Cerebral palsy research news

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Interventions and Management

1.Early developmental trajectories of the impaired hand in infants with unilateral cerebral palsy

Leanne Sakzewski, Susan Greaves, Ann-Christin Eliasson, Margaret Wallen, Iona Novak, Robert S Ware, Jill Heathcock, Nathalie Maitre, Roslyn N Boyd

Dev Med Child Neurol . 2025 Jan 18. doi: 10.1111/dmcn.16240. Online ahead of print.

Aim: To identify developmental trajectories of impaired hand function in infants aged 3 to 15 months with unilateral cerebral palsy (CP).
Method: Sixty-three infants (37 male; median gestational age 37 weeks [interquartile range 30-39.1 weeks]) recruited as part of a randomized trial with a confirmed diagnosis of unilateral CP were included. All infants received early upper limb therapy. The Hand Assessment for Infants (HAI) was completed at baseline and until 12 to 15 months corrected age. Group-based trajectory modelling identified groups with similar trajectories of development of impaired hand function. Multinomial logistic regression determined associations between demographic variables and trajectory membership.
Results: The three-group trajectory model comprised 'low' 29%, 'moderate' 35%, and 'high' 36% functioning groups. The relative risk ratio of being in the low or moderate relative to high group increased by 16% (95% confidence interval [CI] 1.02-1.32) and 14% (95% CI 1.01-1.29) respectively for each 1 week increase in gestational age. Males were more likely to be in the low relative to high group (relative risk ratio 7.22; 95% CI 1.6-32.5).
Interpretation: Three distinct trajectories of development of the impaired hand were identified. Males and infants born closer to term age were at higher risk of being in a low group with little improvement over time, despite receiving early intervention.
PMID: 39826100

2.A Case Report of Cryoneurolysis With Factor VIII Administration for Cerebral Palsy-related Spasticity in a Patient With Hemophilia A

Griffin Mumby, Laura Schatz, Everett Claridge, Mahdis Hashemi, Paul Winston

Case Reports Adv Rehabil Sci Pract . 2025 Jan 15:14:27536351241311802. doi: 10.1177/27536351241311802. eCollection 2025 Jan-Dec.

Abstract
Spasticity affects up to 80% of individuals with cerebral palsy and can lead to pain and difficulties with performing activities of daily living. If left untreated, spasticity can progress to contracture and neuro-orthopedic deformities. Cryoneurolysis is an emerging and mini-invasive ultrasound-guided technique that causes secondary axonotmesis of peripheral nerves through the formation of an ice ball and may result in months to years of improved range of motion and reduced pain in patients with spasticity. However, the safety of cryoneurolysis has not yet been established in patients with an increased bleeding risk secondary to Hemophilia A. We present a case of cryoneurolysis for cerebral palsy-related spasticity in a 14-year-old male with hemophilia A who previously had minimal benefit from botulinum toxin for increased elbow and wrist flexor tone with contracture. Fifteen minutes prior to cryoneurolysis, an IV infusion of 2000 IU of recombinant antihemophilic factor (FVIII) was administered for bleeding prophylaxis. Targets were identified with ultrasound guidance and nerve stimulation and cryoneurolysis was performed without bleeding complications or adverse events. There was an immediate improvement in tone and range of motion that was maintained at 3- and 8-month follow-ups with reported increased left arm function. This case suggests that cryoneurolysis is an effective mini-invasive procedure for spasticity that improves tone and range of motion and is safe for use in patients with Hemophilia A who receive adequate Factor VIII prophylaxis.
PMID: 39823092

3.Anticipatory and Compensatory Postural Adjustments in Sitting and Standing Positions During Functional Activities in Children With Cerebral Palsy

Priyal Vasani, Amitesh Narayan, Akshatha Nayak, Mohammed Alsulaimani, Abdul Rahman Alzahrani

Physiother Res Int . 2025 Jan;30(1):e70028. doi: 10.1002/pri.70028.

Background and purpose: Anticipatory postural adjustments (APA) and compensatory postural adjustments (CPA) have played a vital role in postural control since early childhood, which is critical to accomplishing activities in daily life. However, literature indicated dissimilarities and inconsistencies in APA and CPA analysis in sitting and standing positions in children with Cerebral Palsy (CP). Thus, this study analyzed the changes in postural control (APA and CPA) through the postural muscles [rectus abdominis (RA) and erector spinae (ES)] in both standing and sitting positions during functional activities (grasping a ball) in children with CP.
Methods: Children with CP [N = 21] aged 5-13 years having GMFCS levels I (n = 12) and II (n = 9) participated. Surface electromyography (EMG) was performed for postural muscles (ES and RA) to measure the APA and CPA with two types of loads (heavy and light) in both sitting and standing positions.
Results: Children with CP showed increased EMG amplitude for APA and CPA with a heavier load than light load in sitting and standing positions. The EMG amplitude of CPA in sitting and standing for both load conditions was significantly higher than that of APA.
Discussion: The findings suggest rehabilitation programs should enhance APA and CPA through targeted exercises and load management strategies. These insights have the potential to inform clinical practices, improve postural stability, and ultimately strengthen the ability of children with CP to perform daily activities with greater ease and confidence, thereby significantly impacting the quality of life.
PMID: 39804176

4.The 24-hour physical activities in adults with cerebral palsy and their adherence to the 24-hour movement guideline

Ilse Margot van Rijssen, Jan Willem Gorter, Johanna Maria Augusta Visser-Meily, Manin Konijnenbelt, Marieke van Driel, Mandy Geertruda Cornelia Carina van Drunen, Olaf Verschuren

Arch Phys Med Rehabil . 2025 Jan 9:S0003-9993(25)00024-3. doi: 10.1016/j.apmr.2024.12.021. Online ahead of print.

Objective: To describe 24-hour physical activities (sleep and physical activity) in adults with cerebral palsy (CP), explore potential influencing factors and compare 24-hour physical activities with controls.
Design: Cross-sectional, observational internet study involving adults with CP and a convenience sample of adults without CP.
Setting: Individuals residing in the Netherlands Participants: 110 adults with CP (median age 42, range 28-77 years; 64 (58%) ambulant; 40% male) and 89 adult controls (median age 43, range 18-78 years; 29% male).
Main outcome measures: Sleep quantity and quality measured by the Pittsburgh Sleep Quality Index, physical activity measured using the International Physical Activity Questionnaire- Short Form, and health status using the 5-level EQ-5D.
Results: Most recurrent sleep problems for adults with CP included falling asleep, waking up, needing the toilet, having nightmares, and experiencing pain during the night. Sleep quality was significantly worse for adults with CP compared to controls. 64% of adults with CP met the physical activity guidelines. Total physical activity was similar between adults with CP who are ambulatory and controls. 44% of adults with CP, compared to 51% controls, met both sleep and physical activity guidelines. No factors influencing the 24-hour activities were found for level of severity, age, sex, pain/discomfort, and anxiety/depression.
Conclusions: Given the prevalence of worse sleep quality and modest adherence to the 24-hour movement guideline, this study emphasizes the importance for clinicians to assess problems in physical activities during clinical encounters with adults with CP.
PMID: 39798894

5.Erratum to "The relation between visual functions, functional vision, and bimanual function in children with unilateral cerebral palsy" [Research in Developmental Disabilities 152 (2024) 104792]

Monica Crotti, Els Ortibus, Nofar Ben Itzhak, Lize Kleeren, Lisa Decraene, Nicolas Leenaerts, Hilde Feys, Lisa Mailleux

Published Erratum Res Dev Disabil . 2025 Jan 14:157:104920. doi: 10.1016/j.ridd.2025.104920. Online ahead of print.

No abstract available
PMID: 39813885

6.Executive function is associated with behaviour problems in children and adolescents with cerebral palsy and intellectual disability

Xun Li, Stewart Einfeld, Roger Stancliffe, Antoinette Hodge

J Intellect Dev Disabil . 2025 Jan 17:1-14. doi: 10.3109/13668250.2024.2446215. Online ahead of print.

Background: Children and adolescents with cerebral palsy (CP) commonly have behaviour problems. The present study aimed to determine which of the most common clinical features experienced by children and adolescents with CP and intellectual disability are associated with behaviour problems.
Method: We investigated 11 possible associated variables including epilepsy, visual and hearing impairments, motor difficulties, communication and speech difficulties, pain, sleep disturbance, executive function (EF) deficits, type of CP, and parent stress. Thirty-eight parents or guardians of children aged 6 to 17 years with CP and intellectual disability (parent informed) completed proxy and self-report standardised questionnaires.
Results: EF deficits and parent stress were significantly associated with behavioural problems.
Conclusion: For children and adolescents with CP and intellectual disability, the present study suggests close attention should be placed on specific clinical features including EF deficits and parent stress when considering variables associated with behaviour problems.
PMID: 39819150

7.Prevalence of and risk factors for osteoporosis and fragility fracture in adults with cerebral palsy: A systematic review

Anne Trinh, Ellen Fremion, Shayan Bhathena, Craig F Munns, Prue Morgan, Daniel G Whitney, Bernadette Gillick, Margaret Zacharin, Darcy Fehlings, Amanda J Vincent, Frances Milat

Review Dev Med Child Neurol . 2025 Jan 17. doi: 10.1111/dmcn.16234. Online ahead of print.

Abstract
Aim: To systematically review the prevalence and incidence of osteoporosis, osteopenia, low bone mass, and fragility fracture in adults with cerebral palsy (CP), and identify the risk factors for osteoporosis and fracture.
Method: A systematic literature search was performed in the MEDLINE, PubMed, CINAHL, AMED, Cochrane Reviews, EMBASE, and EBM database reviews from inception until May 2024. Search terms covered a combination of keywords for CP, fracture, osteoporosis, incidence and prevalence, and risk factors. Participants were adults with CP aged 18 years and older. JBI critical appraisal instruments were used to assess quality and risk of bias.
Results: Seventeen of 303 studies met the eligibility criteria to assess the prevalence and incidence of osteoporosis and fracture, and 16 of 663 studies to assess risk factors. Osteoporosis prevalence was 5% in a general adult population with CP, increasing to 43% in those attending outpatient clinics. Osteoporosis incidence reported in one study was 2.85 per 1000 person years. Prevalence of fragility fracture was 5.5% overall but up to 38% in outpatient settings. Risk factors for osteoporosis and fracture included mobility status, nutritional status, and anticonvulsant use.
Interpretation: Low bone density and fracture is common in adults with CP with reduced mobility. The main risk factors for poor bone health are related to reduced mobility, nutrition, and anticonvulsant use.
PMID: 39825475

8.Deep learning empowered sensor fusion boosts infant movement classification

Tomas Kulvicius, Dajie Zhang, Luise Poustka, Sven Bölte, Lennart Jahn, Sarah Flügge, Marc Kraft, Markus Zweckstette, Karin Nielsen-Saines, Florentin Wörgötter, Peter B Marschik

Commun Med (Lond) . 2025 Jan 14;5(1):16. doi: 10.1038/s43856-024-00701-w.

Background: To assess the integrity of the developing nervous system, the Prechtl general movement assessment (GMA) is recognized for its clinical value in diagnosing neurological impairments in early infancy. GMA has been increasingly augmented through machine learning approaches intending to scale-up its application, circumvent costs in the training of human assessors and further standardize classification of spontaneous motor patterns. Available deep learning tools, all of which are based on single sensor modalities, are however still considerably inferior to that of well-trained human assessors. These approaches are hardly comparable as all models are designed, trained and evaluated on proprietary/silo-data sets.
Methods: With this study we propose a sensor fusion approach for assessing fidgety movements (FMs). FMs were recorded from 51 typically developing participants. We compared three different sensor modalities (pressure, inertial, and visual sensors). Various combinations and two sensor fusion approaches (late and early fusion) for infant movement classification were tested to evaluate whether a multi-sensor system outperforms single modality assessments. Convolutional neural network (CNN) architectures were used to classify movement patterns.
Results: The performance of the three-sensor fusion (classification accuracy of 94.5%) is significantly higher than that of any single modality evaluated.
Conclusions: We show that the sensor fusion approach is a promising avenue for automated classification of infant motor patterns. The development of a robust sensor fusion system may significantly enhance AI-based early recognition of neurofunctions, ultimately facilitating automated early detection of neurodevelopmental conditions.
Plain language summary
Study of the movements of infants enables evaluation of development. We explored whether combining information obtained from different types of detectors, able to assess pressure, motion, and visually, improved the accuracy of results. Different ways to combine data from these different detectors were tested, and it was found that using all three together produced the most accurate results. Our approach could be further developed to allow more reliable automated tools to detect problems with development in infants, potentially leading to earlier diagnosis and intervention in disorders such as cerebral palsy.
PMID: 39809877

9.Family Perspectives on Functional Priorities for Brazilian Children and Adolescents with Cerebral Palsy

Amanda Aparecida Alves Cunha Nascimento, Deisiane Oliveira Souto, Gabriela Silva Oliveira, Arthur Felipe Barroso de Lima, Thalita Karla Flores Cruz, Vitor Geraldi Haase

Occup Ther Health Care . 2025 Jan 13:1-21. doi: 10.1080/07380577.2025.2450694. Online ahead of print.

Abstract
This study aimed to identify the functional priorities of parents/guardians of Brazilian children and adolescents with cerebral palsy (CP) and to examine possible variations in priorities concerning different age groups and functional classifications. This cross-sectional study included 171 children with CP (mean age: 7.68 ± 3.32 years). The Canadian Occupational Performance Measure was administered to the families to identify functional priorities. Among the 740 functional priorities identified, activities of daily living (ADLs) were the most frequent, followed by priorities related to body functions, motor skills, and play. The functional priorities were similar across different functional levels and age groups.
PMID: 39804799

10.Family reflections: a whole person: navigating aging and cerebral palsy

Jocelyn Cohen

Pediatr Res . 2025 Jan 17. doi: 10.1038/s41390-025-03825-4. Online ahead of print.

No abstract available
PMID: 39824942

11.Monitoring Treatment Fidelity in a Pragmatic Pediatric Rehabilitation Trial Comparing Two Physical Therapy Schedules: Analysis and Unexpected Findings

Elizabeth Maus, Kimberley Scott, Rachel Ferrante, Sandy Antoszewski, Jill Heathcock

Phys Ther . 2025 Jan 17:pzaf004. doi: 10.1093/ptj/pzaf004. Online ahead of print.

Objective: This study aimed to describe the monitoring of treatment fidelity in a pragmatic pediatric rehabilitation trial using the National Institutes of Health Behavior Change Consortium framework, and to identify child and therapist factors that influence treatment fidelity.
Methods: Therapists (n = 28) were trained in the key ingredients (1-on-1, functional, goal-directed, motor learning intervention) and study protocol for a comparative effectiveness trial titled: A Comparison: High Intensity periodic vs. Every week therapy in children with cerebral palsy (ACHIEVE) for children ages 2 to 8 years with cerebral palsy. Therapists were instructed to record every tenth hour of treatment. A subset of recordings were used to monitor treatment fidelity so that each therapist was rated twice using the study- specific ACHIEVE Treatment Fidelity Checklist. Generalized linear mixed effects modeling and logistic regression were used to analyze child and therapist factors related to treatment fidelity.
Results: Median treatment fidelity scores were high (>80%). With training, therapist's years of experience and specialty certification do not significantly impact treatment fidelity. There is a trend toward lower treatment fidelity scores for children with communication difficulties, particularly for therapist's use of multi-modal instructions to direct the child in the desired activity.
Conclusion: Functional, goal-directed, motor learning intervention can be delivered with high fidelity for children with cerebral palsy within a busy clinical setting. Motor learning principles may be implemented differently for children with communication difficulties. More research is needed to explore optimal motor learning strategies for these children.
Impact: With training, physical therapists can deliver high-fidelity intervention to children with cerebral palsy across all Gross Motor Function Classification System levels within a busy clinical setting. Therapists may use motor learning principles differently in children with communication delays.
PMID: 39823290

12.Early Intervention for Children With Developmental Disabilities and Their Families via Telehealth: Systematic Review

Yoomi Shin, Eun Ju Park, Anna Lee

Review J Med Internet Res . 2025 Jan 17:27:e66442. doi: 10.2196/66442.

Background: Early intervention during the first 3 years of life is crucial for children with developmental disabilities to optimize developmental outcomes. However, access to such services is often limited by geographical distance and resource constraints. Telehealth can be part of a solution for overcoming these barriers, enabling the delivery of early intervention services. However, a comprehensive understanding of the efficacy and implementation of telehealth in early interventions remains elusive, particularly for children aged 0-3 years.
Objective: This systematic review aims to synthesize existing research on the effectiveness and implementation of telehealth interventions in infants and toddlers (aged 0-3 years) who are at risk of or diagnosed with developmental disabilities. The primary objective of the study is to evaluate the ways that telehealth compares to conventional in-person interventions in improving developmental outcomes for children and supporting family well-being.
Methods: A systematic search was conducted of 4 electronic databases (PubMed, Embase, CINAHL, and Web of Science), focusing on studies published between 2010 and 2024. The inclusion criteria were studies involving telehealth interventions for children aged 0-3 years who were at high risk or had developmental disabilities, which involved active interactions between the providers and the families. Study quality was assessed using the mixed methods appraisal tool, and a narrative synthesis was used to analyze the data.
Results: Eighteen studies met the inclusion criteria: 12 single-case designs, 4 randomized controlled trials, and 2 nonequivalent control group designs. All studies involved caregiver-child dyads, with child ages ranging from 5 to 37 months and having or at risk of autistic spectrum disorder (n=10, 56%), cerebral palsy (n=4, 22%), and other conditions (n=4, 22%). Synchronous videoconferencing was the primary modality for caregiver training and coaching (n=17, 94%) while 1 intervention used an Internet of Things system. Outcomes were identified in child communication (n=9, 50%), physical (n=6, 33%), social or emotional (n=6, 33%), and adaptive behavior (n=4, 22%), as well as caregiver implementation (n=12, 66%). Telehealth demonstrated comparable or superior effectiveness to traditional in-person methods in 2 studies. However, the focus on specific conditions and limited research on cognitive development were notable gaps.
Conclusions: Telehealth can be a viable alternative to traditional in-person early interventions for young children who have developmental disabilities and their families. It enhances accessibility and interactions between families and providers at a distance while promoting family-centered care. Challenges exist, including those of technological literacy, and the lack of research on cognitive outcomes must be addressed. Future work should explore more comprehensive interventions, including multidisciplinary approaches and expanded family outcomes, to solidify the role that telehealth plays in early intervention.
Trial registration: PROSPERO CRD42024551286; https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=551286.
PMID: 39819975

13.Enhancing quality of life in individuals with cerebral palsy: a systematic review and meta-analysis of physiotherapy interventions

Adrielle Andrade Passos, Franciely Oliveira de Andrade Santos, Ricardo Mario Arida, João Angelo Ferres Brogin, Jean Faber, Citlali López-Ortiz, Lavínia Teixeira-Machado

Review Disabil Rehabil . 2025 Jan 15:1-23. doi: 10.1080/09638288.2024.2443040. Online ahead of print.

Purpose: This systematic review examined studies that addressed physiotherapy intervention approaches to the Quality of Life (QoL) of people with Cerebral Palsy (CP).
Materials and methods: We conducted a comprehensive search strategy in five databases (PEDro, PubMed, Web of Science, Scopus, and Google Scholar) until 12 February 2024. We assessed the included studies' methodological quality and statistical description using the PEDro scale. We performed a meta-analysis using random-effect models to synthesize the results of different physiotherapy interventions and their impact on QoL.
Results: We included 37 studies that met the eligibility criteria, involving people with CP aged between 18 months and 53 years across all levels of the Gross Motor Function Classification System (n = 1541). The included studies present a considerable variation in scales, duration, types of therapies, and number of sessions. The meta-analysis demonstrated significant standardized mean differences in favor of alternative physiotherapy compared to conventional physiotherapy, considering a single general index of QoL.
Conclusion: Findings from the included studies indicate that alternative physiotherapy can improve the QoL for people with CP, but the results vary. A personalized, comprehensive approach is essential, emphasizing high-frequency, guided activities. More rigorous research is needed for those with GMFCS levels IV and V.
Plain language summary
Improving Quality of Life (QoL) for people with Cerebral Palsy (CP) requires tailored physiotherapy interventions.To improve

QoL, rehabilitation professionals should prioritize alternative approaches, such as task-oriented training, constraint-induced movement therapy, and dual-task training.Intervention protocols should ensure adequate frequency, duration, and intensity, as insufficiently dosed interventions are frequently associated with limited or nonsignificant improvements in QoL outcomes.
PMID: 39811998

Prevention and Cure

14.Increasing Use of Antenatal Magnesium Sulphate Prior to Preterm Birth for Preventing Cerebral Palsy in Australia and New Zealand, 2012-2020: A Binational Registry Study

Emily Shepherd, Sarah McIntyre, Alice Rumbold, Tasneem Karim, Shona Goldsmith, Amy Keir, Amanda Poprzeczny, Rod W Hunt, Nadia Badawi, Christopher J D Mckinlay, Caroline A Crowther, Lisa Yelland; Australian and New Zealand Neonatal Network (ANZNN)

Aust N Z J Obstet Gynaecol . 2025 Jan 16. doi: 10.1111/ajo.13937. Online ahead of print.

Abstract
We assessed the use of magnesium sulphate prior to preterm birth for preventing cerebral palsy in an Australian and New Zealand registry study. Use increased markedly from 32.3% (2012) to 78.8% (2020) ($p < 0.001$). Binational approaches to sustain and explore the feasibility of further increasing use, informed by evolving evidence and guidelines, are needed.
PMID: 39821226

15.Safety and Efficacy of Autologous Bone Marrow Derived Mononuclear Cell Transplant in the Management of Various Neurological Disorders

Sanjay Kala, Anchal Aggarwal, Bhagat Singh Rajput, Chayanika Kala, Santosh K Barman

Cureus . 2024 Dec 12;16(12):e75617. doi: 10.7759/cureus.75617. eCollection 2024 Dec.

Abstract
Background: Cerebral palsy (CP), traumatic spinal cord injury (SCI), and muscular dystrophy (MD), among the various other neurological disorders, are major global health problems because they are chronic disorders with no curative treatments at present. Current interventions aim to relieve symptoms alone and therefore emphasize the necessity for new approaches.
Objective: This study aims to assess the safety and efficacy of autologous bone marrow-derived mononuclear cell (BM-MNC) therapy in patients with CP, traumatic SCI, and MD. Functional improvement and safety are the primary outcomes, while secondary outcomes include patient-reported improvement in quality of life.
Methods: This was a single-arm, open-label prospective study conducted on 100 patients with CP, SCI, and MD at the GSVM Medical College, Kanpur, India. Bone marrow aspirates were processed via centrifugation, and autologous BM-MNCs were administered intrathecally or intramuscularly. Gross motor function classification system (GMFCS) for CP, the American spinal injury association (ASIA) motor score for SCI, and the north star assessment for limb girdle type dystrophies (NSAD) for MD were used for functional outcome assessment at baseline and at post-treatment cycles. Informed consent was obtained, and the study was approved by the ethics committee. Paired t-tests were used to analyze statistical significance ($p<0.05$).
Results: Functional improvements were significant with autologous BM-MNC therapy. Improved motor and cognitive function were shown in CP patients with reduced GMFCS scores ($p<0.001$). Upper and lower extremity ASIA motor scores improved markedly ($p<0.001$) in SCI patients. Stabilized muscle strength was seen in MD patients, with increased NSAD and activities of daily living (ADL) scores, suggesting slowing of the disease progression ($p<0.019$). Side effects were mild and transient.
Conclusion: Autologous BM-MNC therapy appears to be a promising, minimally invasive option for patients with CP, SCI, and MD, which appears to markedly improve functional outcomes and quality of life and may therefore be relevant to clinical practice.
PMID: 39803099