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Interventions and Management

Interventions and Management

1. Radiographic and Clinical Results of Combined Bone and Soft-Tissue Tailored Surgeries for Hip Dislocation and Subluxation in Cerebral Palsy

Giulia Beltrame, Artemisia Panou, Andrea Peccati, Haridimos Tsididakis, Francesco Pelillo, Nicola Marcello Portinaro

Children (Basel) . 2025 Jan 15;12(1):91. doi: 10.3390/children12010091.

Background/objectives: The aim of the study is to present middle-term results of tailored bone and soft-tissue surgeries in subluxated and dislocated hips in children affected by cerebral palsy.

Methods: A total of 87 medical records belonging to 73 children affected by CP, treated with combined soft-tissue releases, VDO, and pelvic osteotomy, were reviewed retrospectively. Radiological measurements of AI, RI, and NSA were obtained before surgery, postoperatively, at 12 and 24 months after surgery. Results were assessed globally and by GMFCS, age, and Robin score.

Results: Postoperative results are not statistically influenced by age and GMFCS levels at surgery. All three radiographic parameters showed persistent statistically significant improvement after surgery and at follow-up, respectively.

Conclusions: Obtaining the best possible concentric reduction of the femoral head in the acetabulum, with simultaneous multilevel soft-tissue rebalancing, creates the best mechanical and biological environment to allow the reshaping of both articular surfaces, obtaining physiological internal joint pressure. The anatomical best congruency is protective from recurrence.

PMID: [39857922](https://pubmed.ncbi.nlm.nih.gov/39857922/)

2. Muscle power is associated with higher levels of walking capacity and self-reported gait performance and physical activity in individuals with cerebral palsy

Mattie E Pontiff, Abhinandan Batra, Li Li, Noelle G Moreau

Front Physiol . 2025 Jan 6:15:1488905. doi: 10.3389/fphys.2024.1488905. eCollection 2024.

Introduction: The purpose of this study was to investigate the relationships between a Power Leg Press test (PLP) with walking capacity and self-reported performance and participation in individuals with Cerebral Palsy (CP), and to compare the strength of the associations between two power tests (PLP and isokinetic (IsoK)) with walking capacity.

Methods: Ambulatory individuals with CP (n = 33; age 17.89 ± 7.52 years) performed five inclined power leg presses at 40%-50% of their 1-repetition maximum "as fast as possible". A linear position transducer was attached to the weight bar, and the displacement, total load, and angle of the sled were used to calculate peak power for each trial. Isokinetic knee extensor power was measured at 60 deg/sec. Walking capacity was measured using the 10-m walk test fast (FS) and self-selected (SS) speeds and the 1-min walk test (1MWT). Self-reported performance and participation measures were the Activities Scale for Kids-performance (ASKp), Patient-Reported Outcomes Measurement Information System (PROMIS®), and the Gait Outcomes Assessment List (GOAL). Pearson's correlation coefficients determined relationships between power measures with walking capacity and self-report measures ($\alpha < 0.05$).

Results: PLP and IsoK power were significantly correlated to SS ($r = 0.361$, $r = 0.376$), FS ($r = 0.511$, $r = 0.485$), and 1MWT ($r = 0.583$, $r = 0.443$), respectively ($p < 0.05$). There was no significant difference between the strength of the associations between walking capacity and each test of power (PLP and IsoK) ($p > 0.05$). PLP power was significantly correlated to composite scores on the ASKp ($r = 0.690$) and GOAL ($r = 0.577$) and to four components of the PROMIS, including physical function ($r = 0.588$) ($p < 0.01$). The Gait and Mobility subscale of the GOAL ($r = 0.705$) and the Locomotion ($r = 0.636$), Transfers ($r = 0.547$), and Standing ($r = 0.521$) subscales of the ASKp had strong relationships to peak power produced during the PLP test ($p < 0.01$).

Discussion: PLP power was significantly correlated with walking capacity and self-reported walking performance and mobility-based participation in ambulatory individuals with CP. Higher movement velocities associated with the PLP test may explain the significant associations of power with faster gait speeds. Self-reported mobility performance and physical activity also showed moderate to strong relationships with lower extremity power. Overall, these results suggest a strong link between decreased muscle power generation and walking limitations in individuals with CP.

PMID: [39835201](#)

3. Are challenging walking environments linked to falls or risk of falling in children with cerebral palsy? A systematic review

Rebecca L Walker, Thomas D O'Brien, Gabor J Barton, Bernie Carter, David M Wright, Richard J Foster

Review Gait Posture . 2025 Jan 13:117:306-316. doi: 10.1016/j.gaitpost.2025.01.008. Online ahead of print.

Background: Children with cerebral palsy (CP) regularly fall over and this has negative effects on their physical and psychosocial wellbeing (e.g., reduced activity participation). However, the reasons for falls are not well understood. The way in which children negotiate challenging walking environments (e.g., uneven surfaces), may reveal more about how falls occur as these environments require gait modifications to maintain stability. Stability in challenging walking environments has been explored for children with CP; however, it remains unclear how these lead to falls.

Research question: Do challenging walking environments that mimic those faced in the real-world, contribute to increased fall occurrence and fall risk in children with CP?

Methods: Five databases were searched, and 1386 records screened to include ambulatory children with CP, aged 5-18 years old, investigating dynamic walking in challenging environments, with outcomes of fall occurrence or fall risk. The full protocol for this review was registered on PROSPERO (CRD42021290456).

Results: Sixteen studies met the inclusion criteria. One study reported occurrence of stumbles, two reported no falls. Fifteen studies identified gait alterations used by children with CP in challenging environments. Twenty-four gait characteristics were identified to be indicative of cautious walking strategies and seven gait characteristics identified to increase fall risk, suggesting a potential link. However, limited evidence exists as to whether this reflects falls faced in the real-world.

Significance: Investigations into stability over challenging walking environments for children with CP are lacking any measures of fall occurrence. Investigations into the mechanisms that may contribute to high fall risk, or fall avoidance when negotiating obstacles, uneven surfaces, steep declines and stairs may reveal further causes of real-world falls, and in doing so inform future fall prevention techniques. Finally, understanding the multifaceted causes of falls in real-world challenging environments from the perspectives of children with CP is key for future research.

PMID: [39842153](#)

4. Outcomes of Calcaneal Lengthening Osteotomy in Ambulatory Patients with Cerebral Palsy and Planovalgus Foot Deformity

Byoung Kyu Park, Sharkawy Wagih Abdel-Baki, Isaac Rhee, Kun-Bo Park, Hoon Park, Hyun Woo Kim

J Bone Joint Surg Am . 2025 Jan 24. doi: 10.2106/JBJS.24.00394. Online ahead of print.

Background: To date, no studies have evaluated the longevity of calcaneal lengthening osteotomy (CLO) in patients with cerebral palsy (CP) and pes planovalgus. This study aimed to explore the changes in foot alignment following CLO in patients with CP, utilizing both radiographic evaluations and dynamic foot-pressure assessments.

Methods: A retrospective study of 282 feet in 180 ambulatory patients was performed. The mean patient age at the surgical procedure was 8.9 ± 2.6 years. The mean follow-up period was 8.0 ± 4.3 years, and the mean age at the final follow-up 16.9 ± 4.4 years. Weight-bearing radiographs at 3 separate time points (before the surgical procedure, 6 months postoperatively, and at the final follow-up) were used. The feet were classified as corrected, undercorrected, or overcorrected on the basis of the radiographic parameters.

Results: At the final follow-up, we classified 98 feet (34.8%) as corrected, 58 (20.6%) as undercorrected, and 126 (44.7%) as overcorrected. Foot-pressure analysis demonstrated that the undercorrected feet had higher relative vertical impulses in the medial forefoot and medial midfoot than in the other groups, whereas the overcorrected feet had higher impulse in the lateral midfoot. There were no significant differences in preoperative radiographic parameters between the 3 groups, except for the calcaneal pitch angle. At 6 months after the surgical procedure, we classified 181 feet (64.2%) as corrected, 58 (20.6%) as undercorrected, and 43 (15.2%) as overcorrected. However, 53.6% of initially corrected feet changed to being undercorrected or overcorrected during further follow-up, 43.1% of the undercorrected feet became corrected or overcorrected, and 16.3% of the overcorrected feet became corrected. A younger age at the surgical procedure and lower naviculocuboid overlap at 6 months after the surgical procedure were the risk factors for overcorrection.

Conclusions: Although CLO is an effective method for correcting planovalgus foot deformities and enhancing foot-pressure distribution, the extent of correction observed early after the surgical procedure was not necessarily sustained over the follow-up period in individuals with CP. Furthermore, our findings highlight a noticeable tendency toward the overcorrection of the deformity, as evidenced by increased pressure exerted on the lateral midfoot.

PMID: [39854489](#)

5. The Impact of Aquatic Exercise on Walking Ability, Quality of Life, and Enjoyment in Children with Cerebral Palsy: A Systematic Review

Miki Nakatani, Yuji Kanejima, Kodai Ishihara, Hanhwa Koo, Kazuhiro P Izawa

Review Pediatr Rep . 2025 Jan 2;17(1):2. doi: 10.3390/pediatric17010002.

Background/objectives: Aquatic exercise is attracting attention as a method of rehabilitation for children with cerebral palsy (CP). The purpose of this systematic review was to evaluate whether aquatic exercise for children with CP improves their walking ability and quality of life (QOL) and is enjoyable for them.

Methods: A literature search was conducted on 2 August 2024 using three databases: PubMed, Web of Science, and the Cochrane Central Register of Controlled Trials through Evidence-Based Medicine Reviews. Studies included in the review focused on aquatic exercise interventions for children with CP, with outcomes related to walking ability, QOL, or enjoyment. Studies that did not isolate the effects of aquatic exercise (except when combined with conventional interventions) were excluded. Two reviewers independently conducted screening and risk of bias assessments.

Results: Seven studies involving 94 participants in total were included in the review. Three of these studies had a control group. All four studies reported improvements in walking ability, including walking endurance and efficiency. One of two studies showed improvement in health-related QOL (HRQOL) compared to the control group, whereas the other did not show significant differences between groups. All three studies that assessed enjoyment reported high levels of enjoyment of aquatic exercise. However, all studies were at risk of bias.

Conclusions: The reviewed studies suggest that aquatic exercise for children with CP may be enjoyable and may improve walking ability. Further research is needed to accurately assess the effects of aquatic exercise and compare it to other interventions.

PMID: [39846517](#)

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

No authors listed

Dev Med Child Neurol . 2025 Jan 23. doi: 10.1111/dmcn.16249. Online ahead of print.

No abstract available

PMID: [39846449](#)

7.Cerebral palsy pain instruments: Recommended tools for clinical research studies by the National Institute of Neurological Disorders and Stroke Cerebral Palsy Common Data Elements project

No authors listed

Dev Med Child Neurol . 2025 Jan 23. doi: 10.1111/dmcn.16246. Online ahead of print.

No abstract available

PMID: [39846494](#)

8.Development and temporal-validation of prognostic models for 5-year risk of pneumonia, respiratory failure/collapse, and fracture among adults with cerebral palsy

Daniel G Whitney

Adv Med Sci . 2025 Jan 22:S1896-1126(25)00007-0. doi: 10.1016/j.advms.2025.01.007. Online ahead of print.

Purpose: Pneumonia, respiratory failure, and fracture are common and highly burdensome for adults with cerebral palsy (CP). To date, there are no clinically friendly tools to assess individualized risk of these outcomes for adults with CP. The objective was to develop and validate prognostic models for 5-year risk of pneumonia, respiratory failure/collapse, and fracture for adults with CP.

Patients and methods: This single medical center retrospective cohort study used medical records from January 1, 2012 till June 1, 2024 from adults ≥ 18 years old with CP. The development cohort (n=1,520) included those with a start date of follow-up from January 1, 2015 till December 31, 2015 and evidence of being treated at the medical center for ≥ 3 years prior to day 0. The 5-year risk of outcomes was modelled using logistic regression and variations of the following predictors that were collected during the 3-year baseline: age, sex, Whitney Comorbidity Index, pneumonia, respiratory failure/collapse, fracture, and asthma/COPD. Discrimination (c-statistic) and calibration statistics assessed the model's performance. Decision curve analysis assessed the model's clinical utility. The models were validated in a temporal validation cohort, whose start date of follow-up was January 1, 2016 to May 31, 2019 (n=529).

Results: The prognostic models had good discrimination (c-statistic=0.76-0.78), good-to-excellent calibration, and demonstrated superior clinical utility in identifying true positives and true negatives. All models demonstrated temporal validation.

Conclusions: Prognostic models for 5-year risk of outcomes were developed and temporally validated for adults with CP using measures that can be easily collected from medical records.

PMID: [39855470](#)

9.A high-performance brain-computer interface for finger decoding and quadcopter game control in an individual with paralysis

Matthew S Willsey, Nishal P Shah, Donald T Avansino, Nick V Hahn, Ryan M Jamiolkowski, Foram B Kamdar, Leigh R Hochberg, Francis R Willett, Jaimie M Henderson

Nat Med. 2025 Jan;31(1):96-104. doi: 10.1038/s41591-024-03341-8. Epub 2025 Jan 20.

Abstract

People with paralysis express unmet needs for peer support, leisure activities and sporting activities. Many within the general population rely on social media and massively multiplayer video games to address these needs. We developed a high-performance, finger-based brain-computer-interface system allowing continuous control of three independent finger groups, of which the thumb can be controlled in two dimensions, yielding a total of four degrees of freedom. The system was tested in a human research participant with tetraplegia due to spinal cord injury over sequential trials requiring fingers to reach and hold on targets, with an average acquisition rate of 76 targets per minute and completion time of 1.58 ± 0.06 seconds-comparing favorably to prior animal studies despite a twofold increase in the decoded degrees of freedom. More importantly, finger positions were then used to control a virtual quadcopter-the number-one restorative priority for the participant-using a brain-to-finger-to-computer interface to allow dexterous navigation around fixed- and random-ringed obstacle courses. The participant expressed or demonstrated a sense of enablement, recreation and social connectedness that addresses many of the unmet needs of people with paralysis.

PMID: [39833405](#)

10.Is It Feasible to Apply a Virtual Box and Block Test in Children with Unilateral Cerebral Palsy?: A Pilot Study

Soraya Pérez-Nombela, Javier Merino-Andrés, Julio Gómez-Soriano, María Álvarez-Rodríguez, Silvia Ceruelo-Abajo, Purificación López-Muñoz, Rocío Palomo-Carrión, Ana de Los Reyes-Guzmán

J Clin Med . 2025 Jan 9;14(2):391. doi: 10.3390/jcm14020391.

Abstract

Background: With technological advancements, virtual versions of the Box and Block Test (BBT) employing the Leap Motion Controller have been developed for evaluating hand dexterity. Currently, there are no studies about the usefulness of this system in children with unilateral cerebral palsy (UCP). Thus, our main objective is to apply a virtual BBT based on the Leap Motion Controller in children with UCP compared with the real BTT for assessing upper limb function within a pilot study. **Methods:** Seven children between the ages of 4 and 8 years who were diagnosed with UCP were assessed three times using the real and virtual BBT. **Results:** For all the participants, performance was greater in the real BBT than in the virtual BBT. During the last assessment, the participants reached 28.17 (SD:6.31) blocks in the real test and 9.00 (SD:5.90) in the virtual test. The correlation index between the two modalities of the BBT was moderate ($r = 0.708$). **Conclusions:** The results obtained in this study suggest that the application of the virtual BBT in children with UCP is feasible. Future studies are needed to validate the application of the virtual BBT in children with UCP.

PMID: [39860397](#)

11. Metaverse-Aided Rehabilitation: A Perspective Review of Successes and Pitfalls

Michele Vecchio, Rita Chiaramonte, Enrico Buccheri, Sofia Tomasello, Pierfrancesco Leonforte, Antonio Rescifina, Antonio Ammendolia, Umile Giuseppe Longo, Alessandro de Sire

Review J Clin Med . 2025 Jan 14;14(2):491. doi: 10.3390/jcm14020491.

Abstract

Background: The evolution of technology has continuously redefined the landscape of rehabilitation medicine. Researchers have long incorporated virtual reality (VR) as a promising intervention, providing immersive therapeutic environments for patients. The emergence of the metaverse has recently further expanded the potential applications of VR to augment the possibilities in rehabilitation. Rehabilitation is a crucial aspect of healthcare, and technological advancements have allowed new approaches to aid in this process. One such approach is the metaverse, a virtual world where users can interact with each other and their surroundings in a simulated environment. This comprehensive review aimed to analyze the scientific evidence using the term "metaverse" in rehabilitation and its potential patient benefits. **Methods:** We conducted a comprehensive literature search from the inception to September 2024 in PubMed, Scopus, Web of Science, and Cochrane Database to identify studies investigating the term "metaverse" and its role in rehabilitation. We then assessed these studies based on their methodology, patient population, technology used, and therapeutic outcomes. **Results:** Out of 81 articles, 55 remained after removing duplicates. After screening the title, abstract, and full text, we included five articles. **Conclusions:** Results from these studies suggested potential benefits in various rehabilitative areas, such as cerebral palsy, intellectual disabilities, pain management, and physical performance improvement among the elderly. The metaverse presents promising avenues for enhancing rehabilitation outcomes. While VR's effectiveness is well established, the metaverse, being a newer concept, necessitates further studies for a more comprehensive understanding.

PMID: [39860498](#)

12. White matter lesions and DTI metrics related to various types of dysfunction in cerebral palsy: A meta-analysis and systematic review

Yu Jiang, Gang Liu, Bowen Deng, Xiaoye Li, Jingpei Ren, Yi Zhao, Chuanyu Hu, Lin Xu, Feng Gao, Xiaohong Mu

Meta-Analysis PLoS One . 2025 Jan 24;20(1):e0312378. doi: 10.1371/journal.pone.0312378. eCollection 2025.

Background: Assessing various types of dysfunction in cerebral palsy is a key factor in the treatment and rehabilitation of patients. The objective of this study was to use meta-analysis and systematic review to identify the specific white matter lesions and DTI metrics strongly associated with various types of dysfunction in cerebral palsy.

Methods: We conducted a literature search of PubMed, Embase, Cochrane Library and Web of Science databases to identify trials published that had evaluated the correlation between DTI metrics in sensorimotor pathways and function scores in cerebral palsy. Correlation coefficient (r) values were extracted for each study, and the extent of r was quantitatively explored. The remaining part of the study was analyzed qualitatively.

Results: 46 studies involving 1458 children with cerebral palsy, were included. 19 articles for Meta-analysis and 27 articles were descriptively analyzed. DTI metrics such as FA, MD in both sensory and motor pathways significantly correlated with various function ratings. In overall motor dysfunction, compared with the CST and PTR, FA of the PLIC correlated more strongly with GMFCS, and showed no significant heterogeneity ($r = -1.28$, confidence interval [CI]-1.70 to -0.87, $I^2 = 38.2\%$, $P = 0.233$). In upper limb dysfunction, compared with the AHA and MA2, FA of the CST correlated more strongly with BBT, and showed no significant heterogeneity ($r = -0.56$, confidence interval [CI]-0.78 to -0.34, $I^2 = 0.0\%$, $P = 0.511$). Lower limb dysfunction and other dysfunctions we used qualitative analysis. The qualitative analysis offered a concise overview of each investigation.

Conclusions: This study basically identifies the specific white matter lesions corresponding to overall motor dysfunction, upper limb and lower limb motor deficits and other dysfunctions in patients with cerebral palsy, as well as the associated DTI metrics.

PMID: [39854387](#)

13. Understanding Parental Satisfaction in Caring for Children with Cerebral Palsy

Aleksandra Kołacka, Maja Matthews-Kozancecka, Oskar Komisarek, Jacek Kwiatkowski, Aleksandra Domagalska, Włodzimierz Samborski, Ewa Mojs, Mirosław Andrusiewicz, Roksana Malak

Healthcare (Basel) . 2025 Jan 8;13(2):110. doi: 10.3390/healthcare13020110.

Introduction: The life satisfaction of parents of children with cerebral palsy should be assessed. Parenting a child with a disability may bring more challenges and efforts, impacting overall quality of life.

Aim of the study: the study aimed to evaluate the satisfaction with life of parents of children with cerebral palsy.

Material and methods: The study was designed to assess the satisfaction with life of parents of children with cerebral palsy. To measure this outcome, we developed an original survey consisting of 29 questions inspired by the Satisfaction With Life Scale (SWLS). The study involved 43 parents or legal guardians of children diagnosed with cerebral palsy.

Results: A correlation was identified between parental life satisfaction and the amount of leisure time reported by parents ($p = 0.004$, $R = 0.46$). The research indicates that parental life satisfaction does not depend on the parent's satisfaction with the level of therapy ($p > 0.05$) and the degree of improvement in the child's functioning ($p > 0.05$).

Conclusions: The level of parental life satisfaction does not depend on the level and outcome of therapy. The more leisure time the parents have, the greater their life satisfaction is. Parents of children with cerebral palsy should take care of their free time.

PMID: [39857137](#)

14. Involving people with lived experience when setting cerebral palsy research priorities: A scoping review

Evonne Younan, Sarah McIntyre, Natasha Garrity, Tasneem Karim, Mark Wallace, Paul Gross, Shona Goldsmith

Review Dev Med Child Neurol . 2025 Jan 24. doi: 10.1111/dmcn.16219. Online ahead of print.

Aim: To describe research priority-setting activities for cerebral palsy (CP) that have been conducted worldwide involving people with lived experience, focusing on participant characteristics, methods employed, identified research priorities, and collaboration as research partners.

Method: The JBI scoping review approach was followed. Six electronic databases and grey literature were searched for all publications up to February 2024. We extracted study and participant characteristics, methods, and research priorities. Priorities were then categorized into prevention and cure, quality of life and community engagement, and service provision and intervention.

Results: Five studies from North America and Australia met the inclusion criteria. Participants with lived experience were most often parents/caregivers ($n = 135$, proportion 12-80%), with 54 (proportion 12-25%) people with CP participating in the priority-setting exercises. The studies' methods were varied, with surveys and workshops being the most common. The most reported category of research priorities was optimal intervention. People with lived experience collaborated as research partners (e.g. in aspects of study development/analysis/reporting) in four studies.

Interpretation: This review, the first to examine CP research priority-setting efforts on a global scale, identified five activities conducted to date. The small overall number of participants with lived experience of CP, originating only from North America and Australia, highlights the need for increased representation to better reflect the diverse CP community worldwide. Future projects need to address these gaps, using rigorous methodologies, and continued collaboration with research partners to ensure their perspectives shape and enhance the research agenda.

PMID: [39861941](#)

15. Family reflections: including a lifespan perspective in cerebral palsy care and research

Jodi Kreschmer, Duncan Wyeth

Pediatr Res . 2025 Jan 18. doi: 10.1038/s41390-025-03873-w. Online ahead of print.

No abstract available

PMID: [39827253](#)

16.A Survey of Parents' Perspective of Receiving a Developmental Diagnosis for Their Child

Stacey D Miller, Maria Juricic, Jaimy Coates, Jeffrey N Bone, Ash Sandhu, Kishore Mulpuri, Maureen O'Donnell

Children (Basel) . 2025 Jan 17;12(1):105. doi: 10.3390/children12010105.

Abstract

Receiving a diagnosis, such as cerebral palsy (CP), can have lasting impacts on caregivers and families. Previous literature has described that caregivers wish to receive a diagnosis together, without delay, in a private, direct, honest, and sympathetic way. This study aimed to understand the experience of caregivers of children with cerebral palsy (CP) or similar conditions when receiving a diagnosis for their child.: Caregivers of children and youth aged 0-18 years with CP or a similar physical condition completed a survey investigating who first provided a diagnosis, and the way it was provided. Questions were based on the pediatric SPIKES framework. Caregivers were asked how receiving a diagnosis could have been improved. Thematic analysis of qualitative data were performed.: A total of 180 surveys were completed. Mean age at diagnosis was 19.0 (SD 25.7) months. Most caregivers reported the healthcare provider was sympathetic and understanding (75%) and clear and direct (69%). Only 25% of caregivers recalled being directed to where to find information; only 37% reported being told what their child does well or is expected to do well. Thematic analysis revealed three themes: (1) less waiting, (2) more compassionate communication, and, (3) information and support to move forward: Caregivers wanted the diagnosis to be timely and provided with compassion. Requests for greater information on the diagnosis, available support, and their child's future, suggest that greater care to support families in the aftermath of receiving a diagnosis is also needed.

PMID: [39857936](https://pubmed.ncbi.nlm.nih.gov/39857936/)

17.Ambient Toxic Air Contaminants in the Maternal Residential Area during Pregnancy and Cerebral Palsy in the Offspring

Haoran Zhuo, Beate Ritz, Joshua L Warren, Krystal Godri Pollitt, Zeyan Liew

Environ Health Perspect . 2025 Jan;133(1):17008. doi: 10.1289/EHP14742. Epub 2025 Jan 24.

Background: Cerebral palsy (CP) is the most common permanent neuromotor disorder diagnosed in childhood. Although most cases have unknown etiology, emerging evidence suggests environmental risk factors of CP.

Objectives: We investigated whether ambient toxic air contaminants (TACs) in the maternal residential area during pregnancy, specifically volatile organic compounds (VOCs) and metals, were associated with offspring CP risk in California.

Methods: We conducted a case-cohort study that included CP cases (N=906) and a 20% random sample of all live singleton births (N=184,954) who lived within a 5-mile (8-km) radius of air toxics monitoring stations in California during 2005-2015 as the control comparison group. CP cases were ascertained from diagnostic records of the California Department of Developmental Services. We a priori selected TACs with suspected neurotoxicity and developmental toxicity, including 14 VOCs and 6 metals. We estimated the adjusted risk ratio (RR) and 95% confidence interval (CI) for CP and the average maternal residential exposures to each TAC over the entire pregnancy using modified Poisson regression. For air contaminant mixtures, we used quantile-based g-computation to estimate the effects of mixtures of VOCs or metals. Finally, we performed a negative control exposure analysis on exposure estimates of 36-48 months after delivery to evaluate uncontrolled confounding bias.

Results: Maternal residential exposures to six VOCs (benzene, toluene, 1,3-butadiene, acetone, acetonitrile, and methylene chloride) and four metals (antimony, lead, nickel, and vanadium) were associated with 3%-25% higher risk of CP per interquartile range increase, and the estimated mixture effects of VOCs (RR=1.24; 95% CI: 1.08, 1.43) or metals (RR=1.38; 95% CI: 1.20, 1.58) were stronger. The observed associations were close to null for negative control exposures (36-48 months after delivery) to mixtures of VOCs or metals and CP.

Discussion: In California, maternal prenatal residential exposure to VOCs and metals in the outdoor air, largely attributed to mobile traffic emission sources, was associated with an increased risk of CP in offspring. <https://doi.org/10.1289/EHP14742>.

PMID: [39853265](https://pubmed.ncbi.nlm.nih.gov/39853265/)

18. Long-term impact of early identification of cerebral palsy

Ana-Marie Rojas

Curr Opin Pediatr . 2025 Jan 13. doi: 10.1097/MOP.0000000000001439. Online ahead of print.

Purpose of review: Early identification of cerebral palsy (CP), as in all neurologic conditions, has a profound impact on the ability to initiate interventions, support the education and empowerment of parents, ameliorate the effect of the conditions, and importantly identifies cohorts for neuroprotection or repair to address the primary injury. CP is a life span condition. Rapid initiation of services, support and anticipatory guidance is essential to maximize functional outcomes, prevent or manage complications and improve quality of life.

Recent findings: CP diagnosis should not be delayed. Early imaging as well as motor and neurologic evaluation can aid in early detection of CP before age 5 months. Early therapeutic intervention can influence function and assist in prevention of complications that can impact abilities. There is important ongoing research with efforts to prevent CP or alter the phenotype of the condition.

Summary: Literature review provides evidence to change in standard of care in diagnosing CP. There are published guidelines on how to pursue the diagnosis during early infancy. Early identification results in early intervention with the purpose of enhancing functional skill development, prevention of complications, and establishing parental support. Early identification provides an optimistic view and opportunity to intervene immediately in hopes to have an impact in the functional outcome and improving quality of life.

PMID: [39831770](#)

19. Cell-Based Therapy for Cerebral Palsy: A Puzzle in Progress

Masoumeh Nouri, Morteza Zarrabi, Safdar Masoumi, Elaheh Khodadoust, Anahita Majmae, Man Amanat, Mahmoud Reza Ashrafi, Massoud Vosough

Cell J . 2025 Jan 8;26(9):569-574. doi: 10.22074/cellj.2024.2032098.1600.

Abstract

Cell-based therapy has shown promising outcomes in the treatment of cerebral palsy (CP). However, there is no consensus on a standard therapeutic protocol regarding the source of cells, optimal cell dose, timing and frequency of cell injections, route of administration, or the use of combination therapy. This lack of consensus necessitates a comprehensive investigation to clarify these crucial yet undefined factors in cell-based therapy for CP patients. In this commentary, we discuss and compare the trends in Gross Motor Function Measure-66 following intrathecal injection of umbilical cord blood mononuclear cells (UCB-MNCs) and umbilical cord tissue mesenchymal stromal cells (UCTMSCs) in children with CP. Our study revealed that MNC injections led to earlier improvements in gross motor function, whereas MSC applications resulted in more sustainable changes. These findings provide key insights into the efficacy of different cell types, which will be beneficial for future studies and for refining cell-based therapy protocols for CP treatment.

PMID: [39827383](#)

20. Updates on neonatal cell and novel therapeutics: Proceedings of the Second Neonatal Cell Therapies Symposium (2024)

Madison C. B. Paton, Manon Benders, Remy Blatch-Williams, Elizabeth Dallimore, Adam Edwards, Ngaire Elwood, Kylie Facer, Megan Finch-Edmondson, Natasha Garrity, Adrienne Gordon, Rod W. Hunt, Graham Jenkin, Courtney A. McDonald, Justin Moore, Marcel F. Nold, Iona Novak, Himanshu Popat, Carlos Salomon, Yoshiaki Sato, Mary Tolcos, Julie A. Wixey, Tamara Yawno, Lindsay Zhou & Atul Malhotra

15 January 2025 *Pediatr Res* (2025). <https://doi.org/10.1038/s41390-025-03856-x>

Abstract

Cell therapies as treatments for neonatal conditions have attracted significant research and parent interest over the last two decades. Mesenchymal stromal cells, umbilical cord blood cells and neural stem cells translate from lab, to preclinical and into clinical trials, with contributions being made from all over the world. Effective and timely translation involves frequent reflection and consultation from research-adjacent fields (i.e. cell therapies for cerebral palsy, adult neurology, companies, and regulatory bodies) as well as meaningful involvement of people with lived experience. Progress to date suggests that aligning outcome and data reporting in later phase clinical trials will support our sector, as well as involving industry partners for streamlined solutions in cell manufacturing, commercialisation and regulatory processes. Importantly, our field can also benefit from resource sharing and research collaboration in novel drug therapies, small molecules and extracellular vesicles as we attempt to bridge preclinical and clinical research. In this review, we present highlights and learnings from the second Neonatal Cell Therapies Symposium (2024), held in Sydney, Australia.

21. Involving people with lived experience when setting cerebral palsy research priorities: A scoping review

Evonne Younan, Sarah McIntyre, Natasha Garrity, Tasneem Karim, Mark Wallace, Paul Gross, Shona Goldsmith

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Aim

To describe research priority-setting activities for cerebral palsy (CP) that have been conducted worldwide involving people with lived experience, focusing on participant characteristics, methods employed, identified research priorities, and collaboration as research partners.

Method

The JBI scoping review approach was followed. Six electronic databases and grey literature were searched for all publications up to February 2024. We extracted study and participant characteristics, methods, and research priorities. Priorities were then categorized into prevention and cure, quality of life and community engagement, and service provision and intervention.

Results

Five studies from North America and Australia met the inclusion criteria. Participants with lived experience were most often parents/caregivers ($n = 135$, proportion 12–80%), with 54 (proportion 12–25%) people with CP participating in the priority-setting exercises. The studies' methods were varied, with surveys and workshops being the most common. The most reported category of research priorities was optimal intervention. People with lived experience collaborated as research partners (e.g. in aspects of study development/analysis/reporting) in four studies.

Interpretation

This review, the first to examine CP research priority-setting efforts on a global scale, identified five activities conducted to date. The small overall number of participants with lived experience of CP, originating only from North America and Australia, highlights the need for increased representation to better reflect the diverse CP community worldwide. Future projects need to address these gaps, using rigorous methodologies, and continued collaboration with research partners to ensure their perspectives shape and enhance the research agenda.