Cerebral palsy research news

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CP Alliance Chair of Cerebral Palsy Research

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Interventions and Management

1.Changes in Upper Limb Kinematics in Children With Cerebral Palsy After Lower Limb Surgery: A Retrospective Comparative Study

Yasar Samet Gokceoglu, Fuat Bilgili, Cansu Sardogan, Daghan Koyuncu, Mehmet Demirel, Ekin Akalan

BMC Musculoskelet Disord. 2026 Mar 3. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41772526

2.Accelerometric Decoding of Upper Extremity Movement Intention in Children With and Without Cerebral Palsy: Complementary Value of Mechanomyography

Marcela Correa, Ali Samadani, Ledycnarf J de Holanda, Yara Corky, Tom Chau

J Electromyogr Kinesiol. 2026 Feb 25:87:103126. Online ahead of print.

Abstract
Children with movement disorders often interact with their environment via targeted upper extremity movement, but athetosis and dystonia introduce variability. While accelerometry has been used for hyperkinetic movement analysis in cerebral palsy (CP), decoding movement intention remains difficult. This multiple case study examined whether integrating mechanomyographic (MMG) signals with motion data from six tri-axial accelerometers placed over major upper-limb muscles improved recognition accuracy during a tablet-based drawing task. Hidden Markov model classification showed that combining MMG with motion signals improved intention-decoding accuracy. In typically developing children, combined signals yielded 88.0 ± 5.6% quaternary classification accuracy. One participant with CP achieved similar performance, and all three participants with CP exceeded 70% accuracy when distinguishing between movement pairs. These results indicate that MMG may enhance movement-intention decoding, informing assistive technology design for motor-impaired individuals.
PMID: 41764881

3.Variability as a Marker of Motor Imagery in Cerebral Palsy: Between Intention and Action

Deisiane Oliveira Souto

Dev Med Child Neurol. 2026 Feb 28. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41762667

4.Selective Dorsal Rhizotomy Mediating Multidimensional Improvement in Ambulatory Children With Spastic Cerebral Palsy: A Longitudinal Case Series

Hailey Budnick, Kailah Young, Amaan Azeemullah, Sarah Johnson, Trevor Taylor, Jeffrey S Raskin, Francisco Angulo-Parker

J Neurosurg Pediatr. 2026 Mar 6:1–7. Online ahead of print.

Objective: Selective dorsal rhizotomy (SDR) is a gain-of-function procedure that involves selectively sectioning dorsal rootlets to decrease pathologically active myotatic reflexes mediating spasticity. SDR with physical therapy is supported by level I evidence as a treatment for ambulatory children with spastic cerebral palsy (CP). The Gross Motor Function Classification System (GMFCS) is a clinical assessment tool for gross motor function focused on ambulation and mobility, defined by categories graded on a scale from I, most ambulatory, to V, nonambulatory. The GMFCS is intended to provide a general overview of mobility and ambulation. Institutional practice variation in performing SDR coexists with a clinical consensus that ambulatory school-age children with GMFCS levels I through III derive the most benefit from the procedure, with limited evidence supporting SDR in nonambulatory children with CP (GMFCS levels IV and V). While there are several assessment systems to describe the motor functionality of patients with spasticity, they inadequately identify what aspect of motor function or gait improves after SDR. To investigate this, the authors conducted a retrospective study in a single-institution cohort of ambulatory children with spastic CP, comparing tone, gait parameters obtained from gait analysis data, and patient-reported outcomes before and after SDR.
Methods: All consecutive pediatric patients with spastic CP who, between February 2019 and August 2021, underwent both an SDR procedure and pre- and postoperative gait mapping at a single institution were included in the study. The gait parameters of step and stride length for each foot, stride velocity, and toe-in/-out angle were collected. Patient outcomes were determined via chart review.
Results: Ten ambulatory patients, 7 of whom were male, had serial gait mapping data and were included in the study. The mean age at surgery was 5.6 years, and the median preoperative GMFCS level was III. There were no major perioperative complications, and the patients were followed up with serial gait mapping for a mean of 2.8 years. The patient- and family-reported outcomes were improved in all patients. The mean ambulation velocity, step length, and stride length all increased, whereas the mean toe-in/-out angle differed in improvement bilaterally.
Conclusions: Children with spastic CP benefit from SDR in multiple dimensions including better patient-reported outcomes, tone control, and improved gait parameters. Improvements in step length, stride length, and velocity are asymmetrical, and the functional impact on gait should be explored in future studies.
PMID: 41791119

5.Inpatient Rehabilitation After Multi-Level Orthopedic Surgery in Youth With Cerebral Palsy: Discharge and 18-Month Mobility Outcomes

Stephanie Butler, Brittany Virgil, Chris Church, Katie Bushong, Laura Owens, M Wade Shrader, Jose J Salazar-Torres, Arianna Trionfo, Nancy Lennon

Phys Occup Ther Pediatr. 2026 Mar 2:1–17. Online ahead of print.

Aims: To describe mobility outcomes for youth with cerebral palsy (CP) who received inpatient rehabilitation (IPR) following multilevel surgery (MLS) and surgical and patient factors associated with mobility outcomes.
Methods: Data for 58 youth (mean age 13.5 years; GMFCS level II 53%; III 47%) who underwent high-burden MLS were retrospectively reviewed. Eighty-one percent received IPR following MLS; average length of stay was 4.3 weeks. The Functional Independence Measure for Children (WeeFIM) was administered at admission and discharge. The PODCI-TBM, GDI, and GMFM-D were administered preoperatively and at 18 months.
Results: Youth made significant gains in acute mobility function ($p < 0.0001$). Among GMFCS III youth, length of stay was significantly longer ($p = 0.03$). Lower WeeFIM cognitive scores and lower preoperative GMFM-D scores correlated with fewer mobility gains during IPR ($r = 0.48$, $p = 0.0007$). At 18 months, GDI improved significantly ($p < 0.01$), while GMFM-D and PODCI-TBM did not ($p > 0.05$).
Conclusion: Youth had improved mobility acutely after MLS, associated with cognition and preoperative gross motor function. IPR did not influence 18-month mobility improvements.
PMID: 41772809

6.The Influence of Spasticity on Goniometric Range of Motion Measurement in Children With Cerebral Palsy

Olof Lindén, Katarina Lauruschkus, Philippe Wagner, Gunnar Hägglund, Henrik Lauge-Pedersen

BMC Musculoskelet Disord. 2026 Mar 4. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41781917

7.Quantification of Muscle Morphology and Stiffness in Spastic Hemiplegic Cerebral Palsy Versus Typically Developing Controls Using Magnetic Resonance Elastography

Diego A Caban-Rivera, Curtis L Johnson, Chris Church, Daniel R Smith, M Wade Shrader, Stephanie Lee, Parma E Montufar Wright, Faaiza Kazmi, Arianna Trionfo, Jason J Howard

Clin Biomech (Bristol). 2026 Feb 24:135:106798. Online ahead of print.

Background: Increased muscle stiffness is common in cerebral palsy, but accurate and reliable methods for quantitative assessment are not established for cerebral palsy. Magnetic resonance elastography provides a robust approach to mapping skeletal muscle properties. This study aimed to assess muscle morphology and stiffness in the gastrocnemius-soleus complex in children with hemiplegic cerebral palsy, comparing more affected and less affected sides, and to legs of typically developing children.
Methods: Eleven children (age 11.5 ± 4.1 years) with spastic hemiplegic cerebral palsy (Gross Motor Function Classification System levels I/II; no botulinum toxin injections within 6 months) and fifteen typically developing children (age 13.1 ± 4.5 years) were prospectively enrolled. Magnetic resonance elastography measured both legs in participants with cerebral palsy and the dominant leg in controls. Additional imaging assessed muscle volume, cross-sectional area, and contractile to non-contractile tissue ratio. Normalized stiffness and anatomical features were compared between groups. Pearson correlations evaluated associations with age and between imaging measures.
Findings: Normalized stiffness in soleus was significantly higher in the more affected leg in unilateral cerebral palsy than the less affected leg (471 vs 328 Pa/cm2, p = 0.010) and the contractile tissue ratio also differed significantly (7.44 vs 10.25, p = 0.002). Gastrocnemius and soleus cross-sectional areas were reduced in the more affected side relative to controls, more markedly in soleus. Soleus stiffness showed significant positive correlations with age.
Interpretation: Results suggest increased stiffness and reduced contractile tissue in the soleus of the more affected leg in cerebral palsy, supporting the utility of magnetic resonance elastography in characterizing muscle pathology.
PMID: 41775054

8.The Approach to Hip Instability in Children With Cerebral Palsy: An Umbrella Review

Ana Paula Tedesco, Alessandro Melanda, Davi Moshe, Epitácio Rolim Filho, Francesco Camara Blumetti, Leonardo Cury Abrahão, Mauro César de Morais Filho, Patricia Moreno Grangeiro

EFORT Open Rev. 2026 Mar 2;11(3):208–223.

Purpose: Children with cerebral palsy (CP) are at high risk for progressive hip displacement, which may impair quality of life. This umbrella review synthesizes systematic reviews on hip evaluation, prevention, and treatment in children with CP.
Methods: Systematic reviews (2004–2024) on children aged 0–18 years were included. Searches spanned nine databases. Methodological quality was assessed using AMSTAR 2 and JBI criteria.
Results: Twenty-five systematic reviews addressed hip surveillance, tone management, preventive procedures, reconstructive and salvage surgeries. Hip surveillance reduced dislocation rates and decreased the need for salvage surgery. Postural and tone management showed inconsistent preventive effects. Combined pelvic and femoral osteotomies produced better outcomes than isolated procedures. Soft-tissue surgeries had high recurrence. Femoral hemiepiphysiodesis improved radiographic outcomes but often required revision. Salvage options relieved pain but carried functional limitations. Total hip arthroplasty improved pain and function but had high complication rates.
Conclusions: Evidence supports hip surveillance and combined surgical approaches but highlights significant gaps requiring further research.
PMID: 41770043

9.The Effects of Progressive Resistance Training on Lower Limb Strength in Adolescents With Cerebral Palsy: A Systematic Review and Meta-Analysis

Yu Fang, Weimin Zhang, Yang Zhang, Pengpeng Dong, Haolan Li, Sonthaya Sriramatr

J Back Musculoskelet Rehabil. 2026 Mar 5:10538127261428185. Online ahead of print.

Background: Cerebral palsy (CP) is a leading cause of physical disability in children, characterized by impaired motor function and muscle weakness. Progressive resistance training (PRT) has emerged as a potential strategy for improving lower limb strength, though the existing evidence remains inconsistent.
Objective: To assess the impact of PRT on lower limb muscle strength in youth with CP, compared to control or alternative interventions.
Methods: This study systematically reviewed randomized controlled trials (RCTs) following PRISMA guidelines. Six RCTs involving 232 participants with CP (ages 8–25 years, GMFCS levels I–III) were included in the quantitative meta-analysis. Standardized mean differences (Hedges' g) were calculated using a random-effects model. Risk of bias was assessed using the Cochrane RoB 2 tool, and evidence certainty was evaluated using GRADE framework.
Results: PRT significantly improved lower limb muscle strength compared to controls (Hedges' g = 0.46, 95% CI [0.26–0.66], $p < 0.001$) with low-to-moderate heterogeneity ($I2 = 25.6\%$). Evidence certainty was rated as MODERATE. Subgroup analyses suggested potentially larger effects for gym-based interventions and participants with GMFCS II–III. Sensitivity analyses confirmed result robustness. No serious adverse events were reported.
Conclusion: PRT effectively enhances lower limb strength in youth (8–25 years) with CP, particularly under structured, supervised conditions. Further research is needed to clarify its long-term functional and psychosocial benefits.
PMID: 41787863

10.Prediction Tool for Independent Walking in Children With Dyskinetic Cerebral Palsy: A Modeling Study

Lusha Qiao, Gongxun Chen, Yiwen Wang, Zhiwei Cheng, Zhichong Hui, Wenli Gao, Kaili Shi, Mingmei Wang, Xuexing Ding, Yongxia Wang, Guangyu Zhang, Lei Yang, Sansong Li, Dengna Zhu

BMC Pediatr. 2026 Mar 2. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41772507

11.Erratum to "Importance of Analyzing Spasticity and Co-Activation as Complementary Biomarkers of Gait in Children With Cerebral Palsy"

Gabriel Graffagnino, Benoît Sijobert, Karine Patte, Christine Azevedo-Coste, David Gasq

Clin Biomech (Bristol). 2026 Feb 27:106780. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41763994

12.A Field-Based Predictive Model for Evidence-Based Classification in Male Footballers With Cerebral Palsy

Raul Reina, José Antonio Quesada Rico, José Manuel Sarabia, Alba Roldan, Daniel Castillo, Aitor Iturricastillo, Matías Henríquez, María Isabel Cornejo, Javier Yanci

Scand J Med Sci Sports. 2026 Mar;36(3):e70247.

Abstract
Over a 6-year research period, the classification of footballers with cerebral palsy (CP) has identified the best activity limitation tests that best capture the influence of eligible impairments on performance, leading to the implementation of a new classification system (i.e., FT1-FT3 sport classes). This study aimed to (i) assess the sensitivity of these tests to discriminate among sport classes; and (ii) estimate predictors of activity limitation outcomes to enhance accuracy in class allocation. A total of 177 international-level male CP footballers (25.90 ± 6.13 years.; 67.70 ± 11.49 kg; 173.90 ± 8.07 cm; 156 outfield players and 21 goalkeepers) completed 11 field-based tests assessing activity limitation, including balance, coordination, jumping, change of direction ability, and dribbling capacity, and a 2 versus 2 small-sided game. Classification and regression tree analysis were used to develop predictive models of sport classes with probabilities calculated at each node, considering a final number of 7 tests. Significant differences were observed between sport classes in all variables, except in one-leg stance acceleration. Specific activity limitation test outcomes for dribbling skills, inter-limb coordination, and static balance predict the sport class allocation with a success rate of 72.1% for a valid sample of 111 CP footballers, and 75.2% for a subsample of 101 players excluding goalkeepers. The dribbling speed test is relevant for classifying those with severe (FT1) and moderate forms of impairment (FT2), while the one-leg stance test better predicts the class allocation of those with less impairment (FT3). This study provides empirical support for classifiers' decision-making and suggests distinct patterns of sport-specific activity limitations across current CP football sport classes.
PMID: 41792894

13.Power Training Combined With Interval Treadmill Training in Cerebral Palsy: An RCT

Noelle G Moreau, Kristie F Bjornson, Phil Hurvitz, Donald E Mercante

Pediatrics. 2026 Mar 5:e2025074493. Online ahead of print.

Objectives: Determine the effect of lower-extremity power training combined with interval treadmill training (PT3) on walking capacity and performance in children with cerebral palsy (CP).
Methods: In this multisite, single-blinded randomized clinical trial, children with spastic, bilateral CP between ages 10 and 17 years were randomized to receive 24 sessions of either PT3 or traditional strength training combined with steady-state treadmill training (STT). Primary outcomes were normalized self-selected and fast gait speed and muscle power. Participants were assessed at baseline, immediate postintervention, 2-month post, and 6-month post.
Results: Of 43 recruited participants (20 female participants; mean age 13.1 SD 2.2 years for PT3 group; mean age 13.8 SD 2.6 years for STT group), 38 were included in the final analyses. No differences between groups were observed for self-selected speed. PT3 had significantly greater change in fast speed from baseline to 2-month post compared with STT (adjusted mean difference [MD], 0.030; 95% CI, 0.002–0.059; P = .04). Change in muscle power from baseline to immediate post was significantly greater in the PT3 group (MD, 52.01; 95% CI, 5.63–98.39; P = .03). Stride rate intensity increased immediate post after PT3 (MD, 7.95; 95% CI, 0.45–15.95; P = .04).
Conclusions: Power training combined with high-intensity interval treadmill training was superior to an equivalent dosage of traditional strength training combined with steady-state treadmill training for improving muscle power immediate post-training and fast gait speed 2-month post-training. Increases in stride rate intensity after PT3 were not maintained at follow-up time points.
PMID: 41784138

14.Outcomes of Adherence to Play Therapy in Children With Cerebral Palsy: A Clinical Trial

S Lakshmi, Renukadevi Mahadevan, Lianta Linus, Aron Raju, Mohamed Ahmed Mohamed, Fahad Abdulelah Mohammed Aldauyj, Salma Ebrahim Alnuaimi

Clin Ter. 2026 Mar–Apr;177(2):376–383.

Background: Cerebral palsy (CP) is a group of non-progressive motor impairment syndromes secondary to lesions or anomalies of the developing brain. Play is an essential occupation of childhood, supporting performance skills. Research suggests play therapy may improve motor skills due to sensory and perceptual engagement.
Objective: The primary objective was to determine adherence to a structured play-therapy program in children with CP. The secondary objective was to explore changes in hand and upper-extremity function.
Methods: This pilot, single-arm clinical trial recruited 12 children aged 5–13 years with hemiplegic or diplegic CP. The intervention consisted of institution-based play therapy (45 minutes/day, 5 days/week for 6 weeks) plus a home component (2 days/week). Adherence was the percentage of prescribed sessions completed, with ≥75% defined as adherent. Upper-extremity function was measured using the QUEST before and after the program.
Results: Institutional adherence ranged from 59% to 96% (mean 86.4%); 11 of 12 children met the ≥75% adherence threshold. Home adherence ranged from 0% to 83%. QUEST scores increased from 47.65 ± 14.47 to 48.51 ± 14.61, with statistically significant improvement ($Z = -1.992$, $p = 0.046$).
Conclusion: Children with hemiplegic and diplegic CP demonstrated good adherence (84.6%) to the 6-week play-therapy program, with significant improvements in hand function. Larger controlled studies are needed to confirm effectiveness and address barriers to home adherence.
PMID: 41773379

15.Weight Measurements and Disease-Specific Growth Charts to Predict Clinical Outcomes in Children With Cerebral Palsy

Judy-April O Murayi, Laurie J Glader, Richard D Stevenson, Carson J Richardson, Praveen S Goday

Dev Med Child Neurol. 2026 Feb 28. Online ahead of print.

Aim: To determine whether weight-for-age (WFA) centiles on disease-specific growth charts predict clinical outcomes in children with cerebral palsy (CP). Method: We conducted a retrospective cohort study of pediatric patients with CP in Gross Motor Function Classification System levels III to V, treated at a tertiary care hospital from January 2016 to June 2022. Patients were categorized as above or below the 20th centile WFA using CP-specific growth curves. Clinical outcomes included emergency department and urgent care visits, hospital and pediatric intensive care unit (PICU) admissions, fracture incidence, surgical procedures, and mortality. Results: Of 127 patients (62.9% male, age range 3–20 years; mean age 10 years 7 months, SD 4 years 5 months), 113 were above and 14 were below the 20th centile. The 'below' group had a 122% higher mean number of emergency department and urgent care visits than the 'above' group ($p = 0.004$, adjusted incidence rate ratio: 2.22; 95% CI 1.29–3.8). They also had a median 1.5 more PICU admissions and 5.2 longer PICU days compared with the 'above' group. Mortality was 4.4% (5/113) in the 'above' group and 28.6% (4/14) in the 'below' group. Interpretation: Children with CP who fall below the 20th centile WFA appear to require more healthcare services and may face increased mortality risk. Maintaining WFA above the 20th centile may represent an important clinical target.
PMID: 41762660

16.Diagnostic Accuracy of Mid-Upper Arm Circumference-for-Age Z-Score (MUACZ) for Detecting Malnutrition in Children With Cerebral Palsy: A Cross-Sectional Study

Gülümse Oruçoğlu Başka, Hülya Kayılıoğlu

BMC Pediatr. 2026 Mar 6. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41792652

17.AI-Based Video Analysis for the Assessment of Upper Limb Function in Children With Unilateral Cerebral Palsy: Feasibility of Remote Monitoring

Youngsub Hwang, Hakje Yoo, Minkyung Kim, Myung Jin Chung, Jeong-Yi Kwon

J Neuroeng Rehabil. 2026 Mar 3. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41776622

18.Feasibility of Vigorous Extended Reality Tele-Exergaming for Cardiometabolic Health in Youth With Mobility Disabilities: Protocol for a Case Series Study

Byron Lai, Maggie Logan, Raven Young, Ashley Wright, Jordyn Terrell, Larsen Bright, Drew Davis, Christen J Mendonca

JMIR Res Protoc. 2026 Feb 27:15:e85246.

Background: Young people with mobility disabilities have limited options to maintain their cardiometabolic health and cardiorespiratory fitness. Active video gaming using extended reality head-mounted displays is becoming increasingly common for promoting serious exergaming. However, there is a need to identify dosing protocols that can potentially lead to meaningful improvements in cardiometabolic health and cardiorespiratory fitness.
Objective: This feasibility study aims to explore potential benefits of vigorous-intensity extended reality exergaming, conducted at home with telemonitoring for body composition and cardiometabolic health, in 4 young people with cerebral palsy and overweight or obesity. The secondary aim is to assess the effects of the program on cardiorespiratory fitness. The tertiary aim is to describe the safety and acceptability of the intervention.
Methods: This case study is a phase 1 feasibility trial with a pretest-to-posttest design including 4 participants. Young people with cerebral palsy and overweight or obesity (aged 13–24 years) will be purposively selected based on 2 mobility categories (ambulatory: n = 2; nonambulatory: n = 2). The intervention includes 240 minutes per week of vigorous-intensity exercise at home for 6 weeks, with telemonitoring and weekly coaching calls. Participants will use an immersive exergame via head-mounted display. Caregivers will schedule play time and monitor safety. Body composition will be measured by dual-energy x-ray absorptiometry before and after the intervention. Blood-related health indicators will be measured via blood spot tests, and blood pressure via sphygmomanometer. Cardiorespiratory fitness will be assessed using a portable metabolic cart during graded exercise testing. Quantitative and qualitative data will assess feasibility, and changes in outcomes will be descriptively analyzed.
Results: Recruitment began in October 2025, with data collection expected to conclude by December 2025. Full results are anticipated for publication in April 2026.
Conclusions: This feasibility study evaluates an accessible and intensive extended reality exercise program delivered via telehealth for youth with cerebral palsy. Findings will guide the development of a pilot efficacy trial targeting improved cardiometabolic health.
PMID: 41773697

19.Effectiveness of Robotic Rehabilitation Interventions in Children With Cerebral Palsy: Protocol for a Systematic Review and Meta-Analysis of Randomized Controlled Trials

Wei You, Kejimu Sunzi, Quanmin Deng, Lina Yin, Yang Gao, Yao Chen, Cheng Lei

Syst Rev. 2026 Mar 3. Online ahead of print.

Background: Cerebral palsy (CP) is the leading cause of childhood motor disability, often requiring intensive rehabilitation to improve motor function and independence. Robot-assisted therapy enables high-intensity, task-specific treatment, but evidence for its superiority over conventional rehabilitation interventions (CRIs) is inconsistent. This protocol describes a systematic review and meta-analysis evaluating robot-assisted therapy on motor outcomes in children with CP.
Methods: Developed per PRISMA-P guidelines, this review will search five databases from inception to June 2025. Included studies will be RCTs comparing robot-assisted therapy vs CRIs. Two reviewers will independently screen and extract data. Primary outcomes include gross motor function, ADL, gait, and balance; secondary outcomes include upper limb function and quality of life. Meta-analysis will use a random-effects model. Subgroup, sensitivity, publication bias, and trial sequential analyses will be conducted. Evidence quality will be assessed with GRADE.
Systematic review registration: PROSPERO CRD420250652267.
PMID: 41772722

20.CTNNB1-Related Disorders: Clinical and Radiological Contributions From a French Cohort

Eline Chauvet-Piat, Marie-Céline François-Heude, Gaël Manes, Arthur Coget, Nicolas Leboucq, Bérénice Lecardonnel, Heidy Baide-Mairena, Marine Allais, Souad Touati, Stéphanie Sanchez, Mirna Khalil, Hugues Chevassus, Marjolaines Willems, David Geneviève, Marion Serrand, Laure Mazzola, Vincent Dubard, Mathilde Renaud, Caroline Le Camus, Rebecca More, Mathieu Milh, Caroline Paris, Ians-Bouteiller Cécile, Agathe Roubertie

Front Neurol. 2026 Feb 18:17:1754143. eCollection 2026.

Abstract
CTNNB1 monoallelic pathogenic variants account for up to 4% of genetically determined cerebral palsy cases, yet their phenotypic spectrum remains poorly defined. We retrospectively analyzed 25 individuals with pathogenic CTNNB1 variants using medical records and a questionnaire. Data included genetic variants, perinatal history, developmental milestones, behavioral characteristics, head growth, feeding, sleep difficulties, neurological and ophthalmological assessments. Brain MRIs were reviewed by expert neuroradiologists. Twenty-two distinct heterozygous variants were identified. Microcephaly occurred in 16/22 patients. All exhibited global developmental delay, independent walking was achieved at a mean age of 2.1 years, with regression in 4/16 independent walkers. Behavioral disorders were frequent, as were oral sensorimotor disorders (21/25) and sleep disturbances (13/21). Lower limb hypertonia was present in 22/25 patients [spastic (8) and/or dystonic (11)]. Unstable gait were common among ambulatory patients. Exaggerated startle reactions, often since birth, were reported in 16/21. Exudative vitreoretinopathy was identified in 3/5 patients with retinal angiography. Brain MRI (19 patients) showed: thickening of anterior commissure (8), frontal lobe hypoplasia (9), widening of superior vermian sulci (10) and corpus callosum anomalies (7). This study broadens the spectrum of CTNNB1-related syndrome, reporting a complex motor phenotype combining (i) gait disturbances related to dystonic or non-dystonic hypertonia and unsteadiness, sometimes associated to dystonia in other body parts (ii) possible deterioration of motor achievements over the course of the disease (iii) an exaggerated startle reflex. New non-specific brain anomalies are precisely described. Our work underscores the need for registries and longitudinal studies to refine characterization and guide future therapies.
PMID: 41789168

21.Early Detection of Cerebral Palsy Through Context-Driven Implementation in Low- and Middle-Income Countries: From Impossible to Achievable

Joanne M George

Dev Med Child Neurol. 2026 Feb 28. Online ahead of print.

Abstract
(No abstract available.)
PMID: 41762670

22.Mental Health Difficulties in Cerebral Palsy: A Qualitative Study of Young People's and Parents' Perspectives

Manjula Manikandan, Jennifer Fortune, Jessica Burke, Aisling Walsh, Aoife Twohig, Ian McClelland, Amanda Breen, Meriel Norris, Jennifer M Ryan; RELATE-CP study team

Dev Med Child Neurol. 2026 Mar 4. Online ahead of print.

Aim: To explore the experiences of mental health difficulties and access to mental health support among young people with cerebral palsy (CP).
Method: We used a qualitative descriptive design. Participants were young people with CP aged 13 to 25 years and parents of children with CP (6–25 years). Nineteen semi-structured interviews were conducted. A narrative thematic analysis was conducted to identify themes related to their mental health experiences.
Results: Four themes were identified from the data: (1) understanding manifestations of mental health, triggers, and the importance of early intervention; (2) structural and human challenges in accessing mental health services; (3) the interplay between mental health and personal, social, educational, and familial challenges; (4) navigating future aspirations and holistic mental health support.
Interpretation: People with CP face complex, interconnected challenges to their mental health, influenced by personal, family, social, and systemic factors. Mental health difficulties often go unrecognized or are inadequately addressed, highlighting the need for early identification, integrated service provision, and holistic, person-centred interventions that support young people and their families.
PMID: 41782267

23.Relationship Between Cognitive Abilities and Motor Impairment in Persons With Cerebral Palsy: A Systematic Review

Evy Dhondt, Joke Opdenacker, Marjolein Huybens, Kristine Stadskleiv, Els Ortibus

Dev Neuropsychol. 2026 Mar 4:1–19. Online ahead of print.

Abstract
Cerebral palsy is primarily defined by motor impairments, yet cognitive difficulties frequently co-occur and influence development and daily functioning. This systematic review examined associations between motor function and cognition in individuals with CP, interpreting findings within the Cattell-Horn-Carroll framework. Twenty-eight studies were included. Both gross and fine motor impairments were consistently associated with lower overall intellectual functioning. However, evidence regarding specific CHC cognitive domains was limited and inconsistent. Substantial heterogeneity in study design, assessment instruments, and small samples constrained comparability. While the link between general intelligence and motor severity appears robust, domain-specific cognitive-motor relationships remain insufficiently established.
PMID: 41779166

24.Macrophages, Muscle Stem Cells, and Repair; Immunohistochemical Characteristics in Muscle Growth Impairments in Children With Cerebral Palsy

Guadalupe Meza, Ryan E Kahn, Neeraj M Patel, Jill E Larson, Vineeta T Swaroop, Sudarshan Dayanidhi

Am J Physiol Cell Physiol. 2026 Mar 4. Online ahead of print.

Abstract
Children with cerebral palsy (CP) have muscle growth impairments (muscle contractures), altered walking patterns and show markers of inflammation. During muscle repair macrophages coordinate with muscle stem cells-satellite cells (MuSC), which have previously been shown to be altered in abundance and function in children with CP. We investigated: 1) if macrophage populations in contractured muscles of children with CP are similar to typically developing (TD) children with a chronic ACL-tear, and 2) if macrophages, capillaries, MuSC, myonuclei, centrally nucleated fibers were associated with each other, indicative of repair. Thirty-six subjects participated in this study (CP: 11.2 ±0.7 years, 18M/12F, TD: 13.5 ±0.8 years, 3M/3F). Muscle biopsies were obtained during surgical correction for muscle contractures-adductors/gastrocnemius (CPCon), or vastus lateralis (TD-ACL and CP NonCon). Muscle cross-sections were immunohistochemically labeled for total, anti-inflammatory (M2) macrophages, capillaries, myofiber boundaries, while MuSC abundance, activation and proliferation information were used from a prior study. Macrophage subpopulations in CP Con were similar to TD-ACL muscles. Within CPCon there were positive associations between total, M1 macrophages, and MuSC content ($r = 0.54$, $r = 0.70$, $p < 0.05$, respectively), but not in the CP NonCon muscles. Centrally-nucleated fibers, myonuclear abundance and MuSC content were also positively associated with each other only in the CPCon muscles ($r = 0.65$, $r = 0.46$, $r = 0.66$, $p < 0.05$, respectively). In TD-ACL injured muscles similar associations were seen between macrophages and MuSC, central nucleation and myonuclear abundance. Collectively, our data suggest that contractured muscles in children with CP may be in a state of repair, similar to ACL-injured TD children.
PMID: 41778682

25.Managing Multidrug-Resistant Stenotrophomonas Maltophilia Sepsis in a Child With Cerebral Palsy and Global Developmental Delay: A Complex Rare Case From a Resource-Limited Setting

Bipesh Kumar Shah, Sadmarg Thakur, Lekhnath Yogi, Amit Yadav

Sage Open Pediatr. 2026 Feb 27:13:30502225251412942. eCollection 2026.

Abstract
Stenotrophomonas maltophilia is a hospital-acquired, multidrug-resistant pathogen posing major therapeutic challenges, especially in children with complex comorbidities. We report a case of a 5-year-old girl with cerebral palsy, global developmental delay, and epilepsy who developed S. maltophilia sepsis. She presented with fever and vomiting followed by rapid deterioration including pneumonia, septic shock, acute kidney injury, and new-onset seizures. Her course was complicated by a horseshoe kidney and suspected rectovaginal fistula. Empirical broad-spectrum antibiotics failed to improve her condition until blood cultures identified S. maltophilia susceptible only to trimethoprim-sulfamethoxazole, levofloxacin, and ciprofloxacin. Targeted therapy led to gradual recovery. Additional management included central line removal, antifungal therapy for persistent candiduria, and optimization of antiepileptic treatment. This case emphasizes the importance of early microbiological diagnosis, individualized pathogen-directed therapy, and close monitoring in resource-limited pediatric settings.
PMID: 41773275

26.The Role of Pallidotomy in the Precision Medicine Era

Giacomo Garone, Alice Innocenti, Alessandro De Benedictis, Maria Camilla Rossi-Espagnet, Franco Randi, Donatella Lettori, Simone Reali, Flaminia Frascarelli, Alessandra Savioli, Silvia Cossu, Laura Cantonetti, Nazaret Infante, Nicola Specchio, Carlo Efisio Marras
Front Neurol. 2026 Feb 13:17:1735969. eCollection 2026.

Background: Use of radiofrequency pallidotomy (RP) for medically refractory dystonia has declined since deep brain stimulation (DBS) became standard. However, severe comorbidities common in children with dystonia may limit DBS eligibility. RP may be a valuable alternative, but evidence remains limited.
Methods: Records of patients undergoing RP at a single institution were reviewed. Outcomes were assessed via the Clinical Global Impression-Improvement scale; recurrence was evaluated for those with status dystonicus (SD).
Results: Eighteen patients underwent 21 procedures. Sixteen received bilateral pallidotomy; two underwent unilateral pallidotomy after DBS removal. Three required repeated surgery for recurrent SD. Ten had acquired dystonia (including CP), five genetically confirmed dystonia, three idiopathic. Mean follow-up (excluding three early losses) was 6.62 ± 3.65 years. At three months, 12 of 16 improved; at final follow-up, outcomes ranged from unchanged to worsened in many patients. Among six with ongoing SD, crises resolved over ~50 days. SD recurred in eight patients after ~20 months.
Conclusion: RP is a feasible rescue therapy for severe refractory SD when DBS is contraindicated. Short-term improvements are common, but benefits frequently decline, with high recurrence rates in dyskinetic CP.
PMID: 41767011

Prevention and Cure

27.Early Multimodal Assessment for Prediction of Cerebral Palsy in Neonatal Hypoxic-Ischemic Encephalopathy

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Objective: To determine the predictive value of magnetic resonance imaging (MRI), amplitude-integrated electroencephalography (aEEG), the Hammersmith Neonatal Neurological Examination (HNNE), and the General Movements Assessment (GMA) for cerebral palsy (CP) in neonates with hypoxic-ischemic encephalopathy (HIE), and to evaluate whether combining these modalities improves diagnostic accuracy.
Study design: In this prospective two-center cohort study, 53 term or late-preterm infants with HIE treated with standardized therapeutic hypothermia (33.5 °C for 72 h) were evaluated. aEEG and MRI findings were compared with concurrent HNNE and GMA results. CP was diagnosed during follow-up by a pediatric neurologist blinded to neonatal data. Diagnostic performance was analyzed using receiver-operating characteristic (ROC) curves and multivariable logistic regression according to STROBE guidelines.
Results: CP developed in 11 infants (20.8%). aEEG showed the highest predictive accuracy (AUC = 0.816 [95% CI 0.65-0.98]), and abnormal aEEG independently predicted CP (OR = 18.5, p = 0.004). The combined "MRI or aEEG abnormal" model achieved the best overall accuracy (86.8%), with sensitivity = 90.9% and negative predictive value = 97.3%. MRI and HNNE had moderate predictive value, whereas GMA showed high specificity but low sensitivity.
Conclusion: aEEG emerged as a robust and independent early biomarker for CP prediction after HIE. Combining aEEG with MRI substantially enhanced diagnostic precision, reflecting complementary functional and structural brain injury mechanisms. Although HNNE and GMA add screening value, they are insufficient alone. Standardized multimodal protocols integrating structural (MRI), functional (aEEG), and clinical (HNNE-GMA) assessments should be incorporated into clinical practice to improve early prognostication and guide neuroprotective interventions.
PMID: 41791421

28.An Updated Meta-Analysis of Umbilical Cord Blood to Treat Cerebral Palsy: Distinguishing Cord Blood Infusions From Mesenchymal Stromal Cell Therapy

An Duong, Risa Shorr, David S Allan

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Abstract
Treatment with umbilical cord blood (UCB) for cerebral palsy (CP) remains experimental. This updated meta-analysis assessed the efficacy of UCB mononuclear cells (MNCs) and UCB-derived mesenchymal stromal cells (MSCs). A systematic review of controlled clinical trials to November 2024 identified ten trials (621 patients). Seventy-one percent received UCB-MNCs; three trials used UCB-MSCs, and one compared MSCs vs MNCs. Dosage and administration varied. Meta-analysis of GMFM score change at 12 months (seven studies) showed improvement in the intervention group compared to controls (SMD = 0.5828, 95% CI 0.19–0.98, p = 0.004). Subgroup analysis showed no significant improvement for MNCs alone, while MSCs demonstrated significant improvement (SMD = 0.9192, 95% CI 0.33–1.50, p = 0.002). UCB-MSCs appear more promising than UCB-MNCs. Larger RCTs with longer follow-up are needed to confirm benefits.
PMID: 41771239