

Monday 10 February 2025

**Cerebral Palsy Alliance** is delighted to bring you this free weekly bulletin of the latest published research into cerebral palsy. Our organisation is committed to supporting cerebral palsy research worldwide - through information, education, collaboration and funding. Find out more at [cerebralpalsy.org.au/our-research](https://cerebralpalsy.org.au/our-research)

**Professor Nadia Badawi AM**  
CP Alliance Chair of Cerebral Palsy Research

[Subscribe to CP Research News](#)

## Interventions and Management

### Interventions and Management

#### **1. Use of the Neurological Hand Deformity Classification in clinical practice for children with cerebral palsy: a case study approach**

Simon Garbellini, Dave Parsons, Christine Imms

Disabil Rehabil . 2025 Feb 5:1-9. doi: 10.1080/09638288.2025.2458752. Online ahead of print.

**Introduction:** The management of hand deformities of people with neurological impairment is complex and challenging. The use of orthoses to manage hand deformity in clinical practice continues despite low level evidence. Understanding the purpose of an orthosis supported by a biomechanical framework, the Neurological Hand Deformity Classification (NHDC), to identify deforming forces and how to resolve them with appropriate orthotic intervention may reduce controversy surrounding orthosis use.

**Methods:** Detailed case descriptions were used to demonstrate how the NHDC can be clinically applied to aid orthotic decision making. In the description of the participants presented, the use of the NHDC provided structure to: observe and classify the dynamic movement of the wrist and hand musculature; identify the dynamic forces causing deformity; and guide decision making for intervention strategies.

**Results:** The identification of the structures involved in the deforming forces on the hand and how orthotic intervention to resolve the deforming forces was guided by the NHDC is discussed. Context is provided regarding the reason, purpose and description of the orthoses used, and timing and dosage of wear is outlined.

**Conclusion:** The NHDC can form part of a comprehensive upper limb assessment to inform intervention decisions including upper limb orthotic intervention.

Plain language summary

Managing neurologically-based hand deformity can challenge even the most experienced clinician. The Neurological Hand Deformity Classification was developed to guide clinicians to classify hand deformity and to identify deforming forces. Descriptive case study methods are used to demonstrate how the Neurological Hand Deformity Classification can be applied clinically to aid upper limb orthotic decision making in managing deforming forces.

PMID: [39905971](#)

#### **2. Developmental trajectories of impaired hand function in unilateral cerebral palsy: Clinical insights and future directions**

Nava Gelkop, Hanoeh Cassuto

Dev Med Child Neurol . 2025 Feb 5. doi: 10.1111/dmcn.16257. Online ahead of print.

No abstract available

PMID: [39907061](#)

### **3. Effects of a therapeutic suit based on myofascial meridians on postural control and balance in children with cerebral palsy: a multiple-baseline, single-subject study**

Thalita Karla Flores Cruz, Deisiane Oliveira Souto, Raphael Guimarães Capuchinho, Arthur Felipe Barroso de Lima, Amanda Aparecida Alves Cunha Nascimento, Ianara Pereira Silva, Patrícia Aparecida Neves Santana, Lia Constantino Criscoulo, Vitor Geraldi Haase

Front Pediatr . 2025 Jan 20;13:1459839. doi: 10.3389/fped.2025.1459839. eCollection 2025.

**Aim:** To investigate the effects of an intervention programme based on the TREINI Exoflex therapeutic suit on balance, postural control, activity, and participation outcomes in children with cerebral palsy (CP).

**Method:** A multiple-baseline, single-subject A/B research design was used. Balance, postural control, mobility, activities of daily living (ADLs), and goal attainment measures were collected for four children with CP. The intervention was a programme designed for the use of a therapeutic suit, that is, the TREINI Exoflex. The 2-SD band and percentage of non-overlapping data methods were used to compare outcomes between the baseline and intervention phases.

**Results:** The intervention improved balance and postural control in all four children. The scope of the intervention on activity and participation outcomes varied between children. All children showed improvements in at least one stipulated goal and two in mobility and ADLs. Improvements in goal achievement occurred mainly for balance-related goals, whereas behavioural goals were not achieved.

**Conclusion:** The results of this study support the use of the TREINI Exoflex suit during functional activities by children with CP. Future research should examine the effects of this approach in children of different ages and at different functional levels.

PMID: [39902061](#)

### **4. Orthotic bracing to treat equinus in children with spastic cerebral palsy: Recorded compliance and impact of wearing time**

Claudia Oestreich, Harald Böhm, Matthias Hösl, Leonhard Döderlein, Daniela Lewens, Chakravarthy U Dussa, Renate Oberhoffer-Fritz

Gait Posture . 2025 Jan 30;118:75-84. doi: 10.1016/j.gaitpost.2025.01.034. Online ahead of print.

**Aim:** Spastic cerebral palsy (SCP) often results in "pes equinus," managed with ankle-foot orthoses (AFOs). Yet, little is known about actual wearing time and the minimum duration for improvement. This study explores orthotic compliance, examining its impact on clinical and gait parameters. The hypothesis anticipates a compliance rate below 50 %, suggesting AFOs worn for over 6 hours enhance ankle dorsiflexion.

**Method:** In a clinically prospective study, SCP children (ages 5 - 15 years) with equinus underwent gait analysis at recruitment and three months later. Wearing time, measured by sensors, categorised participants into compliant ( $\geq 6$  hours) and non-compliant ( $< 6$  hours) groups.

**Results:** Data were obtained for 32 participants (21 males, 11 females; mean age 10 years 7 months [SD 3 years]). Among 32 participants, 47 % wore AFOs over 6 hours, showing significant ankle dorsiflexion improvement. Thigh shell wearing time was shorter; only two exceeded 6 hours during the day.

**Interpretation:** Confirming our hypothesis, compliance was  $< 50$  %, yet AFOs over 6 hours improved ankle dorsiflexion. The study revealed minimal AFO daytime use and thigh shell acceptance. Wearing time significantly impacted equinus deformity, underscoring the need to identify factors influencing compliance for effective measures to extend usage.

PMID: [39914247](#)

### 5.A systematic review and meta-analysis of neuromuscular electrical stimulation post-botulinum toxin injection in children with cerebral palsy

Fu-An Yang, Jie-Ren Mi Le, Chia-Hsiang Lu, Chao-Chun Huang, Hung-Chou Chen

Meta-Analysis Sci Rep . 2025 Feb 8;15(1):4690. doi: 10.1038/s41598-025-88991-5.

#### Abstract

The aim of our study is to investigate whether adjunct neuromuscular electrical stimulation (NMES) therapy improves functional performance outcomes in children with cerebral palsy (CP) who have received botulinum toxin (BTX) injections. We searched the PubMed, Cochrane Library, CINAHL, EMBASE, and Scopus databases for randomized controlled trials studying the effects of NMES after BTX injection in children with CP from database inception to July 3, 2024. Two independent reviewers extracted data, and risks of bias were assessed using the PEDro scale for randomized controlled trials. We included 5 randomized controlled trials in this meta-analysis. NMES treatment following BTX injection resulted in greater functional performance outcomes compared with BTX injections alone (standardized mean difference = 0.57; 95% CI = 0.22 to 0.92). However, NMES following BTX injections did not significantly improve spasticity outcomes (standardized mean difference = 0.28; 95% CI = - 0.21 to 0.76). Despite including only a small number of trials, the present analysis demonstrated that NMES is an effective adjunct to BTX injections for managing CP in children. Further research must be conducted to refine these therapies, ensure better outcomes, and alleviate the burdens faced by individuals with CP.

PMID: [39920249](#)

### 6.The effect of Snoezelen intervention on problem behaviors in children with cerebral palsy: A randomized controlled trial

Mina Kim, Sook-Hee Yi, Jee-Sun Lee, Ji-Young Lee, Yun-Tae Hwang, Jeong-Soo Kim

Complement Ther Med . 2025 Feb 1:89:103139. doi: 10.1016/j.ctim.2025.103139. Online ahead of print.

**Aim:** To evaluate the effect of Snoezelen intervention on problem behaviors in children with cerebral palsy (CP) and to analyze its correlation with motor function, as measured by the Gross Motor Function Classification System (GMFCS).

**Method:** This study is registered under the Clinical Research Information Service (CRIS) with the registration number KCT0002794. The unique protocol ID for this trial is SRH2018R-01. A randomized controlled trial with 28 children (aged 2-5 years) with CP was conducted. The experimental group received Snoezelen intervention three times a week for four weeks. Problem behaviors were assessed using the CBCL 1.5-5 and K-PSI, and motor function was assessed using the GMFCS.

**Results:** The experimental group showed a significant reduction in emotionally reactive behavior ( $p = 0.044$ ). A strong negative correlation (Spearman's  $\rho = -0.744$ ,  $p = 0.002$ ) was found between GMFCS scores and changes in emotionally reactive behavior.

**Interpretation:** The Snoezelen intervention may reduce emotional reactivity and enhance emotional stability in children with CP, although its effectiveness may vary depending on the level of motor impairment. Further research is needed to confirm these findings.

PMID: [39900254](#)

## 7. Impact of COVID-19 on Hospital Admissions for Children With Developmental Disadvantages: A Western Sydney Metropolitan Hospital Experience on Health Inequity

Lanxin Li, Habib Bhurawala, Anthony Liu

J Paediatr Child Health . 2025 Feb 5. doi: 10.1111/jpc.16798. Online ahead of print.

**Aims:** To investigate the impact of Sydney's COVID-19 lockdown on children with developmental disadvantages and reflect on current clinical practice.

**Methods:** Retrospective data was collected from a western Sydney metropolitan hospital's electronic database and patients. We reviewed all children with Autism Spectrum Disorder (ASD), Cerebral Palsy (CP) or Intellectual Disability (ID) admitted 36 months prior to and after lockdown policy being implemented.

**Results:** The prevalence of hospital presentation was reduced during the lockdown period. The average length of stay (LoS) increased by approximately 1.5 folds. Comparatively, the average LoS of the general paediatric population increased minimally. Seizures, asthma, and upper respiratory tract infections were the three commonest issues for hospital admissions in both periods. COVID-19 infection accounted for 4% of admissions in the lockdown period. Around 20.8% of patients with disadvantages were admitted with more than two major issues. None of these patients had concurrent COVID-19 infection.

**Conclusions:** Children with developmental disabilities experience greater disadvantages during lockdown. The likely reasons include inequity caused by increased barriers to healthcare service. The indirect benefit of reducing infection transmission during lockdown was not reflected in our patient group, contributing to the disease burden. Chronic diseases remain the most common causes of admissions in all periods, suggesting the essentiality of improving chronic disease management in future clinical practice.

PMID: [39907044](#)

## 8. Association of Cerebral Palsy With Unanticipated Admission Following Pediatric Ambulatory Surgery

Nina Shamansky, Christian Mpody, Olubukola O Nafiu, Joseph D Tobias, Brittany L Willer

Paediatr Anaesth . 2025 Feb 6. doi: 10.1111/pan.15081. Online ahead of print.

**Background:** Cerebral palsy, a neurologic disorder caused by damage to the developing brain, is a leading cause of childhood disability. Due to musculoskeletal, movement, and secondary impairments, children with cerebral palsy often require surgical care. With the growing cost of surgical care, many children with cerebral palsy are scheduled for surgery in an ambulatory setting. Whether cerebral palsy increases the risk of unanticipated admission (a critical quality indicator of care) following ambulatory surgery has not been characterized. Our objective was to determine the association of cerebral palsy with unanticipated admission following pediatric ambulatory surgery.

**Methods:** We used the Pediatric Health Information System (PHIS) database to evaluate a retrospective cohort of children (< 18 years) who underwent scheduled ambulatory operations between January 1, 2010 and December 31, 2022. The primary outcome was unanticipated admission. Using log-binomial regression models, we estimated the relative risk and 95% confidence intervals for unanticipated admission, comparing patients with and without cerebral palsy. To account for confounding variables, we performed a 1:1 propensity score matching without replacement.

**Results:** A total of 1 954 108 children underwent ambulatory surgeries during the study period. Of these, 4.1% required unanticipated admission. The overall incidence of unanticipated admission was significantly higher among children with cerebral palsy than in those without (9.8% vs. 4.0%;  $p < 0.001$ ). This association remained significant after multivariable adjustment (relative risk: 1.73; 95% CI: 1.59-1.87,  $p < 0.001$ ).

**Conclusion:** Although cerebral palsy is not a contraindication for ambulatory surgery in children, it is significantly associated with the risk of unanticipated hospital admissions. This underscores the need for careful preoperative clinical site of care selection in this vulnerable patient population.

PMID: [39912379](#)

### 9. Multi-gesture drag-and-drop decoding in a 2D iBCI control task

Jacob Tobias Gusman, Tommy Hosman, Rekha Crawford, Tyler Singer-Clark, Anastasia Kapitonava, Jessica Kelemen, Nick Hahn, Jaimie M Henderson, Leigh Hochberg, John Simeral, Carlos Vargas-Irwin

J Neural Eng . 2025 Feb 3. doi: 10.1088/1741-2552/adb180. Online ahead of print.

**Objective:** Intracortical brain-computer interfaces (iBCIs) have demonstrated the ability to enable point and click as well as reach and grasp control for people with tetraplegia. However, few studies have investigated iBCIs during long-duration discrete movements that would enable common computer interactions such as "click-and-hold" or "drag-and-drop".

**Approach:** Here, we examined the performance of multi-class and binary (attempt/no-attempt) classification of neural activity in the left precentral gyrus of two BrainGate2 clinical trial participants performing hand gestures for 1, 2, and 4 seconds in duration. We then designed a novel "latch decoder" that utilizes parallel multi-class and binary decoding processes and evaluated its performance on data from isolated sustained gesture attempts and a multi-gesture drag-and-drop task.

**Main results:** Neural activity during sustained gestures revealed a marked decrease in the discriminability of hand gestures sustained beyond 1 second. Compared to standard direct decoding methods, the latch decoder demonstrated substantial improvement in decoding accuracy for gestures performed independently or in conjunction with simultaneous 2D cursor control.

**Significance:** This work highlights the unique neurophysiologic response patterns of sustained gesture attempts in human motor cortex and demonstrates a promising decoding approach that could enable individuals with tetraplegia to intuitively control a wider range of consumer electronics using an iBCI.

PMID: [39899980](#)

### 10. Tiny drivers, big decisions: parental perceptions and experiences of power mobility device trials for young children with cerebral palsy

Lisa K Kenyon, Bethany M Sloane, Lauren N Beers, Katelyn J Chung, Jessica Doty, Amberlyn R Erlenbeck, Madeline Herrenkohl, Samuel W Logan, Heather A Feldner

Disabil Rehabil Assist Technol . 2025 Feb 5:1-8. doi: 10.1080/17483107.2025.2459884. Online ahead of print.

**Purpose:** To explore parental perceptions and experiences at three timepoints [baseline (T0), post-intervention period 1 (T1), and post-intervention period 2 (T2)] across a 16-week study involving their children's use of two power mobility (PM) devices: an Explorer Mini (EM) and a modified ride-on car (mROC).

**Materials and methods:** Data for this phenomenological qualitative study were gathered as part of a multi-site randomized, counterbalanced AB crossover clinical trial, wherein all child participants used PM device A (EM) and PM device B (mROC) for eight weeks each. Trained researchers conducted in-person, audio-recorded semi-structured parental interviews at T0, T1, and T2. Data from each timepoint were individually analysed using the constant comparative method.

**Results:** Twenty-four child-parent participant dyads partook in the larger clinical trial. The parent participant within each dyad completed three qualitative interviews (one per timepoint), resulting in a total of 72 interviews (24 at each timepoint). At each timepoint, unique themes representing the parent participants' journey across the study emerged. Main themes were: T0 - "Anticipation", "Adjustment", and "Recognizing Strengths"; T1 - "Benefits and Barriers", "Expectations", and "Importance of Device Trials"; T2 - "One Size Doesn't Fit All, But All Are Worth Trying", "Environmental Affordances Enable Learning", and "Enabling Abilities and Participation".

**Conclusion:** This study provides insights into how parental perceptions about power mobility may shift over time, thereby assisting clinicians in implementing ON Time Mobility. The study further highlights how PM use can positively impact socialization and participation and how PM use may provide children with a mobile learning environment.

Plain language summary

Trialing power mobility devices is important to support ON Time Mobility. When selecting power mobility devices, clinicians should consider the whole child and their individual needs (e.g., postural supports, abilities, sensory needs) as well as how a device may fit into their family life (e.g., environments of use, time, the family's goals). Children may need time and repetition to adjust to, and become comfortable with, a power mobility device. Power mobility devices may provide a mobile learning environment that allows children to explore and learn from their surroundings and engage with their environment.

PMID: [39908089](#)

### 11. Can muscle synergies shed light on the mechanisms underlying motor gains in response to robot-assisted gait training in children with cerebral palsy?

Gloria P Vergara-Diaz, Stefano Sapienza, Jean-François Daneault, Eric Fabara, Catherine Adans-Dester, Giacomo Severini, Vincent C K Cheung, Carmen Echevarría Ruiz de Vargas, Donna Nimec, Paolo Bonato

J Neuroeng Rehabil . 2025 Feb 7;22(1):23. doi: 10.1186/s12984-025-01550-x.

**Background:** Children with cerebral palsy (CP) often experience gait impairments. Robot-assisted gait training (RGT) has been shown to have beneficial effects in this patient population. However, clinical outcomes of RGT vary substantially from patient to patient. This study explored the hypothesis that clinical outcomes are associated with changes in muscle synergies in response to RGT.

**Methods:** Thirteen children with CP and Gross Motor Function Classification Scale (GMFCS) levels I-IV were recruited in the study. Children participated in a 6 week-RGT intervention and underwent clinical evaluations and gait studies-with focus on the analysis of electromyographic (EMG) data-pre- and post-training. Lower-limb muscle synergies were derived from the EMG recordings. Pre- vs. post-RGT clinical outcomes and muscle synergies were compared to explore potential relationships. **Results:** Three and, less often, two muscle synergies were detected in study participants pre-RGT. Linear mixed effect models showed that composition of the muscle synergies and their temporal activation coefficients present deviations from normative data proportional to the severity of functional limitations (i.e., GMFCS levels,  $p < 0.01$ ). At a group level, changes in muscle synergies pre- vs. post-RGT did not significantly correlate with changes in clinical outcomes ( $p > 0.05$ ). However, it was observed that participants who displayed prominent changes in muscle synergies also displayed large improvements in clinical scores.

**Conclusions:** Gait impairments in children with CP were associated with muscle synergies that deviated from normative. Participants who demonstrated the most substantial improvements in clinical scores following RGT exhibited multiple changes in the muscle synergies. However, no statistically significant correlations were identified at the group level. Future studies relying on larger datasets are needed to further investigate this observation and potential underlying mechanisms.

PMID: [39920813](#)

### 12. Therapeutic hypothermia for neonatal hypoxic ischaemic encephalopathy in Sub-Saharan Africa: A scoping review

Naa A Buxton-Tetteh, Shakti Pillay, Gugulabatembumahlubi T J Kali, Alan R Horn

Review PLoS One . 2025 Feb 6;20(2):e0315100. doi: 10.1371/journal.pone.0315100. eCollection 2025.

**Introduction:** There are divergent views and limited data regarding therapeutic hypothermia (TH) for neonatal hypoxic ischaemic encephalopathy (HIE) in sub-Saharan Africa (SSA). Our aim was to map and synthesize the published literature describing the use of TH for HIE in SSA, and the associated outcomes.

**Method:** We searched Pubmed, Scopus, Google Scholar, and Web of Science from 1 January 1996 to 31 December 2023 for research studies, protocols, feasibility studies and surveys on term and near-term babies with HIE (population) treated with TH (concept) in SSA (context).

**Results:** Thirty records were included: Three surveys, one feasibility study and 26 publications describing 23 studies of 21 cohorts, cooling 1420 babies in South Africa, Uganda, and Ghana. There were five studies recruiting at follow-up, five pilot studies, one randomised controlled trial, one case series, and 10 birth cohorts. The methods and design of the studies were highly variable and often inadequate. Only three studies with adequately described and validated cooling methods, non-selective sequential recruitment, and neurological outcomes were identified. Two studies of babies from birth, both with intensive care facilities, reported survival with normal/mildly abnormal outcome in 71% at discharge in one study, and 71% at 12 months in another, with 16% cerebral palsy (CP) in survivors, and only 16% loss to follow-up. The third study, which only included clinic attenders after TH without intensive care, reported 7% CP in survivors, but 36% loss to follow-up.

**Conclusions:** Data from the adequately described TH studies in SSA indicate outcomes at discharge and twelve months which are similar to global norms. However, these data are limited to South Africa. Interpretation of other studies was limited by loss to follow-up, variable methodology and exclusion of babies with severe HIE in some studies. There is a need for standardised definitions to facilitate interpretation in TH studies.

PMID: [39913550](#)

### 13. Care burden and quality of life among family caregivers of children with cerebral palsy in China: the mediating roles of social support and coping styles

Fang Liu, Rui Zhang, Cui Cui, Hengyu Zhou

BMC Public Health . 2025 Feb 7;25(1):506. doi: 10.1186/s12889-025-21679-7.

**Background:** Children with cerebral palsy have substantial caregiving demands, and the overall health of their caregivers is greatly affected. The contributing variables to caregivers' quality of life must be identified. Our attention will be paid to the impact of caregiver's social resources such as social support and caregiver's personal resources such as coping styles on their care situation.

**Aims:** To explore the relationships among care burden, social support, coping styles, and QOL of caregivers for cerebral palsy children by mediation effect models.

**Design:** A cross-sectional study design.

**Methods:** The purposive sampling method was used in this study to select 189 caregivers of cerebral palsy children from the rehabilitation department of a children's hospital in western China from May 2022 to August 2023. Self-designed demographic data questionnaire, the WHO's Quality of Life Questionnaire, the Zarit Burden Interview, the Social Support Rating Scale, and the Simplified Coping Style Questionnaire were used for conducting the investigation. Correlations analyses between variables were analyzed using Pearson's correlation coefficient. The mediating effects were explored using the Process Macro and bootstrap method.

**Results:** Among the 189 caregivers, 59.26% were mothers, 64.55% had received high school or lower education. The majority of caregivers were not employed (62.96%). Care burden had a detrimental impact on both physical QOL and mental QOL. Social support and positive coping style were positively correlated with physical and mental QOL. Among the mediation analyses, significant indirect effects were found for the mediation path of social support between care burden and either physical or mental QOL. Whereas positive coping style as a mediator was not statistically significant. Additionally, social support and positive coping style formed a significant serial mediation path.

**Conclusion:** Caregivers of cerebral palsy children suffer from a certain level of caregiving burden and an unsatisfactory living quality. Social support alone or in combination with positive coping style played mediating roles in connection of care burden and QOL. Future interventional research ought to prioritize boosting social support and developing positive coping style since they may exert the synergistic effect on both physical and mental QOL of caregivers.

PMID: [39920621](#)

### 14. Patterns of Use of Complementary, Alternative, and Integrative Medicine in Children with Cerebral Palsy in a Developing Country: A Cross-Sectional Study

Arushi Gahlot Saini, Pradeep Kumar Gunasekaran, Singanamalla Bhanudeep, Indar Kumar Sharawat, Pratibha Singhi

Altern Ther Health Med. 2025 Feb 3:AT11354. Online ahead of print.

**Background:** Complementary, alternative, and integrative medicine (CAIM) encompasses a diverse range of practices and products used in conjunction with or in place of conventional medicine to promote health and well-being.

**Objective:** To determine the use of alternative therapies, socio-economic milieu, and parental responses in children with cerebral palsy (CP).

**Methods (setting/participation):** This cross-sectional study was conducted over 18 months at a tertiary care pediatric center. Children with a diagnosis of CP were enrolled. A pre-designed questionnaire was administered to the parents and their responses were recorded. It was piloted in the initial ten patients and further refinements were made based on the information collected. All children underwent detailed evaluation, neurological examination, and rehabilitation per the Department protocol.

**Results:** 201 children (71% males) with CP were enrolled. Only 7.5% (n=15) of parents were familiar with the diagnosis at the time of their child's diagnosis. CAIM is widely used in children with developmental disabilities, especially CP, with a prevalence of 47.3% in the index study. The primary concerns of the parents were regarding self-dependence (52.2%), delayed development (15.4%), recurrent seizures (12.4%), and feeding problems (3%). The use of alternative therapy was reported in 95/201 patients, including ayurvedic 29/95 (30.5%), homeopathic 27/95 (28.4%), religious rituals 22/95 (23.2%), and unrecognized doctors 17/95 (17.9%).

**Conclusion:** Our study highlights that parents of children with CP often seek alternative therapies. Familiarizing allopathic providers with CAIM practices will allow proper guidance of patients/parents, and help foster and enhance the parent-doctor relationship.

PMID: [39899550](#)

### 15. Development of fluid intelligence in children and adolescents with cerebral palsy: A cross-sectional study

Daiki Asano, Masaki Takeda, Hirotaka Gima, Satoshi Nobusako

Res Dev Disabil. 2025 Feb 3;158:104928. doi: 10.1016/j.ridd.2025.104928. Online ahead of print.

**Background:** Cerebral palsy (CP) often presents alongside cognitive developmental delays and motor impairments. This study aimed to identify the function most closely linked to the development of fluid intelligence in individuals with CP, and to estimate the point at which the fluid intelligence of children with CP diverges from that of typically developing (TD) children. **Methods and procedures:** Raven's Coloured Progressive Matrices (RCPM) were used to evaluate the fluid intelligence of participants. Fifty-one participants with CP aged 4-18 years and 33 TD children aged 3-9 years were included in this study and underwent RCPM testing. The severity of CP was assessed using the Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS) and Communication Function Classification System (CFCS).

**Results:** Multiple regression analysis demonstrated that within the three distinct functional levels, MACS was a significant predictor of fluid intelligence in children with CP ( $\beta = -0.29$ ,  $p < 0.05$ ). Significant disparities in the development of fluid intelligence between the CP and TD groups emerge after 57.6 months of age.

**Conclusions and implications:** The findings offer valuable insights into timely and functionally targeted interventions to prevent cognitive stagnation.

PMID: [39904153](#)

### 16. MRI Assessment of Geometric Microstructural Changes of White Matter in Infants With Periventricular White Matter Injury and Spastic Cerebral Palsy

Miaoyan Wang, Hua Zhu, Tingting Huang, Jingjing Qiao, Bo Peng, Ni Shu, Anqi Qiu, Jian Cheng, Haoxiang Jiang

J Magn Reson Imaging . 2025 Feb 7. doi: 10.1002/jmri.29730. Online ahead of print.

**Background:** Periventricular white matter injury (PWMI) is a high-risk factor for spastic cerebral palsy (SCP).

**Purpose:** To investigate the geometric microstructural changes in WM in infants with PWMI-SCP using MRI which may facilitate early identification.

**Study type:** Retrospective cohort study.

**Population:** Twenty-three healthy infants (aged 6.53-36 months), 25 infants with PWMI-SCP (aged 6-33 months), and 32 infants with PWMI-nonSCP (aged 6-36 months).

**Field strength/sequence:** 3.0 T, T1-weighted three-dimensional gradient-echo sequence, and diffusion tensor imaging (DTI) with a single-shot gradient echo planar sequence.

**Assessment:** The brain was automatically segmented, parcellated into major regions of interest according to the Desikan-Killiany atlas and volumes extracted. Fractional anisotropy (FA) and mean diffusivity (MD) of regions were extracted from DTI data. Director field analysis (DFA) was used to assess the geometric microstructural properties of WM. Motor dysfunction was graded from 1 (mild) to 5 (severe) according to the Gross Motor Function Classification System.

**Statistical tests:** Tests included analysis of variance, correlation analysis, mediation analysis, and receiver operating characteristic analysis. Corrected P-values  $< 0.05$  were considered significant. Mediation analysis examined whether DFA metrics mediated the relationship between brain morphological and motor dysfunction. Models were constructed to identify PWMI-SCP.

**Results:** The PWMI-SCP group exhibited significantly elevated all four DFA metrics (splay, bend, twist, and distortion), primarily in the corpus callosum, posterior thalamic radiata, and corona radiata, compared to the PWMI-nonSCP group, and was associated with enlarged lateral ventricles, reduced deep nuclear volumes and motor dysfunction. Mediation analysis indicated that increased splay in the corpus callosum partially mediates (mediating effect ratio: 29.74%, 22.46%) the relationship between the lateral ventricles and motor function. The results showed that DFA achieved a higher area under the curve (AUC) than the FA + MD, especially in distinguishing PWMI-nonSCP from PWMI-SCP (AUC = 0.93).

**Data conclusion:** Monitoring fiber-orientational alterations may provide new insights into early identification of PWMI-SCP.

**Plain language summary:** This study utilized directional field analysis (DFA) to systematically examine white matter microstructural changes in three groups: periventricular white matter injury with spastic cerebral palsy (PWMI-SCP), periventricular white matter injury without spastic cerebral palsy (PWMI-nonSCP), and healthy controls. The results revealed significantly abnormal increases in the white matter geometric structure within the sensorimotor circuit in the PWMI-SCP group. DFA metrics achieved an AUC of 0.93 in distinguishing PWMI-SCP from PWMI-nonSCP. These specific microstructural changes provide critical insights for the early identification of PWMI-SCP.

PMID: [39917817](#)



**17. Authentic collaboration in research: partnering with people with lived experience**

Natasha Garrity, Kylie Facer, Rod Hunt, Shannon Olivey, Sophie Marmont, Nadia Badawi, Melinda Cruz, Sarah McIntyre

Pediatr Res . 2025 Feb 6. doi: 10.1038/s41390-025-03824-5. Online ahead of print.

No abstract available

PMID: [39915611](#)

**18. Cerebral palsy: Current concepts and a glimpse into the future**

Garrett D Smigelski

JAAPA . 2025 Feb 4. doi: 10.1097/01.JAA.0000000000000178. Online ahead of print.

**Abstract**

Cerebral palsy (CP) is an encompassing term for a group of permanent neurologic disorders of movement and posture commonly seen in early childhood and caused by abnormal brain development early in life. The cause of CP is unclear in the majority of patients affected and can be multifactorial, occurring in various time frames such as prenatal, intrapartum, and postpartum. Because CP is a clinical diagnosis, clinicians must have a strong understanding of the clinical presentation to ensure early diagnosis and improved outcomes for patients. This article reviews CP and describes advances in diagnosis and management; it also provides an overview of new treatments that are under investigation.

PMID: [39903097](#)

**19. Priority setting for multicenter research among adults with cerebral palsy: a qualitative study**

Cristina A Sarmiento, Mary Gannotti, Jocelyn Cohen, Edward Hurvitz

Disabil Rehabil . 2025 Feb 3:1-12. doi: 10.1080/09638288.2025.2459893. Online ahead of print.

**Purpose:** Identify priorities for adult cerebral palsy (CP) research by engaging individuals with lived experience, clinical investigators, and community leaders.

**Materials and methods:** Qualitative descriptive study using iterative focus groups, followed by inductive thematic analysis. Participants included adults with CP and caregivers, clinical investigators, and community leaders in the CP and disability spaces. We explored research priorities among three research areas identified a priori- bone health, kidney health, and preventive care.

**Results:** We conducted four focus groups (20 participants with lived experience; 10 clinical investigators; 9 community leaders). Most participants felt all topic areas were very important, though preventive care emerged as the top priority. We identified three overarching themes that cut across the various research areas discussed: patient and provider knowledge gaps; a precision medicine approach for adult CP care; and the need to address ableism.

**Conclusions:** Adults with CP face unique healthcare needs and risks as they age, and the evidence base to guide their care lags significantly behind. Our study identified preventive care as the top research priority for the adult CP research agenda. Next steps in this line of research should focus on interventions to facilitate primary and preventive care interactions for adults with CP.

**Plain language summary**

Participants identified preventive care as the top research priority for the adult cerebral palsy (CP) research agenda. Ableism is a barrier to care for adults with CP, and rehabilitation professionals should provide and advocate for equitable care and access for adults with CP. Adults with CP, caregivers, clinical investigators, and community leaders highlighted significant knowledge gaps among patients and providers alike regarding the unique health risks and needs facing adults with CP. When possible, rehabilitation professionals should use a precision medicine approach to adult CP care, which takes into account an individual's risk factors to guide care.

PMID: [39901455](#)

