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Interventions and Management

1.Exploring cortical excitability in children with cerebral palsy through lower limb robot training based on MI-BCI

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Sci Rep . 2025 Apr 10;15(1):12285. doi: 10.1038/s41598-025-96946-z.

Abstract

This study aims to compare brain activity differences under the motor imagery-brain-computer interface (MI-BCI), motor imagery (MI), and resting (REST) paradigms through EEG microstate and functional connectivity (FC) analysis, providing a theoretical basis for applying MI-BCI in the rehabilitation of children with cerebral palsy (CP). This study included 30 subjects aged 4-6 years with GMFCS II-III grade, diagnosed with CP and classified as spastic diplegia. They sequentially completed EEG signal acquisition under REST, MI, and MI-BCI conditions. Clustering analysis was used to analyze EEG microstates and extract EEG microstate temporal parameters. Additionally, the strength of brain FC in different frequency bands was analyzed to compare the differences under various conditions. Four microstate classes (A-D) were identified to best explain the datasets of three groups. Compared to REST, the average duration and coverage rate of microstate D under MI and MI-BCI significantly increased ($P < 0.05$), while their frequency and the coverage rate and frequency of microstate A decreased. Compared to MI, the average duration of microstate C under MI-BCI significantly decreased ($P < 0.05$), while the frequency of microstate B significantly increased ($P < 0.05$). Additionally, the transition probability results showed that other microstates under REST had a higher transition probability to microstate A, while under MI and MI-BCI, other microstates had a higher transition probability to microstate D. The brain network results revealed significant differences in brain network connectivity among REST, MI, and MI-BCI across different frequency bands. No FC differences were found between REST, MI, and MI-BCI in the $\alpha 2$ frequency band. In the δ and γ frequency bands, MI and MI-BCI both had greater inter-electrode connectivity strength than REST. In the θ frequency band, REST had greater inter-electrode connectivity strength than MI-BCI, while MI-BCI had greater inter-electrode connectivity strength than both REST and MI. In the $\alpha 1$ frequency band, MI-BCI had greater inter-electrode connectivity strength than REST, and in the β frequency band, MI-BCI had greater inter-electrode connectivity strength than MI. MI-BCI can significantly alter the brain activity patterns of children with CP, particularly by enhancing the activity intensity of EEG microstates related to attention, motor planning, and execution, as well as the brain FC strength in different frequency bands. It holds high application value in the lower limb motor rehabilitation of children with CP.

PMID: [40210930](https://pubmed.ncbi.nlm.nih.gov/40210930/)

2. Muscle Physiology in Spasticity and Muscle Stiffness

Preeti Raghavan

Toxicon. 2025 Apr 9;108350. doi: 10.1016/j.toxicon.2025.108350. Online ahead of print.

Abstract

This paper examines the physiological changes in spastic muscles contributing to spasticity and muscle stiffness, focusing on the underlying mechanisms and their clinical implications. Spasticity, which is prevalent in neurological conditions such as multiple sclerosis, cerebral palsy, spinal cord injury, stroke, and traumatic brain injury, is characterized by disordered sensorimotor control and often results in increased muscle stiffness and resistance to movement. Recent developments in the understanding of spasticity suggest the importance of architectural changes in muscles that may contribute to increased passive resistance, potentiate reflex mechanisms, and progression to fibrosis, with hyaluronan (HA), a glycosaminoglycan, playing a pivotal role in modulating the properties of the muscle extracellular matrix (ECM). The hyaluronan hypothesis of muscle stiffness postulates that the accumulation and biophysical alteration of HA in the ECM of muscle increases its viscosity, resulting in increased passive mechanical resistance. This in turn can increase the sensitivity of the muscle to stretch, potentiating spasticity, and lead to cellular differentiation of myofibroblasts to fibroblasts ultimately leading to fibrosis and contracture. Emerging evidence supports the therapeutic potential of hyaluronidase, an enzyme that degrades HA, in reducing muscle stiffness, spasticity, and improving mobility in neurologic populations. A deeper understanding of HA's role in ECM dynamics offers promising avenues for novel treatments aimed at mitigating stiffness and preventing long-term disability in patients with spasticity.

PMID: [40216366](#)

3. The relation between macro- and microscopic muscular alterations of the medial gastrocnemius in children with spastic cerebral palsy

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J Anat . 2025 Apr 11. doi: 10.1111/joa.14260. Online ahead of print.

Abstract

Children with spastic cerebral palsy (CP) exhibit muscle growth deficits, secondary to the pathological neural input to the muscular system caused by the primary brain lesion. As a result, their medial gastrocnemius is commonly affected and is characterized by macro- and microscopic muscular alterations. At the macroscopic level, the muscle volume (MV), anatomical cross-sectional area of the muscle belly (Belly-CSA), muscle belly length (ML), and the intrinsic muscle quality are reduced. At the microscopic level, the cross-sectional area of the muscle fiber (Fiber-CSA) is characterized by an increased within-patient variability (coefficient of variation), the fiber type proportion is altered, and capillarization is reduced. However, the relationship between the macro- and microscopic muscle characteristics remains unclear, and understanding these connections could offer valuable insights into muscle growth deficits and the potential impact of interventions in children with CP. To address this, the present cross-sectional study examined both macro- and microscopic parameters of the medial gastrocnemius in a single cohort of young ambulant children with CP and age-matched typically developing (TD) peers, and investigated how deficits in macroscopic muscle size correlate with alterations at the microscopic level. A group of 46 children with CP (median age 5.4 [3.3] years) and a control group of 34 TD children (median age 6.3 [3.4] years), who had data on microscopic muscular properties (defined through the histological analyses of muscle biopsies), as well as macroscopic muscle properties (defined by 3D freehand ultrasound) were included. We defined Pearson's or Spearman's correlations, depending on the data distribution. The macroscopic muscle size parameters (MV, Belly-CSA, ML) showed significant moderate correlations (0.504-0.592) with the microscopic average Fiber-CSA in TD and CP. To eliminate the common effect of anthropometric growth at the macro- as well as microscopic level, the data were expressed as deficits (i.e., z-scores from normative centile curves or means) or were normalized to body size parameters. A significant but low correlation was found between the z-scores of MV with the z-scores of the Fiber-CSA ($r = 0.420$, $p = 0.006$). The normalized muscle parameters also showed only low correlations between the macro- and microscopic muscle size parameters, namely between Belly-CSA and Fiber-CSA, both in the TD ($r = 0.408$, $p = 0.023$) and the CP ($\rho = 0.329$, $p = 0.041$) group. Explorations between macroscopic muscle parameters and other microscopic muscle parameters (capillary density, capillary to fiber ratio, and fiber type proportion) revealed no or only low correlations. These findings emphasize that muscle growth deficits in children with CP are not simply a direct consequence of macroscopic muscle size reductions, but rather involve a complex interaction between macro- and microscopic alterations. Understanding these relationships could provide critical insights into the mechanisms of muscle impairment and help guide more targeted interventions to improve muscle function and growth in this population.

PMID: [40214189](#)

4. Gait patterns in hemiplegic cerebral palsy: Is it time for a new classification?

Mauro César de Moraes Filho, Marcelo H Fujino, Cátia M Kawamura, José Augusto F Lopes, Laís Przysiada, Maria Eduarda Antunes Silva

Gait Posture . 2025 Apr 1:120:40-45. doi: 10.1016/j.gaitpost.2025.03.026. Online ahead of print.

Background: The Winters, Gage and Hicks classification (WGHC) for spastic hemiplegia has been widely used, despite its limitations. The purpose of this study was to evaluate the reliability of WGHC in large series of cerebral palsy (CP).

Research question: May all hemiplegic CP patients be classified according to WGHC?

Methods: Participants with the diagnosis of spastic hemiplegic CP were identified in gait laboratory database. Only the first gait analysis of each patient was considered, and 983 patients met the inclusion criteria. Individuals with mixed tone (45), other pathologies combined with hemiplegia (11) and previous orthopedic surgeries or botulinum injections within 12 months (395) were excluded. The remaining 532 subjects were classified according to the 4 groups described by WGHC.

Results: 224 (42.1 %) patients were unclassified by WGHC and 4 additional groups were identified: group V (115/21.6 %)- none of the alterations described in WGHC; group VI (76/14.3 %)- WGHC III or IV, but with normal ankle dorsiflexion in stance and swing; group VII (29/5.5 %)- WGHC II, III or IV, but with normal ankle dorsiflexion in swing phase; group VIII (4/0.7 %)-reduction of ankle dorsiflexion in stance and swing phases with increased hip flexion in stance, but with normal knee range of motion. The age in group VI (14.5 years) was higher than other groups ($p < 0.001$). The GDI in group V (76.3) was similar ($p = 0.979$) to group I (73.9) and greater than other groups ($p < 0.001$). The mean pelvic asymmetry (32.70) and internal hip rotation (180) in group IV were higher than other groups ($p < 0.001$). The higher prevalence of perinatal anoxia (33.3 %) was observed in group VII.

Significance: In the present study, 57.9 % of patients were classified according to WGHC and 4 additional patterns were identified, leading a proposal of update at WGHC.

PMID: [40188697](#)

5. Aquatic Treadmill Walking Lowers Pelvic Motion Irregularity in Typically Developing and Children with Cerebral Palsy

Oluwaseye P Odanye, Joseph W Harrington, Aaron D Likens, Brian A Knarr, David C Kingston

Am J Phys Med Rehabil . 2025 Apr 2. doi: 10.1097/PHM.0000000000002750. Online ahead of print.

Objective: Evaluate the impact of aquatic treadmill walking on the pelvic dynamics of children with cerebral palsy (CP).

Design: The study is a block-randomized cross-over design with 8 children with CP and 15 typically developing (TD) children. All participants walked at fast, normal, and slow speeds on an aquatic (WET) treadmill and conventional (DRY) treadmill. Inertial measurement units recorded the participants' pelvic angles in the mediolateral, anteroposterior, and axial angles from which sample entropy values were determined.

Results: A multilevel model showed decreased irregularity in the pelvic dynamics of both CP and TD groups in WET conditions compared to DRY and at slower compared to higher speeds in the mediolateral and axial planes. For the anteroposterior plane, the irregularity of the pelvic motion decreased at the slow speed-WET condition compared to the fast trial.

Conclusion: The study shows the potential of the aquatic treadmill environment to induce more typical postural dynamics for children with CP compared to conventional dry treadmills. Postural dynamics also had decreased irregularity at slower walking speeds. A longitudinal study would show the retention tendencies of observed impacts on children with CP.

PMID: [40208608](#)

6. Management Approaches to Spastic Gait Disorders

Sheng Li, Tulsi Pandat, Bradley Chi, Daniel Moon, Manuel Mas

Review Muscle Nerve . 2025 Apr 8. doi: 10.1002/mus.28402. Online ahead of print.

Abstract

Spastic gait presents clinically as the net mechanical consequence of neurological impairments of spasticity, weakness, and abnormal synergies and their interactions with the ground reaction force in patients with upper motor neuron syndromes and with some neuromuscular diseases. It is critical to differentiate whether the primary problem is weakness or spasticity, thus better understanding different phenotypes of spastic gait disorders. Pelvic girdle abnormality plays a pivotal role in determining the clinical presentation of gait disorders, since it determines the body vector and compensatory kinetic chain reactions in the knee and ankle joints. Knee joint abnormality can be a mechanical compensation for hip and/or ankle and foot abnormality. Diagnostic nerve blocks and instrumented gait analysis may be needed for diagnosing the underlying problems and developing an individualized plan of care. A wide spectrum of treatment options has been used to manage spastic gait disorders. Some are in early and investigational stages, such as neuromodulation modalities, while others are well-developed, such as therapeutic exercise, ankle-foot orthoses, botulinum toxin treatment, and surgical interventions. Physicians and other healthcare providers who manage spastic gait disorders should be familiar with these treatment options and should employ appropriate interventions concurrently rather than serially. The most effective treatments can be selected based on careful evaluation, inputs from patients, family, and therapists, along with appropriate goal setting. Treatment plans need to be re-evaluated for effectiveness, relevance, and in concordance with disease progress. This is particularly important for patients with progressive neuromuscular diseases such as amyotrophic lateral sclerosis.

PMID: [40196899](#)

7. Age-related trajectories of muscle strength and power in individuals with cerebral palsy and the relationship to walking capacity

Mattie E Pontiff, Noelle G Moreau

Gait Posture . 2025 Apr 3;120:66-71. doi: 10.1016/j.gaitpost.2025.03.028. Online ahead of print.

Background: Cessation of walking is a consequence of aging in many individuals with Cerebral Palsy (CP). Muscle strength and power are associated with walking capacity in those with CP. However, the age-related trajectories in strength and power and how they compare to trajectories of those with typical development (TD) are unknown. Additionally, determining which measure of muscle performance (strength or power) is more closely associated with walk capacity may guide clinical assessments of muscle performance that are most meaningful to mobility in those with CP.

Research question: Do the associations between age and muscle performance differ between individuals with CP and TD? Is muscle power more strongly associated with walking capacity compared to muscle strength in those with CP?

Methods: Age-related differences in muscle strength and power between individuals with CP ($n = 66$, 13.5 ± 4.8 years, GMFCS I-IV) and TD ($n = 42$, 16.8 ± 6.1 years) were examined with linear regression and ANCOVA. Associations between measures of walking capacity and strength and power were evaluated with Pearson's (r).

Results: Linear regression between muscle strength and power with age was statistically significant in both groups. Age-related changes in strength and power were significantly greater in TD compared to CP. Linear regression between normalized strength and power with age was significant in those with TD but not in CP. All measures of walking capacity were significantly associated with both strength and power, but muscle power was more strongly correlated ($p < 0.05$).

Significance: Although age-related changes were observed in both groups, individuals with TD demonstrated greater age-related changes in muscle power and strength than those with CP. After normalizing by body mass, no age-related changes were observed in CP, suggesting that gains in power and strength are insufficient to offset increases in body mass with age. Muscle power had a stronger relationship to walking capacity than strength.

PMID: [40188701](#)

8. Cord Blood Treatment for Children With Cerebral Palsy: Individual Participant Data Meta-Analysis

Megan Finch-Edmondson, Madison C B Paton, Annabel Webb, Mahmoud Reza Ashrafi, Remy K Blatch-Williams, Charles S Cox Jr, Kylie Crompton, Alexandra R Griffin, MinYoung Kim, Steven Kosmach, Joanne Kurtzberg, Masoumeh Nouri, Mi Ri Suh, Jessica Sun, Morteza Zarrabi, Iona Novak

Pediatrics . 2025 Apr 11:e2024068999. doi: 10.1542/peds.2024-068999. Online ahead of print.

Context: Umbilical cord blood (UCB) is a novel treatment for cerebral palsy (CP), with trials indicating UCB can improve gross motor function. However, heterogeneity has limited the ability to interpret findings.

Objective: Assess the safety and efficacy of UCB for improving gross motor function in children with CP, including exploring cell dose effect and responder subgroups.

Data sources: Individual participant data from published reports and registered trials identified via systematic searches.

Study selection: Studies administering UCB to individuals with CP collecting Gross Motor Function Measure (GMFM) scores.

Data extraction: A 1-stage individual participant data meta-analysis was conducted in R to obtain the pooled effect of UCB and cell dose effect on GMFM using linear mixed models. Responder subgroups were also investigated.

Results: Four hundred ninety-eight participant data records were obtained from 11 studies. Main analysis of 170 participants treated with UCB and 171 controls demonstrated UCB increased mean GMFM-66 score compared with controls by 1.36 points at 6 months (95% CI, 0.41-2.32; $P = .005$) and 1.42 at 12 months (95% CI, 0.31-2.52; $P = .012$). Mean GMFM-66 effect size increased with increasing cell dose at 3 ($P < .001$) and 12 months ($P = .047$). CP severity and baseline age were associated with GMFM-66 effect size. The rate of serious adverse events was similar between groups.

Limitations: Heterogeneity across variables and time points, reducing subanalysis power.

Conclusions: UCB is safe and provides benefit for improving gross motor function in some children with CP, with higher doses associated with increased effect size. Younger participants (aged approximately <5 years) with milder CP showed increased benefit. Findings will help design future trials with precision.

PMID: [40210215](#)

9. Cord Blood Treatment for Children With Cerebral Palsy

Peter Rosenbaum, Robert Palisano

Pediatrics . 2025 Apr 11:e2024070467. doi: 10.1542/peds.2024-070467. Online ahead of print.

No abstract available

PMID: [40210219](#)

10. Effects of Whole-Body Vibration Therapy on Physical Function in Children With Cerebral Palsy: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

Chi-Hung Huang, Chi-Ying Chen, Ho-Wei Lin, Yu-Fen Chiu 5, Li-Fong Lin, Ka-Wai Tam, Tung-Wu Lu, Shih-Wen Chiang, Yi-Chun Kuan

Phys Ther . 2025 Apr 11:pzaf052. doi: 10.1093/ptj/pzaf052. Online ahead of print.

Objective: Although whole-body vibration (WBV) is often employed alongside traditional physical therapies to treat cerebral palsy, its effects on motor function remain unclear. Therefore, this study investigated the effects of WBV either alone or in combination with other therapies in children with cerebral palsy, compared with control groups that underwent traditional physical therapy or remained untreated.

Methods: We analyzed randomized controlled trials published up to September 2024 that assessed motor function in WBV and control groups, including those receiving conventional physical therapy or no intervention. Articles were retrieved from PubMed, EMBASE, Scopus, and the Cochrane Library. The random-effects model was used to analyze the outcomes of these trials.

Results: Our search yielded 23 studies involving 729 participants. Compared with the control group, the WBV group exhibited significantly greater improvements in walking speed (pooled mean difference: 14.26 cm/s [95% CI = 6.45 to 22.08 cm/s]), Timed "Up & Go" Test results (pooled mean difference = -2.52 seconds [95% CI = -3.66 to -1.37 seconds]), Gross Motor Function Measure scores (total score: pooled mean difference = 0.69 [95% CI = 0.30 to 1.08]; dimension D: pooled mean difference = 3.41 [95% CI = 0.53 to 6.29]; dimension E: pooled mean difference = 3.28 [95% CI = 1.36 to 5.20]), and overall stability index values (standardized mean difference = -1.20 [95% CI = -2.28 to -0.11]). The Modified Ashworth Scale results varied between the muscle groups, and no intolerable adverse effects of WBV were reported.

Conclusion: WBV improves postural control and motor performance in children with cerebral palsy by enhancing walking speed, Timed "Up & Go" Test performance, and gross motor function without causing intolerable adverse effects. However, the certainty of the current evidence on the topic is very low or low. Additional well-structured trials are required to determine the optimal intensity of WBV treatment.

Impact: Given its therapeutic benefits and safety, WBV may be considered as an adjunctive therapy for managing cerebral palsy, particularly for children with spastic cerebral palsy.

PMID: [40214179](#)

11. Towards a successful teledance program for youth with cerebral palsy: A mixed-method study with the instructor's perspective

Annie Pouliot-Laforte, Claire Cherrière, Margaux Hebinck, Jessica Tallet, Catherine Donskoff, Louis-Nicolas Veilleux, Martin Lemay, Maxime T Robert

J Pediatr Rehabil Med . 2025 Apr 10:18758894251324317. doi: 10.1177/18758894251324317. Online ahead of print.

Purpose Dance is a leisure time physical activity (LTPA) known to improve motor, cognitive, and psychosocial functions in youth with cerebral palsy (CP). Online exercise or tele-programs are promising in overcoming the environmental barriers of accessibility to LTPA. To ensure successful implementation, it is necessary to identify limitations specific to dance in a pediatric population. The aim was to explore the perspectives of the main stakeholders, i.e., dance instructors and youth, to implement such a program. **Methods** In a mixed-method design, feasibility indicators were assessed by participation and retention rates, the Physical Activity Enjoyment Scale (PACES), and the Children's Effort Rating Table (CERT). Semi-structured interviews were conducted before and after the intervention with youth with CP [$n = 15$] and dance instructors [$n = 3$]. Interviews were analyzed with an inductive approach. **Results** Participation and retention rates were $86.7\% \pm 10.7$ and 100% , and the PACES and CERT average scores were $91\% \pm 11$ and 3.7 ± 1.3 , respectively. Four themes emerged from the interviews: 1) Technology; 2) Pedagogical Approach; 3) Participant's Environment; and 4) Social Relations. **Conclusion** The teledance program is feasible and enjoyable, requiring minimal equipment and travel. However, there is a need to consider and provoke social interaction, to enhance the social and relational dimension of dance.

PMID: [40207635](#)

12. Anorexia nervosa in a child with cerebral palsy

Yukia Nishiue, Dai Miyawaki, Moe Koki, Tomoko Harada

PCN Rep . 2025 Apr 7;4(2):e70097. doi: 10.1002/pcn5.70097. eCollection 2025 Jun.

Background: There have been no reports of children with cerebral palsy (CP) developing anorexia nervosa (AN). This report presents a 13-year-old girl with CP who was hospitalized in a state of severe underweight and impaired consciousness, and was subsequently diagnosed and treated for AN.

Case presentation: The patient is a 13-year-old girl diagnosed with CP, who relied on a wheelchair for mobility. Her weight consistently remained at -2 standard deviations. She began restricting her food intake after comparing her body to her sister's and receiving comments from caregivers about her weight. Consequently, her body mass index dropped to 8.2, and when admitted, she showed impaired consciousness. After intensive care treatment, she was hospitalized in the psychiatric ward for about 6 months before discharge. Despite extensive rehabilitation, her physical abilities at discharge did not return to preillness levels.

Conclusion: This case indicates that diagnosing and assessing AN in children with CP can be particularly challenging. Children with CP who develop AN are prone to rapid progression to severe physical conditions; therefore, early consultation with a specialist is strongly recommended.

PMID: [40201534](#)

13. Hemiplegic Cerebral Palsy: Clinical Features Associated With Arterial Ischemic Stroke or Periventricular Venous Infarction

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J Child Neurol . 2025 Apr 10:8830738251327615. doi: 10.1177/08830738251327615. Online ahead of print.

Objective We sought to determine the clinical features of hemiplegic cerebral palsy associated with perinatal arterial ischemic stroke or periventricular venous infarction. **Methods** We studied children with hemiplegic cerebral palsy enrolled at 9 rehabilitation centers across Ontario. We compared children with underlying perinatal arterial ischemic stroke or periventricular venous infarction on clinically acquired brain imaging. Analysis also included prenatal (maternal, prenatal/gestational) and perinatal (obstetrical, neonatal) clinical features collected from birth records and standardized parent interviews. **Results** The 144 children with hemiplegic cerebral palsy (62% male) included 95 with perinatal arterial ischemic stroke and 49 with periventricular venous infarction. In this cohort of children with hemiplegic cerebral palsy, we found neonatal systemic thrombosis (ie, blood clots in the body) ($P = .05$), emergency cesarean section ($P = .05$), and neonatal seizures ($P = .01$) to be clinical features associated with hemiplegic cerebral palsy in children with perinatal arterial ischemic stroke more often than periventricular venous infarction. Preterm delivery rates were similar for perinatal arterial ischemic stroke and periventricular venous infarction. **Conclusion** We determined clinical features associated with the 2 most typical forms of focal ischemic brain injury in children with hemiplegic cerebral palsy, including mode of delivery emergency cesarean section, neonatal seizures and systemic thrombosis. These findings provide further insight and support for existing findings about focal brain injury patterns leading to hemiplegic cerebral palsy in children.

PMID: [40208027](#)

14. Analysis of Commercial Instagram Content on Pediatric Neurological Physiotherapy Interventions and Products in Brazil

Mickaelly Aisha Dos Santos, Francine Andrade, Marinna Cruz de Souza, Laís Rodrigues Gerzson, Karoline Kobus-Bianchini, André Luís Ferreira Meireles

Phys Occup Ther Pediatr . 2025 Apr 10;1-15. doi: 10.1080/01942638.2025.2486111. Online ahead of print.

Aims: To describe the content of commercial pediatric neurological physical therapy posts on Instagram and report the main interventions and products featured.

Methods: A cross-sectional study was conducted using five pediatric neurological physical therapy hashtags on Brazilian commercial Instagram profiles, on three different days. The initial 50 posts for each hashtag were extracted by two independent reviewers. Data included the source of the posts, content characteristics, target populations, interventions featured in the posts and on the Instagram profiles, as well as the products promoted in the posts.

Results: A total of 449 Instagram posts from 190 profiles were analyzed. Most posts were in video format ($n = 278$; 61.9%), categorized as service reports ($n = 203$; 45.2%), and posted by autonomous physical therapists ($n = 195$; 43.4%). The most frequent interventions were Suit therapy ($n = 60$; 15.9%) and mobility training ($n = 59$; 15.6%). Cerebral palsy ($n = 90$; 20%) and Down syndrome ($n = 35$; 7.7%) were the most frequently represented health conditions.

Conclusions: Instagram offers various interventions and products for pediatric neurological rehabilitation. Excess information may cause indecision and adherence to ineffective treatments by families. Future research should assess the evidence behind services on social media and their impact on parents' decision-making.

PMID: [40207618](#)

15. Associations of prenatal exposure to residential greenspace and active living environments with cerebral palsy: A population-based cohort study in Ontario, Canada

Amrin Ahmed, Steven Hawken, Anna Gunz, Robert Talarico, Chengchun Yu, Hong Chen, Paul J Villeneuve, Éric Lavigne

Environ Epidemiol . 2025 Apr 8;9(2):e379. doi: 10.1097/EE9.0000000000000379. eCollection 2025 Apr.

Background: Prenatal exposure to environmental factors, such as greenspace and active living environments, has been associated with numerous health benefits, including improved neurodevelopmental outcomes. Although cerebral palsy (CP) is not typically linked to these exposures, emerging evidence suggests that exposure to environmental factors during pregnancy may influence brain development, making it important to explore their potential role in CP risk.

Methods: We conducted a retrospective cohort study using health administrative data from Ontario, Canada, between 1 April 2002 and 31 December 2020. We identified 1,436,411 mother-infant pairs, of which 2,883 were diagnosed with CP during the follow-up period. Exposures of interest included the Normalized Difference Vegetation Index (NDVI), Green View Index (GVI), and park proximity. The Canadian Active Living Environments index was also utilized. Cox proportional hazards models estimated hazard ratios (HRs) for CP risk associated with these environmental exposures, adjusting for potential confounders.

Results: Interquartile range (IQR) increases in NDVI (HR = 1.040; 95% confidence interval [CI]: 0.987, 1.096; per IQR = 0.1) and GVI (HR = 0.989; 95% CI: 0.943, 1.038; per IQR = 10.05%) were not significantly associated with CP risk. Similar results were found for quartile increases of NDVI and GVI. Residential proximity to parks at birth was associated with a reduction in CP risk (HR = 0.946; 95% CI: 0.904, 0.990; per 0.06 increase in park proximity index), after adjusting for active living environment and air pollution.

Conclusions: Our study suggests that living closer to parks reduces the risk of CP. Further research should investigate these protective effects and consider other dimensions of greenspace quality and usability.

PMID: [40207298](#)

16. Correction to 'The 24-Hour Activity Checklist for Cerebral Palsy: Translation, Content Validity and Test-Retest Reliability of Portuguese Versions'

No authors listed

Published Erratum Child Care Health Dev . 2025 May;51(3):e70073. doi: 10.1111/cch.70073.

No abstract available

PMID: [40195041](#)

Erratum for

The 24-Hour Activity Checklist for Cerebral Palsy: Translation, Content Validity and Test-Retest Reliability of Portuguese Versions.

Vila-Nova F, Sá CDSC, Leite HR, Cadete A, Folha T, Longo E, Martins ME, Oliveira R.

Child Care Health Dev. 2025 Mar;51(2):e70057. doi: 10.1111/cch.70057.

PMID: [40045483](#)

17. Sustainable Model of Early Intervention and Telerehabilitation for Children With Cerebral Palsy in Rural Bangladesh: The SMART-CP Randomized Clinical Trial

Mahmudul Hassan Al Imam, Israt Jahan, Nuruzzaman Khan, Delwar Akbar, Shafiul Islam, Mohammad Muhit, Nadia Badawi, Gulam Khandaker

JAMA Pediatr . 2025 Apr 7:e250150. doi: 10.1001/jamapediatrics.2025.0150. Online ahead of print.

Importance: Access to early intervention and rehabilitation services among children with cerebral palsy (CP) remains limited in Bangladesh, which demands an innovative and sustainable service delivery model.

Objective: To evaluate the effectiveness of the Sustainable Model of Early Intervention and Telerehabilitation for Children With CP (SMART-CP) model compared with usual care in improving access to and utilization of early diagnosis, early intervention, and rehabilitation services in rural Bangladesh.

Design, setting, and participants: This was a 2-arm cluster randomized clinical trial, with 8 clusters (ie, subdistricts) randomly allocated to the intervention (SMART-CP model) or control arm. The setting was in Sirajganj, Bangladesh, and included children with CP 18 years or younger. Outcomes were measured at 0 and 12 months, and an intention-to-treat analysis was conducted. Data were analyzed from December 2023 to May 2024.

Interventions: The SMART-CP model comprised (1) a rural referral network involving key informants and caregiver peer groups (called mPower or mothers' power), (2) subdistrict level SMART-CP centers, and (3) telerehabilitation services. Children in the intervention arm received weekly goal-directed therapy, mPower group meetings every 2 weeks, and monthly telerehabilitation sessions.

Main outcomes and measures: The primary outcome was whether a child with CP accessed any form of rehabilitation services, with secondary outcomes analyzed as hypothesis generating.

Results: Overall, 968 children with CP (mean [SD] age, 7.9 [4.9] years; 581 male [60.0%]) were enrolled, with 500 in the intervention arm and 468 in the control arm. Between baseline and endline, rehabilitation services uptake significantly increased in the intervention arm (70.2% [351 of 500] vs 99.4% [497 of 500]), compared with the control arm (63.9% [299 of 468] vs 68.2% [319 of 468]; $P < .001$). Children in the intervention arm were 1.5 times more likely to access rehabilitation than the control arm. Secondary analyses suggested that the intervention arm also facilitated early CP diagnosis (mean [SD] diagnosis time, 2.0 [2.0] years vs 3.8 [3.3] years; Cohen $d = -0.7$) and initiation of rehabilitation (mean [SD] rehabilitation time, 1.8 [1.8] years vs 3.6 [2.4] years; Cohen $d = -0.9$). Additionally, higher therapy session counts (mean [SD] session counts, 23.4 [31.7] vs 4.3 [20.8]; Cohen $d = 0.7$), increased assistive device utilization (20.8% [104 of 500] vs 3.0% [14 of 468]; risk ratio, 0.82; 95% CI, 0.78-0.86; $P < .001$), and lower out-of-pocket expenditure per month (mean [SD] expenditure, \$1.5 [\$1.6] vs \$2.9 [\$5.1]; Cohen $d = -0.4$) were found in the intervention arm. No significant difference in clinical outcomes and mortality rates was observed between the intervention and control groups.

Conclusions and relevance: Results of this cluster randomized clinical trial reveal that the SMART-CP model improved access to and utilization of early diagnosis and intervention services for children with CP in rural Bangladesh. This model holds promise for global scalability.

Trial registration: ANZCTR Trial Identifier: ACTRN12622000396729.

PMID: [40193125](#)

18. Proposed updated description of cerebral palsy

Bernard Dan, Peter Rosenbaum, Lucinda Carr, Martin Gough, John Coughlan, Nonyelum Nweke

Dev Med Child Neurol . 2025 Apr 11. doi: 10.1111/dmcn.16274. Online ahead of print.

Abstract

'Cerebral palsy' ('CP') is a widely used descriptive label for a spectrum of motor impairments caused by non-progressive brain injury or malformation occurring during early development. Advances in research have significantly refined our understanding of CP, including insights into its genetic, inflammatory, and neurophysiological underpinnings. Research across global contexts, including low- and middle-income countries, has expanded knowledge of clinical features. Shifting societal perceptions, driven by individuals with lived experience, have further influenced how CP is understood, challenging ableist attitudes and promoting inclusive frameworks. Additionally, increased recognition of the needs and experiences of adults with CP has highlighted the importance of further developing appropriate services. The primary aim of this paper is to propose an updated description of CP, developed through a collaborative, multidisciplinary process, as a preliminary formulation that integrates stakeholder perspectives at this stage of the process. By framing it as a foundation for further discussion and refinement, the manuscript emphasizes the output itself rather than the process of its development. A comprehensive stakeholder analysis and mapping approach ensured broad representation, including individuals with CP, families, clinicians, researchers, advocacy groups, and others. Data were collected through surveys, interviews, focus groups, and workshops, facilitating a global dialogue that combined the expertise of those with lived experience with that of clinicians. The proposed updated description offers a preliminary framework to guide clinical practice, research, and policy, fostering a shared understanding of CP. The description is intended to serve as a preliminary framework to guide clinical practice, research, and policy, emphasizing a shared understanding of CP. The proposed updated description thus lays the foundation for continued refinement, emphasizing the importance of collaboration in advancing the care and inclusion of individuals with CP.

PMID: [40213981](#)

19. Anxious Dads and Depressed Moms: Child Disability and the Mental Health of Parents

Derek Asuman, Tinna Laufey Ásgeirsdóttir, Johan Jarl

Health Econ . 2025 Apr 10. doi: 10.1002/hec.4962. Online ahead of print.

Abstract

Having a child with a disability undoubtedly affects parents in many ways, including their well-being. However, the specific mental health trajectories of parents, differentiated by the severity of impairments and parental roles, remain under-explored. We investigate the mental-health effects of having a child with a disability. Using individual-level register data from Sweden, we exploit the epidemiological features of Cerebral Palsy (CP) to estimate causal effects. Results show that prescriptions for mental-health disorders increase after the birth of a child with CP. While fathers are more likely to be dispensed anti-anxiety medications, dispensed medications for anti-depressants increase for mothers. Further, the effects are larger for parents of children with severe impairments but do not differ across parental characteristics. Our findings highlight the need for support and assistance for families with children with disabilities.

PMID: [40210611](#)

20. How the Movie 'Out of My Mind' Brings the F-Words for Child Development to Life

Maya Albin

Child Care Health Dev . 2025 May;51(3):e70080. doi: 10.1111/cch.70080.

Abstract

This short communication illustrates how the 2024 movie *Out of My Mind*, starring a protagonist (Melody) with cerebral palsy, embodies the 'F-words' for child development—the paediatric adaptation of the World Health Organization International Classification of Functioning Disability and Health (ICF). The 'F-words' provide a strengths-based and holistic framework to view childhood development, disability and functioning that can benefit service providers, researchers and families alike. If we want the world to adopt the values of the 'F-words', we must bring these values to the world by applying them outside of academia. This short communication outlines how *Out of My Mind* illustrates and exemplifies each 'F-words' domain, as well as the interconnectedness with other domains, from the perspective of a speech-language pathologist and PhD student in Rehabilitation Science. Key reflections include the impact of social, attitudinal and physical environments on the protagonist's participation and how Fun and Functioning are shown in the movie's first-person perspective. This short communication also highlights the impact of attitudinal, physical and system-level barriers on participation and can inspire us all to change the way we think to shape the society we aspire towards.

PMID: [40207691](#)

21. The Need to Standardize the Diagnosis of Cerebral Palsy

Bhooma R Aravamuthan, Michael C Fahey, Darcy L Fehlings, Iona Novak, Michael C Kruer

Pediatrics . 2025 Apr 9:e2024069666. doi: 10.1542/peds.2024-069666. Online ahead of print.

No abstract available

PMID: [40199510](#)

Prevention and Cure

22. Breech presentation at birth has short-term but no long-term effect on neurodevelopmental outcome in moderate and late preterm infants

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Early Hum Dev . 2025 Apr 1:205:106253. doi: 10.1016/j.earlhumdev.2025.106253. Online ahead of print.

Aim: To investigate the effects of fetal presentation at birth on spontaneous postnatal movements, postures and neurodevelopmental outcome in moderate and late preterm (MLPT) infants.

Methods: The study population comprised 154 infants (55 % male, 55 % singletons) of whom 33 (21 %) were born in breech presentation. During the neonatal period and at 3-4 months post-term age, categorical Prechtl general movements assessment (GMA) and detailed scoring of motor functions was performed by means of the General Movement Optimality Score (GMOS) neonatally and Motor Optimality Score-Revised (MOS-R) later. Neurodevelopment was assessed at one year using Bayley-III.

Results: Infants born in breech presentation more frequently exhibited pathological GMs ($p = 0.05$) with increased stiffness in the lower extremities ($p < 0.01$) at neonatal age. Detailed motor assessments at 3-4 months post-term age (MOS-R) showed lower scores in infants born in breech compared to those with cephalic presentation at birth. Fetal presentation at the time of delivery did not impact neurodevelopmental outcomes at 12 months.

Conclusion: Breech presentation at birth affected GMs and movement assessments in the early postnatal period but had no persistent impact on neurodevelopmental outcomes at one year, suggesting a transient effect on lower extremity movements. Given stiffness in the extremities in neonates is an alarm sign and might relate to cramped synchronized GMs indicating an increased risk for cerebral palsy, fetal presentation at birth should be taken into consideration in neonatal neuromotor assessments.

PMID: [40198963](#)