40798-025-00885-y.

Background: Rotation of the trunk about its long axis or 'body roll' is essential for maximising front crawl swimming performance yet research on how physical impairment affects body roll is extremely limited. This study quantifies body roll kinematics in swimmers with and without central motor and neuromuscular impairments (CMNI). It was hypothesised that body roll kinematics differ between CMNI and non-disabled swimmers, are associated with sport class (level of impairment) and are influenced by upper and lower-limb functional levels.
Methods: Three-dimensional motion analysis of 27 CMNI (sport classes 2-9) and 13 non-disabled competitive swimmers at 100-200 m race pace provided body roll kinematics, including shoulder and hip roll ranges and torso twist. Health conditions of the CMNI group were cerebral palsy (n = 12), spinal cord injury (n = 10) and neuromuscular disorders (n = 5). CMNI swimmers were divided into three upper-limb [mild (n = 9), moderate (n = 9), severe (n = 9)] and three lower-limb function subgroups [bilateral (n = 2), unilateral (n = 6), without kick (n = 19)] based on their Froude efficiency (a measure of how effectively upper limbs contribute to propulsion) and the number of lower limbs actively kicking during trials, respectively.
Results: The CMNI group exhibited lower shoulder roll range (104 ± 11° vs. 88 ± 21°, $p < 0.05$) and torso twist (58 ± 13° vs. 48 ± 22°, $p < 0.05$) but greater hip roll range (62 ± 10° vs. 75 ± 29°, $p < 0.05$) than the non-disabled group. Statistical non-parametric mapping revealed less shoulder roll from 0 to 28%, less hip roll from 0 to 10%, greater hip roll from 91 to 100%, and less torso twist from 15 to 32% and from 75 to 81% of the cycle, in the CMNI than the non-disabled group ($p < 0.05$). CMNI body roll patterns varied widely, but discrete and continuous variables did not differ between upper-limb subgroups or between lower-limb subgroups.
Conclusions: CMNI swimmers exhibit different body roll patterns to non-disabled swimmers. The study findings can be used to inform Para swimming coaches and improve the sport-specificity of land-based and water-based assessments currently used to classify CMNI swimmers.
PMID: 40750703

18.The feasibility and efficacy of coach-led virtual home-based cycling among individuals with cerebral palsy

Lisbeth Hoejkjaer Larsen, Henrik Kirk, Jakob Lorentzen

Front Neurol . 2025 Jul 15:16:1604061. doi: 10.3389/fneur.2025.1604061. eCollection 2025.

Introduction: Cerebral palsy (CP) is a neurological disorder that impairs motor control and coordination, often leading to physical and social restrictions in daily activities. This single-arm feasibility study investigates the potential efficacy of virtual moderate- to high-intensity cycling at home among individuals with CP.
Methods: Twenty-three individuals with CP (GMFCS I-IV; 16 males; mean age 26, range 13-58 years) were recruited for a 12-week home-based cycling intervention. The intervention included three weekly sessions, which could be completed either in an online coach-led group setting or independently, along with guidance for additional training. The primary focus was feasibility, addressed by retention, adherence, and safety. Efficacy was primarily evaluated using a functional threshold power test for cycling (FTP), the Timed Up and Go Test (TUG), and the Sit to Stand test (STS), assessed before and after the intervention, and secondly via self-reported questionnaires.
Results: The intervention was demonstrated to be safe and feasible, with no adverse events reported. Retention was high, with only one dropout attributed to mononucleosis. The remaining 22 participants completed the study with a high attendance averaging 3.1 sessions/week [range 2-5]. Improvements were observed in the FTP test (67.2 ± 37.3 W, $p < 0.001$), the TUG test (2.1 ± 1.4 s, $p < 0.001$), and the STS test (3.9 ± 3.3 repetitions, $p < 0.001$) while self-reported fatigue, pain, sleep, well-being, and self-efficacy remained unchanged.
Discussion: Our findings suggest that virtual cycling at home is a safe and feasible approach to engage in moderate- to high-intensity exercise, enhance physical capacity, and improve functional activity outcomes for individuals with activity limitations.
PMID: 40734819

19.Home-based early intensive manual therapy in unilateral cerebral palsy under 2 years of age

Rocío Palomo-Carrión, Elena Pinero-Pinto, Cristina Lirio-Romero, Helena Romay-Barrero, Asunción Ferri-Morales, Rita-Pilar Romero-Galisteo

Pediatr Res . 2025 Jul 26. doi: 10.1038/s41390-025-04306-4. Online ahead of print.

Background: Children with unilateral cerebral palsy (UCP) learn not to use their affected upper limb, which is known as "developmental disregard". Consequently, early intensive training could improve hand function, increasing spontaneous use for the first 2 years of life, where there is a great window for brain changes due to neural plasticity.
Objective: To study the effectiveness of home-based infant-intensive manual therapies in facilitating bimanual functional performance (BFP) compared to standard care in children with UCP aged 9-18 months.
Methods: A randomized controlled trial with single-blinded outcome assessment was conducted. Children were randomized into four groups: modified Constraint-Induced Movement Therapy for infants (infant-mCIMT), Bimanual Intensive Therapy for infants (InfantBIT), Hybrid Therapy, combining mCIMT and BIT, for infants (Infant-hybrid) and conventional therapy for children (Infant-standard-Therapy, control group-CG). Each early intensive protocol lasted 50 h and was applied throughout a 10-week period. The main outcomes were BFP, functional goals and parental satisfaction expectations regarding intensive manual therapy. Three measurements were performed (at Week 0, Week 10 and 6 months after treatment).
Results: Forty infants aged 12.38 months (chronological age) met the inclusion criteria. All groups except CG showed significant increases in BFP after infant intensive manual therapy and at 6 months compared with the baseline assessment ($p < 0.01$). The greatest increases in goal achievement and parent satisfaction occurred in the groups that had an mCIMT component.
Conclusions: Compared with standard therapy, early intensive manual therapies, i.e., infant-mCIMT, infant-BIT and infant-Hybrid therapy, resulted in greater increases in BFP and were maintained at the 6-month follow-up.
Clinical trial registration: ClinicalTrials.gov: NCT06191588.
Impact: Home-based early intensive manual therapies increase bimanual functional performance to a greater extent than conventional therapy. Infant-Hybrid therapy may result in greater improvements in functional bimanual performance compared to Infant-mCIMT or Infant-BIT alone. Higher therapy intensity and family involvement, particularly in home-based programs, are key factors for improving hand function compared to lower-dose, clinic-based usual care.
PMID: 40715358

20.Modified sports intervention for improving participation goals and activity competence in ambulant children with cerebral palsy: A randomized controlled trial

No authors listed

Dev Med Child Neurol . 2025 Jul 25. doi: 10.1111/dmcn.16449. Online ahead of print.

No abstract available
PMID: 40714963

21.Botulinum Neurotoxin A-Induced Muscle Morphology Changes in Children with Cerebral Palsy: A One-Year Follow-Up Study

Charlotte Lambrechts, Nathalie De Beukelaer, Ines Vandekerckhove, Ineke Verreydt, Anke Andries, Francesco Cenni, Ghislaine Gayan-Ramirez, Kaat Desloovere, Anja Van Campenhout

Toxins (Basel) . 2025 Jun 27;17(7):327. doi: 10.3390/toxins17070327.

Abstract
Botulinum neurotoxin type A (BoNT-A) is widely used to reduce spasticity in children with cerebral palsy. Despite its therapeutic benefits, incomplete muscle recovery has been observed post-treatment. This study evaluated longitudinal BoNT-A effects on muscle morphology over one year in children with CP (n = 26, mean age: 5.19 years ± 3.26). Three-dimensional freehand ultrasound assessed medial gastrocnemius muscle volume (MV), muscle belly length (ML), cross-sectional area (CSA), and echo intensity (EI) at baseline and at 3, 6, and 12 months post-BoNT-A. Z-score normalization accounted for natural muscle growth. Linear mixed models analyzed muscular changes over time, and repeated-measures ANOVA compared muscle parameters to an age- and severity-matched control group (n = 26, mean age: 4.98 ± 2.15) at one-year follow-up. MV exhibited a declining trend at 3 ($p = 0.005$), 6 ($p = 0.003$), and 12 months ($p = 0.007$), while ML remained unchanged throughout follow-up ($p = 0.95$). The initially reduced CSA at 6 months ($p = 0.0005$) recovered at one year, and EI increased only at 3 months post-BoNT-A ($p < 0.0001$). At one-year follow-up, there was a trend for reduced growth rate (MV/month) ($p = 0.035$) in the intervention group, whereas the control group exhibited an increased muscle growth ($p = 0.029$). These findings suggest distinct recovery timelines for CSA and ML, which may explain the incomplete MV recovery and highlight substantial interindividual variation in recovery processes.
PMID: 40711138

22.Neighborhoods and Incident Cardiometabolic Disease in People with Disability

Philippa Clarke, Nasya Tan, Paul Lin, Neil Kamdar, Michelle A Meade

Am J Prev Med . 2025 Jul 30:108001. doi: 10.1016/j.amepre.2025.108001. Online ahead of print.

Introduction: The age adjusted prevalence of heart disease in people with disability is almost three-fold that of people without disability. Social determinants of health (SDoH) are important for reducing cardiometabolic risk by providing opportunities for physical activity, healthy eating, and preventive healthcare. Yet, little research has examined how SDOH are associated with cardiometabolic disease in adults with physical disability. This study examined how neighborhood environments reduce or exacerbate risk of incident cardiometabolic disease in adults with physical disability.
Methods: This was a retrospective cohort study using a sample of 27,224 Medicare beneficiaries (2008-2016) with a diagnosis of cerebral palsy, spina bifida, multiple sclerosis, or spinal cord injury, who received social security disability income prior to enrollment. Cardiometabolic disease was identified using ICD-9-CM/ICD-10-CM codes over 3 years of follow-up. Measures of the neighborhood environment came from the National Neighborhood Data Archive and linked to individual residential ZIP codes. Cox regression models estimated hazard ratios for incident cardiometabolic disease, adjusting for age, sex, race/ethnicity, insurance coverage, and comorbid conditions. Analysis was conducted in 2023-2024.
Results: Of the 27,224 adults with physical disability, 49.5% had an incident cardiometabolic diagnosis over three-year observation period. Net of covariates, residence in neighborhoods with more recreational facilities and less traffic was associated with reduced risk of incident cardiometabolic disease, while a greater density of grocery stores was associated with increased risk of disease.
Conclusions: Findings highlight the importance of considering SDOH for mitigating or exacerbating the risk of cardiometabolic disease in adults with physical disability.
PMID: 40750001

23.The effect of intrathecal baclofen on body mass index in children with cerebral palsy

Maximillian Feygin, Kalman A Katlowitz, Sruthi P Thomas, Daniel J Curry, Nisha Gadgil

J Neurosurg Pediatr . 2025 Aug 1:1-8. doi: 10.3171/2025.4.PEDS25100. Online ahead of print.

Objective: This study aimed to investigate the effect of intrathecal baclofen (ITB) on BMI over time in a large pediatric cohort of patients with cerebral palsy (CP).
Methods: The medical records of pediatric patients diagnosed with CP who underwent ITB pump placement at Texas Children's Hospital between 2007 and 2024 were retrospectively reviewed. Pre- and postoperative BMI, demographic information, and clinical characteristics were collected. Multiple BMI velocities were calculated. A linear mixed-effects model was used to account for interpatient variability.
Results: Among 237 patients, the average BMI was 17.90 (SD 4.00) kg/m2 preoperatively and 19.13 (SD 4.58) kg/m2 postoperatively, showing a significant difference ($p = 0.001$, Kruskal-Wallis test) but a small effect size ($\eta 2 = 0.02$, 95% CI 0.001-0.05). The average BMI velocity was 0.55 (SD 3.5) kg/m2/yr presurgery and 0.46 (SD 3.5) kg/m2/yr postsurgery, showing no significant difference ($p = 0.52$, t-test). The mixed-effects model found no statistically significant effect of ITB surgery on BMI rate of change by catheter level. Specifically, cervical ($p = 0.97$), high thoracic ($p = 0.41$), midthoracic ($p = 0.63$), and low thoracic ($p = 0.84$) catheter levels were nonsignificant in effect on BMI.
Conclusions: Although there was an absolute increase in BMI postoperatively, the small effect size and results of the linear mixed-effects model-accounting for clinical confounders, within-patient variability, and catheter level-demonstrated that ITB surgery does not significantly affect BMI. The authors conclude that improved tone control may not substantially impact BMI, necessitating further nutritional intervention to ensure optimal BMI.
PMID: 40749238

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

Emine Nacar, Sinem Suner-Keklik, Ayşe Numanoğlu-Akbaş

J Pediatr Urol . 2025 Jul 9:S1477-5131(25)00389-4. doi: 10.1016/j.jpurol.2025.07.007. Online ahead of print.

Introduction and objective: Lower urinary tract symptoms (LUTS) are common in children with cerebral palsy (CP). Increased severity of functional impairment and impairments in trunk-related structures may be associated with increased severity of LUTS. The aim of our study was to examine the distribution of LUTS in children with mild to moderate spastic type CP and to investigate the relationship between LUTS severity and functional level, trunk control, trunk muscle strength and endurance, respiratory functions and rib cage mobility.
Methods: Fifty-three children with spastic CP with Gross Motor Functional Classification System (GMFCS) levels I-II and III were included in the study. LUTS was assessed using Dysfunctional Voiding and Incontinence Scoring System (DVISS); functional levels were assessed using GMFCS; and trunk control was assessed using Trunk Control Measurement Scale (TCMS). Transversus Abdominis (TrA) muscle strength was measured with Stabilizer Compression Biofeedback Unit; trunk muscle strength was measured with Sit-ups and Modified Push-up test; trunk muscle endurance was measured with McGill's trunk flexion, trunk extension, lateral bridge tests and prone bridge test. Pulmonary function was assessed by Contec SP10 Spirometer and chest mobility was assessed by chest circumference measurement.
Results: There was statistically significant difference between GMFCS level I and level III mean DVISS scores ($p = 0.002$). There was moderate negative correlation between DVISS and TCMS score ($p = 0.002$; $r = -0.416$), moderate positive correlation between TrA muscle strength ($p = 0.001$; $r = 0.482$), modified push-up test ($p = 0.025$; $r = -0.308$), trunk extension test ($p = 0.021$; $r = -0.316$), prone bridge test ($p = 0.008$; $r = -0.362$), FEV1/FVC ($p = 0.020$; $r = -0.320$), FEV1 ($p = 0.005$; $r = -0.384$), PEF ($p = 0.007$; $r = -0.367$).
Conclusion: This study shows that LUTS is common in children with mild to moderate spastic CP and that the severity of these symptoms increases significantly as the severity of functional impairment increases. In addition, it was determined that the decrease in trunk control, trunk muscle strength and endurance, respiratory functions and chest mobility were associated with an increase in LUTS. These findings suggest that isolated pelvic floor training alone may not be sufficient to improve lower urinary tract health in children with CP, but instead, a holistic rehabilitation approach that supports motor function, trunk stability and respiratory capacity should be adopted.
PMID: 40744762

25.Disordered Eating Behaviors in Individuals With Physical Disabilities: A Narrative Review

Emma Raffman, Prakash Jayabalan

Review Am J Lifestyle Med . 2025 Jul 28:15598276251363516. doi: 10.1177/15598276251363516. Online ahead of print.

Abstract
This paper aims to review the current literature on the prevalence of eating disorders (EDs) and their manifestations in individuals with physical disabilities (IWPD). To do this, we performed a comprehensive search of PubMed and identified 631 articles that were potentially relevant to this study. Following a title, abstract, and full-text review, 48 articles were selected. Among the 48 articles included in this review, demographics which were assessed included individuals with spina bifida, cerebral palsy, multiple sclerosis, traumatic brain injury, spinal cord injury, stroke, and athletes with disabilities. These articles were primarily case reports or cross-sectional studies that discussed anorexia nervosa, bulimia, binge eating, food addiction, pica, and sleep-related eating disorders. Upon further analysis of these articles, we conclude eating disorders and disordered eating behaviors are prevalent among individuals with physical disabilities though different disabilities often exhibit different EDs originating from different etiologies.
PMID: 40740659

26.Sexual and reproductive health in neurological disorders: recommendations from the Fifth International Consultation on Sexual Medicine (ICSM 2024)

Stacy Elliott, Veronika Birkhäuser, Frederique Courtois, Murat Gül, Emad Ibrahim, Carlotte Kiekens, Peter Wayne New, Mst Clin Epi, Dana A Ohl, Mikkel Fode

Sex Med Rev . 2025 Jul 29:qeaf030. doi: 10.1093/sxmrev/qeaf030. Online ahead of print.

Introduction: Neurological disorders impact both the central and peripheral nervous systems, often leading to sexual dysfunction (SD). These conditions affect not only genital function but also sensory and motor abilities, pain perception, bladder and bowel control, mood, and hormonal balance. Despite the significance of sexual health for overall quality of life, SD in individuals with neurological conditions remains an under addressed issue.
Objectives: This review aims to provide an overview of SD in individuals with neurological disorders, examining underlying neurophysiological mechanisms, the impact of various neurological conditions, and available treatment strategies. The goal is to offer clinically relevant recommendations to healthcare professionals managing SD in these patients.
Methods: A panel of experts reviewed and synthesized the literature on SD in neurological disorders, with an emphasis on randomized controlled trials and high-quality evidence. The review covers central and peripheral neural control of sexual function, SD associated with specific neurological disorders, and diagnostic and treatment approaches.
Results: Sexual dysfunction in neurological disorders varies by condition. For example, erectile dysfunction (ED) and anejaculation are common in spinal cord injury, while Parkinson's disease may be associated with hypersexuality and orgasmic disorders. Brain injuries such as traumatic brain injury, stroke, and neurodegenerative diseases can reduce libido and satisfaction, and multiple sclerosis is associated with ED and reduced genital arousal. Pharmacological and nonpharmacological interventions, including phosphodiesterase-5 inhibitors, vibratory stimulation, hormonal therapy, pelvic floor therapy, and assistive devices, demonstrate variable efficacy depending on the neurological condition. A multidisciplinary approach, including medical, psychological, and rehabilitative interventions, is crucial for optimizing sexual health in these patients.
Conclusion: Sexual dysfunction is a prevalent consequence of neurological disorders. Proper assessment, should include a sexual history and neurological examination with specific attention to genital sensation and reflex testing. Effective management requires a holistic, multidisciplinary approach. Addressing sexual health should be a core component of neurological rehabilitation to enhance patients' quality of life.
PMID: 40728529

27.Sleep problems from age two to five years and neurological outcome in children born extremely preterm: a cross -sectional study

Kristine Marie Stangenes, Mari Hysing, Maria Vollsæter, Irene Bircow Elgen, Trond Markestad, Bjørn Bjorvatn

Front Pediatr . 2025 Jul 9:13:1562630. doi: 10.3389/fped.2025.1562630. eCollection 2025.

Introduction: Premature birth is associated with a higher risk of sleep problems and neurodevelopmental disabilities (NDD). We examined relationships between sleep problems and cognitive, motor, and sensory functions in a national cohort of five-year-old children born extremely preterm (EPT) with the purpose of identifying possible means of improving developmental outcomes.
Methods: This study was part of a national cohort study of all children born extremely preterm, defined here as gestational age less than 28 completed weeks, or birth weight below 1,000 g, born in Norway in 1999 and 2000. Parents completed a structured retrospective questionnaire at age five to assess sleep problems from ages two to five years. We assessed cognitive function using the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R), evaluated motor function with the Movement Assessment Battery for Children (M-ABC) and classified cerebral palsy (CP) according to the Gross Motor Function Classification System (GMFCS). NDD was graded from no NDD (no disabilities) to NDD 2 and 3 (moderate and severe disability).
Results: Of 372 eligible children, 253 (68%) participated. Parents reported that 28.5% had general sleep problems from ages two to five years. Prevalences of specific problems were 21.7% for nighttime awakenings, 17.8% for difficulty falling asleep, 5.9% for early morning awakening and 1.6% for late morning awakening. Children with Full scale IQ < 85 were at increased risk of general sleep problems (adjusted odds ratio - aOR 1.8), as well as nighttime awakenings (aOR 2.8), and early morning awakenings (OR 2.9), but not for difficulty falling asleep compared to those with higher IQ levels.EPT children with moderate to severe NDD (NDD 2 and 3) showed a higher prevalence of general sleep problems [adjusted odds ratio (aOR) 3.9], nighttime awakenings (aOR 4.8), and early morning awakenings (OR 7.9) compared to those with no NDD (NDD 0).
Conclusion: General and specific sleep problems were associated with low cognitive function and moderate to severe NDD. Our findings underscore the importance of addressing sleep within a comprehensive care framework for EPT children and highlight the need for addressing and target interventions for sleep problems.
PMID: 40726904

28.Bone Mineral Density in Children with Cerebral Palsy: Associations with Anthropometric and Clinical Characteristics-A Cross-Sectional Study

Aqeelah Abdulelah Aljishi, Mohammed A Al-Omari, Ayat H Al Safar, Shahad A AlHazzaa, Alaa I Ibrahim

Children (Basel) . 2025 Jul 7;12(7):894. doi: 10.3390/children12070894.

Abstract
Background/Objectives: Cerebral palsy (CP) is the most common cause of neurological disability in children and is frequently associated with low bone mineral density (BMD) and increased risk of fractures. This study aimed to assess BMD in children with CP, compare it with normative standards, and explore potential associations with anthropometric parameters and the clinical characteristics of children with CP. Methods: Thirty-six children with CP aging 6-15 years from both sexes with varying levels of Gross Motor Functional Classification System (GMFCS) and spasticity were evaluated. Areal BMD and Z-scores (total and subtotal) were measured using dual-energy X-ray absorptiometry (DXA). Regression analysis identified predictors of BMD. Results: Children with GMFCS levels III-V had significantly lower total and subtotal Z-scores compared to those with levels I-II ($p = 0.001$ and $p = 0.02$, respectively). Total Z-score was significantly predicted by weight ($\beta = 1.02$, $p = 0.002$), height ($\beta = -0.72$, $p = 0.02$), and sedentary time ($\beta = -0.47$, $p = 0.005$). "No walking" was the only significant predictor for subtotal Z-score ($\beta = -0.50$, $p = 0.004$). Conclusions: Children with moderate to severe CP exhibited significantly lower BMD, particularly those with limited ambulation and higher spasticity levels. These findings underscore the importance of early screening and targeted interventions to optimize bone health in this population.
PMID: 40723087

29.Relationship between nutritional assessment and nutritional risk screening in hospitalized children with cerebral palsy: a single-center prospective study

Jixun Zhao, Yuyang Qiu, Junmeng Su, Huiqun Wang

Sci Rep . 2025 Jul 28;15(1):27396. doi: 10.1038/s41598-025-12628-w.

Abstract
Cerebral palsy (CP) strongly affects the growth and development of children and is accompanied by a high risk of malnutrition. This study aims to characterize the nutritional status of hospitalized children with CP, evaluate the efficacy of four nutritional risk screening tools, analyze influencing factors of malnutrition. In our study, 64.8% of all 91 patients were malnourished. Nutritional status was associated with the gross motor function classification system (GMFCS) grade, the manual ability classification system (MACS) grade, caregiver concern, and age ($P < 0.05$). Compared with Z score, the sensitivity and consistency of the four malnutrition risk screening tools were lower. Multivariate logistic regression analysis revealed that older age, lower albumin (ALB) concentration, and MACS grade II were independent influencing factors for malnutrition. The prediction model with 4 variables, including age, albumin, triglyceride and MACS grade, was included, the AUC (95% CI) was 0.88 (0.81-0.95), and the P value of the H-L goodness-of-fit test was 0.588, which has practical value. We indicate that the rate of malnutrition in hospitalized children with CP remains high and still requires extensive attention from society, especially in clinical nutrition.
PMID: 40721852

30.Can RESPiratory Hospital Admissions in Children with Cerebral Palsy Be Reduced? A Feasibility Randomized Controlled Trial (RESP-ACT)

Rachael M Marpole, A Marie Blackmore, Andrew C Wilson, Monica S Cooper, Julie Depiazzi, Katherine Langdon, Lisa Moshovis, Asha C Bowen, Noula Gibson

J Pediatr. 2025 Jul 24:114755. doi: 10.1016/j.jpeds.2025.114755. Online ahead of print.

Objective: To investigate the feasibility of implementing recommendations of the consensus statement for the Prevention and Management of Respiratory Disease in children with severe cerebral palsy (CP) via RESPiratory hospital Admissions in children with cerebral palsy: a feasibility randomized Controlled Trial (RESP-ACT).
Study design: Twenty-two children with CP aged 0-12 years at risk of respiratory disease and receiving care through Perth Children's Hospital in Western Australia were randomized into parallel groups. The control group (n=10) continued with their usual teams, while the intervention group (n=12) received a comprehensive assessment followed by individualized investigations and appointments as needed. The primary outcomes include implementation, acceptability, practicality, and measuring efficacy. During the following year, with the help of a blind assessor, caregivers reported their children's health service use on a fortnightly basis. Caregivers and treating clinicians were interviewed at the end of the trial.
Results: Complete data were obtained from 73% of participants at 1 year. They completed 89% of the fortnightly surveys. Hospital service data were assessed for all. The 9 intervention participants interviewed at the end of the trial were satisfied or very satisfied with the service, and all caregivers and clinicians agreed or strongly agreed that such a service should be established. Their practical concerns included managing time, preference for home-based interventions and adequate staffing.
Conclusions: The service is feasible to implement but requires close monitoring. This trial provides data on which to base a larger randomized control trial.
PMID: 40714051

31.Wheelchair satisfaction: a study with mothers of children and adolescents with severe cerebral palsy

Maria José Alves, Fausto Orsi Medola, Luis Carlos Paschoarelli, Nenad Pavel, Luciana Ramos Baleotti

Disabil Rehabil Assist Technol . 2025 Jul 30:1-12. doi: 10.1080/17483107.2025.2537338. Online ahead of print.

Purpose: This study aimed to evaluate the relationship between device and service satisfaction among mothers of children with cerebral palsy who use wheelchairs, as well as to examine the connections between satisfaction, wheelchair characteristics, confidence, and proficiency in wheelchair use.
Materials and methods: A descriptive cross-sectional study was conducted involving 30 mothers of children and adolescents with severe cerebral palsy that are not able to propel the wheelchair by themselves. Participants' satisfaction and the skills for moving with a wheelchair were assessed with the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0), the Wheelchair Skills Test Questionnaire. Statistical analysis, including correlation tests and Analysis of Variance (ANOVA-OneWay), was performed and supplemented by qualitative analysis for a more comprehensive understanding.
Results: The results showed that factors such as wheelchair dimensions, ease of adjustment, weight, comfort, and the quality of delivery and technical assistance services raised concerns and dissatisfaction among participants. Safety and comfort were identified as key factors for satisfaction, reported by 73.3% of participants, while 36.7% mentioned ease of use. A significant correlation between ability and confidence was established ($p < 0.001$), with a high magnitude ($R = 0.94$).
Conclusion: The findings highlight the importance of including primary caregivers in wheelchair assessments to understand the determinants of satisfaction better and proposes Assistive Technology interventions that prioritize caregivers' perspectives. This may improve prescription practices, thereby increasing user satisfaction and usability. Additionally, it highlights the potential of modular and collapsible support systems tailored to meet diverse physical needs.
Plain language summary
Understanding the characteristics of wheelchairs that influence satisfaction provides parameters for the implementation of more effective and meaningful interventions in the field of health, as well as for innovation in the design of these devices. This knowledge can support healthcare professionals in the process of prescribing adapted wheelchairs, including the need to carefully evaluate and prescribe postural adjustment devices that positively interfere with satisfaction and ability to handle the wheelchair. It is important to train family members/guardians to handle wheelchairs in community settings, which can improve their confidence and ability to use the device. Collaboration between healthcare professionals and designers can be essential for identifying user needs and innovating wheelchairs for children and adolescents with severe cerebral palsy.
PMID: 40736324

32.Preliminary Effects of Extended Reality-Based Rehabilitation on Gross Motor Function, Balance, and Psychosocial Health in Children with Cerebral Palsy

Onebin Lim, Yunhwan Kim, Chanhee Park

Bioengineering (Basel) . 2025 Jul 18;12(7):779. doi: 10.3390/bioengineering12070779.

Abstract
Extended reality (XR)-based rehabilitation is an emerging therapeutic approach that combines real and virtual environments to enhance patient engagement and promote motor and cognitive recovery. Its clinical utility in children with cerebral palsy (CP), particularly regarding gross motor skills, balance, and psychosocial well-being, remains underexplored. This preliminary study aimed to evaluate the potential effects of XR-based rehabilitation on gross motor function, balance, parental stress, and quality of life in children with cerebral palsy. Thirty children with cerebral palsy were randomly assigned to an extended reality training group (XRT, $n = 15$) or a conventional physical therapy group (CPT, $n = 15$). Both groups received 30 min sessions, three times per week for 6 weeks. Outcome measures included the Gross Motor Function Measure-88 (GMFM-88), Pediatric Balance Scale (PBS), Functional Independence Measure (FIM), Parenting Stress Index (PSI), and Pediatric Quality of Life Inventory (PedsQL), assessed pre- and post-intervention. A 2 (group) × 2 (time) mixed ANOVA was conducted. The XR group demonstrated improvements in GMFM-88, PBS, and FIM scores, with decreased PSI and increased PedsQL scores. Although most interaction effects were not statistically significant (GMFM-88: $\eta 2 = 0.035$, $p = 0.329$; PBS: $\eta 2 = 0.043$, $p = 0.274$), a marginal interaction effect was observed for PSI ($p = 0.065$, $\eta 2 = 0.059$), suggesting a potential benefit of XR-based rehabilitation in reducing parental stress. This preliminary study indicates that XR-based rehabilitation may provide beneficial trends in motor function and psychosocial health in children with CP, particularly in reducing parental stress. Further studies with larger sample sizes are needed to confirm these findings.
PMID: 40722471

33.Implications of shared motor and perceptual activations on the sensorimotor cortex for neuroprosthetic decoding

Alexander Budugur Silva, Jessie R Liu, Vanessa R Anderson, Cady M Kurtz-Miott, Irina P Hallinan, Kaylo T Littlejohn, Samantha Brosler, Adelyn Tu-Chan, Karunesh Ganguly, David Aaron Moses, Edward F Chang

J Neural Eng . 2025 Jul 28. doi: 10.1088/1741-2552/adf50e. Online ahead of print.

Objective: Neuroprostheses can restore communicative ability to people with paralysis by decoding intended speech motor movements from the sensorimotor cortex (SMC). However, overlapping neural populations in the SMC are also engaged in visual and auditory perceptual processing. The nature of these shared motor and perceptual activations and their potential to interfere with decoding are particularly relevant questions for speech neuroprostheses, as reading and listening are essential daily functions.
Approach: In two participants with vocal-tract paralysis and anarthria (ClinicalTrials.gov; NCT03698149), we developed an online electrocorticography (ECoG) based speech-decoding system that maintained accuracy and specificity to intended speech, even during common daily tasks like reading and listening. Offline, we studied the spectrotemporal characteristics and spatial distribution of reading, listening, and attempted-speech responses across our participants' ECoG arrays.
Main results: Across participants, the speech-decoding system had zero false-positive activations during 63.2 minutes of attempted speech and perceptual tasks, maintaining accuracy and specificity to volitional speech attempts. Offline, though we observed shared neural populations that responded to attempted speech, listening, and reading, we found they leveraged different neural representations with differentiable spectrotemporal responses. Shared populations localized to the middle precentral gyrus and may have a distinct role in speech-motor planning.
Significance: Potential neuroprosthesis users strongly desire reliable systems that will retain specificity to volitional speech attempts during daily use. These results demonstrate a decoding framework for speech neuroprostheses that maintains this specificity and further our understanding of shared perceptual and motor activity on the SMC.
PMID: 40720979

34.Exploratory Evaluation for Functional Changes of Six-Month Systematic Non-Invasive Electrical Stimulation in a Whole-Body Suit on Children with Cerebral Palsy GMFCS III-V

Tina P Torabi, Kristian Mortensen, Josephine S Michelsen, Christian Wong

Neurol Int . 2025 Jun 30;17(7):102. doi: 10.3390/neurolint17070102.

Background/objectives: Spasticity in children with cerebral palsy (CP) can impair motor-related functions. The objective of this exploratory, prospective study was to examine if transcutaneous electrical nerve stimulation (TENS) in a whole-body suit leads to changes in spasticity and other related effects.
Methods: Thirty-one children with CP GMFCS III-V, with a median age of 11.0 years (age range of 7-17 years), were consecutively included, and they used the suit with TENS for 24 weeks. The primary outcome was spasticity measured using the Modified Ashworth Scale (MAS). Functional motor-related tasks were evaluated by the Goal Attainment Scale (SMART GAS). The Modified Tardieu Scale (MTS), passive Range of Motion (pROM), GMFM-66, and Posture and Postural Ability Scale (PPAS) assessments were performed.
Results: Seventeen subjects (17/31) completed the 24 weeks. Dropout was due to difficulty in donning the suit. The level of overall spasticity, most pronounced in the proximal arms and legs, was reduced according to the MAS, but not the MTS or pROM. Subject-relevant motor-related goals improved significantly in standing/walking and hand/arm function. Changes in the GMFM-66 and PPAS were not significant.
Conclusions: Although there were statistically significant but underpowered changes in the MAS after 24 weeks, there were no clinically relevant effects. Exploratorily, we found observer-reliant motor-related functional improvements, which, however, we were unable to detect when trying to quantify them. Donning the suit led to dropout throughout the study. Caregivers need to allocate time, mental capacity and have the physical skill set for donning the suit for long-term use.
PMID: 40710905

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Tina P Torabi, Kristian Mortensen, Josephine S Michelsen, Christian Wong

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PMID: 40710905

36.Caregiver burden of carers of children with cerebral palsy in selected hospitals, Southwestern Nigeria

Oluwasola Adetola Solaja, Adenike A Olaogun

BMC Nurs . 2025 Jul 31;24(1):1001. doi: 10.1186/s12912-025-03664-y.

Background: Caring for children with Cerebral Palsy (CP) placed a heavy burden on the carers, which usually affects different aspects of the life of the carers. Knowledge of their burden helps to inform the broad assessment of caregivers' burden, leading to the development of a client-oriented nursing care plan capable of delivering holistic care. This plan can also inform the development of educational packages, institutional care practices, and a structured support group system that addresses the core challenges of carers of children with CP in third-world countries. Thus, this study assessed the caregiver burden of caregivers of children with cerebral palsy (CP) in southwestern Nigeria.
Methods: This study used a concurrent mixed methods design. The settings of the study were Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Osun State and Massey Children's Hospital, Lagos, Lagos State. Samples were determined using the adjusted Cochran formula. A purposive sampling technique was used to select 92carers from the selected hospitals in Southwestern Nigeria for the quantitative part, while twelve carers participated concurrently in the qualitative study. Data was collected with the use of a standardised instrument (Zarit Burden Interview) and an interview guide for the In-depth interview. Quantitative data analysis was done using the Statistical Product and Service Solutions (SPSS) version 23, while the qualitative data were analysed using content analysis. Hypotheses were tested with an alpha value set at $p \leq 0.05$.
Results: The study found that the majority of carers (91.3%) were between 20 and 50 years, over 89% were females, married (91.3%), mothers (81.5%), with tertiary (47.7%) and senior secondary (35.9%) education. Nearly half of the carers were employed (46.7%), and 40.2% of them were self-employed. The results showed that nearly half of the carers (42.4%) had a moderate burden, 31.5% had a mild burden, while 15.2% had a severe burden. The qualitative data identified the burden as physical stress, time constraint, lack of support, emotional burden, and financial and economic burden. There was a significant association between the educational level of carers ($\chi 2 = 18.39$, $p = 0.03$), the occupation of carers ($\chi 2 = 12.36$, $p = 0.05$), and caregiver burden.
Conclusion: This study concluded that about half of the carers experienced moderate caregiver burden.
PMID: 40745540

37.Adapting a Participatory Group Programme for Caregivers of Children with Complex Neurodisability from Low-, Middle-Income Countries to a High-Income Setting: Moving from "Baby Ubuntu" to "Encompass"

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Int J Environ Res Public Health . 2025 Jul 18;22(7):1144. doi: 10.3390/ijerph22071144.

Abstract
The "Baby Ubuntu" programme is a well-established, low-cost, community-based intervention to support caregivers of children with complex neurodisability, like cerebral palsy, in low- and middle-income country (LMIC) contexts. This process-focused paper describes our utilisation of the ADAPT guidance to adapt "Baby Ubuntu" for use in ethnically and linguistically diverse, and economically deprived urban boroughs in the United Kingdom (UK). The process was guided by an adaptation team, including parents with lived experience, who explored the rationale for the intervention from local perspectives and its fit for this UK community. Through qualitative interviews and co-creation strategies, the perspectives of caregivers and healthcare professionals substantially contributed to the "Encompass" programme theory, drafting the content, and planning the delivery. Ten modules were co-produced with various topics, based on the "Baby Ubuntu" modules, to be co-facilitated by a parent with lived experience and a healthcare professional. The programme is participatory, allowing caregivers to share information, problem solve, and form supportive peer networks. The "Encompass" programme is an example of a "decolonised healthcare innovation", as it aims to transfer knowledge and solutions developed in low- and middle-income countries to a high-income context like the UK. Piloting of the new programme is underway.
PMID: 40724208

38.Phenotyping Neurodisability in Hospital Records in England: A National Birth Cohort Using Linked Administrative Data

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Paediatr Perinat Epidemiol . 2025 Jul 25. doi: 10.1111/ppe.70052. Online ahead of print.

Background: Children with neurodisability often have complex healthcare and educational needs. Evidence from linked administrative health and education data could improve joint working between services.
Objective: To develop a diagnostic code list to identify neurodisability in hospital admission records; to assess the representativeness of this phenotype by characterising children with hospital-recorded neurodisability and their outcomes.
Methods: We developed a national cohort of singletons born in England between 2003 and 2009, including a nested cohort of children enrolled in primary school, using linked health and education data from the Education and Child Health Insights from Linked Data (ECHILD) database. With expert clinicians, we developed an algorithm based on diagnostic information from hospital records to phenotype children with hospital-recorded neurodisability. We described rates of mortality, planned/unplanned admissions up to 11 years old, and school-recorded special educational needs (SEN) provision, as proxy measures of the complexity of a child's needs, overall and for over 40 neurodisability subgroups.
Results: Of 3,580,225 children in the birth cohort, 3.6% had hospital-recorded neurodisability by age 11. The most frequent subgroups included developmental disorders, autism, epilepsy, perinatal brain injury, and cerebral palsy. Children with hospital-recorded neurodisability had higher mortality and planned/unplanned admission rates compared with their peers, and they accounted for 26% of all planned and 14% of all unplanned hospital admissions before age 11. The nested primary school cohort included 2,956,299 pupils (82.6% of all births), 3.7% of whom had hospital-recorded neurodisability. 75% of children with hospital-recorded neurodisability had any school-recorded SEN provision, and 39% had a record of more intensive provision (compared to 30% and 2.4%, respectively, for their peers).
Conclusions: We derived a phenotype for hospital-recorded neurodisability, which affects 1 in 28 primary school children in England, with high rates of hospital admissions and SEN provision. This phenotype and its subgroups can be used by service providers and researchers to examine inequalities and inform resource and service provision.
PMID: 40708380

39.Brain lesion extent, growth, and body composition in children with cerebral palsy

Stina Oftedal, Simona Fiori, Kristie L Bell, Katherine A Benfer, Leanne Sakzewski, Robert S Ware, Peter S W Davies, Roslyn N Boyd

Dev Med Child Neurol . 2025 Jul 31. doi: 10.1111/dmcn.16427. Online ahead of print.

Aim: To investigate the relationship between growth, body composition, and the extent of brain lesion measured using structural magnetic resonance imaging (MRI) in children with cerebral palsy (CP).
Method: This prospective population-based cohort study recorded 359 assessments from 124 children with CP aged 18 months to 13 years (38% female, Gross Motor Function Classification System [GMFCS] levels I = 50, II = 24, III = 17, IV = 12, and V = 21). A neurologist assessed the extent of the brain lesion using a validated semi-quantitative scale (global, basal ganglia/brainstem, hemispheric and corpus callosum scores). Height (HTZ), weight (WTZ), and head circumference (HDZ) z-scores were calculated. The Fat Mass Index (FMI) and Fat-Free Mass Index (FFMI) were determined using a deuterium dilution technique, bioelectrical impedance or dual-energy X-ray absorptiometry, and height. Data were analysed using mixed-effects linear regression.
Results: Greater global (β = -0.04, 95% confidence interval [CI] = -0.07 to -0.02), basal ganglia/brainstem (β = -0.06, 95% CI = -0.11 to -0.02), corpus callosum (β = -0.27, 95% CI = -0.27 to -0.12), and hemispheric (β = -0.08, 95% CI = -0.12 to -0.04) scores were associated with lower HTZ. Greater global (β = -0.03,95% CI = -0.06 to -0.01) and corpus callosum (β = -0.23, 95% CI = -0.40 to -0.06) scores were associated with lower WTZ. A greater hemispheric score (β = -0.06, 95% CI = -0.119 to -0.001) was associated with lower HDZ. Semi-quantitative MRI scores were not associated with FMI or FFMI.
Interpretation: Greater extent of the brain lesion was significantly associated with lower HDZ, HTZ, and WTZ but not body composition in children with CP aged 18 months to 13 years.
PMID: 40745624

40.Motor change, comorbidities, and communication: Toward a more inclusive and realistic description of cerebral palsy

Cláudia Alcantara de Torre, Raquel de Paula Carvalho

Dev Med Child Neurol . 2025 Jul 31. doi: 10.1111/dmcn.16439. Online ahead of print.

No abstract available
PMID: 40745575

41.Reframing cerebral palsy for a truly inclusive future

Rafael Bonfim

Dev Med Child Neurol . 2025 Jul 31. doi: 10.1111/dmcn.16443. Online ahead of print.

No abstract available
PMID: 40745507

42.Simplifying the language in the proposed description of cerebral palsy: Less is more

Hayley Smithers-Sheedy, Shona Goldsmith, Catherine Gibson, Susan Margaret Reid, Michele Hansen, Linda Watson, Megan Auld, Nadai Badawi, Sarah McIntyre; ACPR Group

Dev Med Child Neurol . 2025 Jul 30. doi: 10.1111/dmcn.16420. Online ahead of print.

No abstract available
PMID: 40737297

43.The distinction between the definition and description of cerebral palsy

Ingeborg Krägeloh-Mann, Javier de la Cruz, Malika Delobel-Ayoub, Antigone Papavasiliou, Oliver Perra, Gija Rackauskaite, Elodie Sellier, Daniel Virella, Catherine Arnaud, Veronka Horber; Surveillance of Cerebral Palsy in Europe (SCPE)

Dev Med Child Neurol . 2025 Jul 28. doi: 10.1111/dmcn.16422. Online ahead of print.

No abstract available
PMID: 40722232

44.The updated description of cerebral palsy: A first response from the American Academy for Cerebral Palsy and Developmental Medicine

Laurie Glader; American Academy for Cerebral Palsy and Developmental Medicine Board of Directors

No abstract available
PMID: 40722240

45.Motor classification remains essential in describing cerebral palsy

Elegast Monbaliu, Saranda Bekteshi, Jeroen Vermeulen, Els Ortibus, Annemieke Buizer, Roser Pueyo, Anne Koy, Marcin Bonikovski, Hrvoje Gudlin, Kate Himmelmann; European Dyskinetic Cerebral Palsy Network (EDCPN)

Dev Med Child Neurol . 2025 Jul 27. doi: 10.1111/dmcn.16430. Online ahead of print.

No abstract available
PMID: 40717283

46.Characterizing how people with cerebral palsy move: An opportunity for improved precision in the new definition

Colleen Peyton, Theresa Sukal Moulton

Dev Med Child Neurol. 2025 Jul 25. doi: 10.1111/dmcn.16436. Online ahead of print.

No abstract available
PMID: 40714982

47.Recognizing the lifelong and neurological nature of cerebral palsy: Notes on the proposed updated description

Olaf Verschuren, Edward A Hurvitz, Mark D Peterson

Dev Med Child Neurol . 2025 Jul 25. doi: 10.1111/dmcn.16433. Online ahead of print.

No abstract available
PMID: 40714967

48.A description and a diagnostic framework: Synergy for practical cerebral palsy diagnosis and care

Bhooma Aravamuthan, Darcy Fehlings, Iona Novak, Michael Fahey, Eileen Fowler, Michael Kruer, Henry Chambers

Dev Med Child Neurol . 2025 Jul 29. doi: 10.1111/dmcn.16429. Online ahead of print.

No abstract available
PMID: 40734216

49.Conductive Education for Children With Cerebral Palsy: A Systematic Review of Outcomes, Practice Time and Motor Performance Assessment

Nathália Nídia da Silva, Wivianne Abreu Cavalcante, Albert Lucas Olinto Tertuliano, Alana Amicilene Azevedo de Sousa, Debora Chayeny Alves de Oliveira, Ariane Brito Diniz Santos, Anderson Henry Pereira Feitoza, Lorena Moraes Dantas, Marisete Peralta Safons, Maria Teresa Cattuzzo

Review Child Care Health Dev . 2025 Sep;51(5):e70149. doi: 10.1111/cch.70149.

Aim: To investigate Conductive Education (CE) interventions in children with cerebral palsy (CP), examining how practice time, assessment methods, and CP characteristics influence treatment outcomes.
Method: A systematic review (PROSPERO-CRD42024578760) searched seven databases using 'Conductive Education'. Inclusion criteria: interventional studies in young people with CP receiving CE treatment. The PRISMA strategy guided study selection, aided by Rayyan software. Study quality was assessed using ROBINS-I.
Results: Eighteen studies were included. Seven studies showed low risk of bias; considering low and moderate risk studies, 67% demonstrated positive CE effects. Practice duration appeared crucial: Studies reporting positive outcomes averaged 25.2 h/week compared to 17.7 h/week in studies showing no effect. The Gross Motor Function Measure was the most used assessment tool, followed by the Paediatric Evaluation of Disability Inventory. CE showed better outcomes in spastic CP, particularly in cases with diplegic presentation, compared to athetoid or ataxic types.
Interpretation: CE demonstrates promise for improving motor performance in children with CP, particularly with adequate practice time (≈25 h/week). Treatment success appears influenced by CP type and assessment methods. Future research should prioritize standardized protocols and consistent outcome measures to strengthen evidence quality.
PMID: 40742274

50.Yield of Whole Exome Sequencing in Children With Cryptogenic Cerebral Palsy

Ashwin Vivek Sardesai, Mahesh Kamate

Pediatr Neurol . 2025 Jul 11:171:1-7. doi: 10.1016/j.pediatrneurol.2025.06.023. Online ahead of print.

Background: Recent studies indicate that a significant number of patients with cerebral palsy (CP) may have a genetic cause. However, data from India are limited, where inheritance patterns are likely to be different. We examined the yield of next-generation sequencing in identifying the genetic causes of CP in children with unclear etiology and described the genetic spectrum found.
Methods: Whole-exome sequencing (WES) was performed on 71 children with CP (aged under 18 years, with a stable, nonprogressive course) in whom no acquired cause was identified clinically or radiologically.
Results: The yield of WES was 53.52% (38 of 71 cases) for pathogenic (P) and likely-pathogenic (LP) variants, and 78.87% when including variants of uncertain significance. We identified 54 variants (12 P, 24 LP, and 18 variants of uncertain significance) across 46 genes, along with two pathogenic copy number variants in 38 of the 71 cases. Genes such as AP4M1, ACSF1, AP4S1, and HACE1 showed P/LP variants in more than 1 case. The most common inheritance pattern (found in 30 of 38 cases) was autosomal recessive (78.95%), mainly due to high consanguinity in the cohort [53 of 71 (74.65%)]. We identified nine hereditary spastic paraplegia genes in 13 patients, three cases with Aicardi-Goutières syndrome genes, and four with genes associated with congenital disorders of glycosylation. The genes exhibited diverse pathogenic mechanisms, reflecting the heterogeneity of CP genes.
Conclusions: Careful selection of cohorts can enhance the genetic yield of WES in CP. Autosomal recessive variants are more common in populations with high rates of consanguinity.
PMID: 40729784

51.HPDL Biallelic Variants in Cerebral Palsy and Childhood-Onset Hereditary Spastic Paraplegia: Human and Zebrafish Insights

Serena Mero, Sara Satolli, Daniele Galatolo, Flavio Dal Canto, Michela Armando, Guja Astrea, Melissa Barghigiani, Giorgia Bruno, Gianmarco Dalla Zanna, Rosa De Micco, Claudia Dosi, Martina Lombardi, Federico Melani, Mariarosa Anna Beatrice Melone, Domenico Montanaro, Rossella Pasquariello, Ivana Ricca, Mariapaola Schifino, Rosanna Trovato, Alessandro Tessitore, Jacopo Troisi, Antonio Varone, Valentina Naef, Filippo M Santorelli

Mov Disord . 2025 Jul 28. doi: 10.1002/mds.30296. Online ahead of print.

Background: The human 4-hydroxyphenylpyruvate dioxygenase-like protein (HPDL) has been linked to hereditary spastic paraplegia (HSP) with potential roles in neurogenesis and energy metabolism. However, the prevalence of HPDL variants in childhood-onset motor impairments remains unclear.
Objective: This study set out to characterize new patients with biallelic HPDL variants, and to explore the role of this protein both in vitro and in vivo.
Methods: Exome sequencing was performed on 210 patients with HSP, diplegic cerebral palsy (CP), or moderate/severe neurodevelopmental disorders. To understand the role of HPDL, we performed functional studies in patient-derived fibroblasts and crispant (hpdl-F0) zebrafish larvae.
Results: We identified 14 patients who exhibited reduced HPDL protein expression in cultured skin fibroblasts. Children with HPDL variants had elevated plasma glial fibrillary acidic protein levels, and serum metabolomics revealed reduced levels of 4-hydroxybenzeneacetic acid, a precursor of 4-hydroxymandelic acid (4HMA) and 4-hydroxybenzoic acid (4HB), with disruptions in metabolic pathways, including the Krebs cycle. The involvement of HPDL in energy metabolism was supported by altered mitochondrial respiration and increased cytosolic reactive oxygen species in human cells. Investigations into hpdl-F0 revealed neurodevelopmental abnormalities and epilepsy-like behavior, likely due to mitochondrial dysfunction, mirroring the phenotypes observed in children. Bypass therapy with 4HMA rescued the disease phenotypes in cells and hpdl-F0 crispant, while 4HB did so only partially in fish.
Conclusions: HPDL variants are responsible for CP-like spastic paraparesis in children. Loss of HPDL function disrupts cellular oxidative metabolism, highlighting its role in neurodevelopment and energy homeostasis, both in vitro and in vivo.

PMID: 40719007

52.Erratum: Consensus Guidelines of the Indian Academy of Pediatrics (IAP)-Neurodevelopmental Pediatrics Chapter on Developmentally Supportive Follow-Up for High-Risk Infants

Zafar Mahmood Meenai, M K C Nair, Samir Dalwai, Lal D V Nair, Sheffali Gulati, Sharmila B Mukherjee, Naveen Jain, Deepak Dwivedi, Kawaljit S Multani, Shambhavi Seth, Vivek V Singh, Atanu Bhadra, Vasant Khalatkar, Santhosh K Kraleti, Monica Juneja, Leena Deshpande, Anjan Bhattacharya, Lalan Kumar Bharti, Yogesh Parikh, Leena Srivastava, Sitaraman Sadasivan, Jeeson C Unni, Manmeet K Sodhi, Shyamal Kumar, Deepa Bhaskaran, Adarsh Eregowda, Indu Surana, Abraham K Paul, Ashok Rai, Sanjay Shivanna, Khurshid Wani, Lata Bhat, Shabina Ahmed, Nimmy K Joseph

Published Erratum Indian Pediatr . 2025 Aug;62(8):638-639. doi: 10.1007/s13312-025-00128-z.

No abstract available
PMID: 40694293

Prevention and Cure

53.Implementation of an early intervention strategy for post hemorrhagic ventricular dilatation in preterm infants

Diane Wilson, Sara Breitbart, Lee DiFonzo, Edmond Kelly, Yenge Diambomba, Dilkash Kajal, Kamini Raghuram, Sabrina Wong, Eugene Ng, Paige Church, Elizabeth Asztalos, Phyllis Glanc, Mehmet Cizmeci, Rosanna Pais, Jeffery Traubici, Lara M Leijser, Steven P Miller, Abhaya V Kulkarni, Linh G Ly

J Perinatol . 2025 Jul 25. doi: 10.1038/s41372-025-02371-5. Online ahead of print.

Objective: Evaluate earlier intervention on short- and longer-term outcomes in preterm infants with post-hemorrhagic ventricular dilatation (PHVD) born at ≤32 weeks' gestation.
Study design: Retrospective, multi-center, observational study.
Results: One hundred patients met eligibility criteria. Of 70 survivors, PHVD resolved spontaneously in 32 (46%). The 38 infants needing intervention were managed with: lumbar puncture (LP) alone (n = 23, 60%); LP and ventricular access device (VAD) only (n = 6, 16%); LP, VAD, ventricular-peritoneal shunt (n = 9, 24%). There were no differences in incidence of cerebral palsy or Bayley Scales of Infant and Toddler Development (BSID-III) composite score between the intervention and non-intervention group ($p > 0.5$). Neurosurgical intervention was initiated at smaller ventricle size and BSID-III scores improved significantly compared to a historical cohort with late intervention, ($p < 0.05$).
Conclusion: Initiation of early intervention for PHVD was feasible and was associated with improved neurodevelopmental outcomes compared to late intervention.
PMID: 40715736

54.Persistent inflammation and white matter damage in the preterm brain: Insights from a novel ovine model of chronic inflammation

Abdul Razak, Amy E Sutherland, Yen Pham, Tamara Yawno, Ilias Nitsos, Lindsay Zhou, Tegan A White, Charmaine Rock, Rod W Hunt, Atul Malhotra, Beth J Allison, Suzanne L Miller, Courtney A McDonald

Exp Neurol . 2025 Jul 24:393:115397. doi: 10.1016/j.expneurol.2025.115397. Online ahead of print.

Background: Preterm brain injury involves persistent inflammation, making it a potential therapeutic target. Current large animal models focus on short-term outcomes, limiting understanding of long-term effects. We developed an ovine model of inflammation-induced preterm brain injury to assess long-term neuropathology at an age equivalent to early cerebral palsy diagnosis in human infants.
Methods: Fetal sheep were instrumented at gestational day (d) 90-91 (term is 148d): one group received lipopolysaccharide (LPS 200 ng; n = 9) on 96d, 97d, and 98d (0.65 gestation, ~25-26 weeks human brain development), and a control group received saline (n = 8). Birth was induced on 138d, and lambs were euthanised within 24 h of birth. Brains were evaluated for white matter injury, microglial/macrophage activation and astrogliosis in the subcortical (SCWM), periventricular (PVWM), and cortical (CWM) white matter, subventricular zone (SVZ), and corpus callosum (CC).
Results: Antenatal LPS administration was associated with significant persistent microglial/macrophage activation in the PVWM ($P = 0.04$), SCWM ($P = 0.01$), and CWM ($P = 0.006$). Furthermore, LPS exposure was associated with reduced oligodendrocyte cell number in the PVWM ($P = 0.02$), SCWM ($P = 0.001$), and CWM ($P = 0.0001$), and reduced nyelination in CWM (CNPase, $P < 0.0001$ and MBP, $P = 0.04$) and SVZ (MBP, $P = 0.05$). No difference in astrogliosis or microhaemorrhages was observed.
Conclusion: We demonstrated that in a large animal model of inflammation-induced intrauterine preterm brain injury, long-term persistent inflammation occurs, along with significant white matter injury, including loss of oligodendrocytes and reduced myelination in multiple white matter regions. This model paves the way for long-term evaluation of promising therapeutics and behavioral assessment in this clinically relevant model of persistent preterm brain injury.
PMID: 40714018

55.Neuroprotective effects of antenatal magnesium sulfate on neurodevelopmental outcomes in very low birth weight preterm infants: A 2-year follow-up study

Wai-Tim Jim, Jui-Hsing Chang, Hung-Yang Chang, Chun-Chih Peng, Chyong-Hsin Hsu

Observational Study Medicine (Baltimore) . 2025 Jul 18;104(29):e43385. doi: 10.1097/MD.0000000000043385.

Abstract
Antenatal magnesium sulfate (MgSO4) may provide neuroprotective benefits in preterm infants. This study examined the impact of antenatal MgSO4 on the neurodevelopmental outcomes of very low birth weight (VLBW) preterm infants at the corrected age of 2 years. This retrospective follow-up study included preterm infants with a birth weight ≤ 1500 g and gestational age ≤ 36 weeks who participated in a follow-up program. Antenatal MgSO4 was administered to treat maternal preeclampsia or for neuroprotection or tocolysis. Neurodevelopmental outcomes, including cerebral palsy (CP), neurodevelopmental impairment (NDI), and audiologic and visual assessments, were evaluated at a corrected age of 2 years. Infants exposed to MgSO4 were compared with unexposed controls. Among 328 VLBW infants (2007-2015), 133 were exposed to MgSO4, and 195 were not. Follow-up data were available for 93.3% of the infants. CP occurred in 6.0% of MgSO4 exposed infants versus 13.8% of controls (odds ratio: 0.39; 95% confidence interval: 0.18-0.91; P = .03). NDI was observed in 19.5% of exposed infants compared with 31.3% of controls (odds ratio: 0.53; 95% confidence interval: 0.32-0.90; P = .02). Multivariate logistic regression showed that low parental educational level (<college), birth weight (<1000 g), and periventricular leukomalacia were significantly associated with an increased rate of CP. Similarly, independent factors such as preeclampsia, low socioeconomic status, birth weight < 1000 g, male sex, and periventricular leukomalacia were significantly associated with an increased risk of NDI. Antenatal MgSO4 administration in pregnant women may have neuroprotective effects in VLBW preterm infants, reducing the risk of CP and NDI at the corrected age of 2 years.
PMID: 40696613