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# Cerebral palsy research news

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## Interventions and Management

**1.Three-dimensional assessment of finger individuation reveals finger- and joint-specific selective motor control deficits in pediatric cerebral palsy**

Owais A Khan, Divya Rai, Brooklyn Crabtree, De'Yana Hines, Gavin Colquitt, Christopher M Modlesky, Jing Xu

Res Sq [Preprint]. 2025 Jun 25:rs.3.rs-6896151. doi: 10.21203/rs.3.rs-6896151/v1.

Abstract
Background Children with cerebral palsy (CP) exhibit impaired selective motor control (SMC) that contributes to poor hand function, but current clinical assessments lack the sensitivity to detect finger- and joint-specific deficits to guide rehabilitation strategies. This study aimed to determine the internal consistency and validity of an objective, instrumented assessment of selective finger control (individuation) in children with CP, and to examine its relationship to clinical measures of upper limb function. Methods A custom-designed device recorded 3-dimensional isometric forces concurrently from all five fingertips to compute a composite metric of finger SMC (Individuation Index) for each tested finger and force direction. Group differences in individuation ability were quantified using linear mixed-effect models. Relationships between individuation and clinical assessments were assessed with age-controlled partial Pearson correlation. Results Twenty-eight children with CP and 18 typically developing control children were included. The non-preferred arm was tested in most children with CP (n = 16), with the preferred arm tested in controls and the remaining CP cohort. Individuation Indexes demonstrated excellent internal consistency across groups (all $R \geq 0.97$). Children with CP exhibited lower individuation than controls in both the preferred (Cohen's d ( d) = 0.73) and non-preferred arms, with deficits in the non-preferred arm more pronounced during finger flexion ( d = 1.48), in the index finger ( d = 1.52), and in those exhibiting mirror movements ( d = 0.56). Exploratory analysis in children with CP tested bilaterally (n = 6) revealed finger-specific hand differences, with lower individuation in the non-preferred hand limited to the index finger ( d = 1.36). Clinical scores indicated generally worse manual ability in children with CP than controls ( d range = 0.70-1.38). Individuation Indexes were not related to clinical scores in either hand in children with CP or in controls (all $p > 0.05$). Conclusions This study provides a consistent, valid, and sensitive method to quantify finger SMC in children with CP, revealing finger-, force direction-, and hand-specific impairments that highlight aspects of dexterity not captured by clinical assessments. Quantifying finger individuation enables more precise characterization of hand dysfunction, advancing mechanistic understanding and targeted intervention design for children with CP. Trial Registration : Data collected as part of a larger randomized controlled trial; https://clinicaltrials.gov/ct2/show/NCT03484078.
PMID: 40678248

**2.Partnership delivery of evidence-based therapy intervention to improve upper-limb function: a retrospective analysis**

Jill Massey, Leanne Claire Dreyer, Erika Molteni, Ben Siegle, Tomoki Arichi, Anne Gordon

BMJ Paediatr Open . 2025 Jul 16;9(1):e003572. doi: 10.1136/bmjpo-2025-003572.

Objective: To describe clinical characteristics and outcomes of children and young people with hemiplegia completing a novel dedicated therapy intervention, 'Evelina REACH'. This evidence-based upper-limb outpatient intervention is delivered in partnership with the child, caregivers, and occupational therapists at a tertiary hospital and community allied health professionals.
Design: Retrospective audit of patients completing a 6-week protocolised therapy intervention with repeated standardised measures of spontaneous arm and hand use and of caregiver goal rating.
Setting: A tertiary level children's hospital in London, UK.
Patients: 156 children (median age 26 months, range 4 months-16.5 years) completing a therapy intervention programme between 2012 and 2023.
Interventions: An intensive, protocolised and individualised goal-directed therapy intervention programme, co-delivered by the patient, caregivers and hospital-based and community therapists.
Main outcome measures: Assisting Hand Assessment (AHA), Goal Attainment Scaling (GAS)/Goal Attainment Scaling Light and Canadian Occupational Performance Measure (COPM).
Results: Clinically significant gains were achieved with a mean AHA logit score change of 7 (n=69) which was maintained at 6 weeks post intervention (n=35). At least 1 GAS goal was met or exceeded by 99.2% participants, with measurable score change across three caregiver-mediated COPM goals, performance=90.17%, and satisfaction=83.58%. Of caregivers surveyed, 97.85% would repeat the programme, and 100% would recommend it to others.
Conclusions: Evelina REACH is a clinically effective, goal-directed intensive activity-based therapy intervention that fosters lasting functional improvements in upper-limb use. Further research should explore optimal and scalable co-delivery models to enhance children's access to evidence-based therapy in statutory healthcare.
PMID: 40670048

**3.Risk Factors for Avascular Necrosis in Children With Cerebral Palsy Following Varus Derotation Osteotomy**

Sam P Wimmer, Tishya A L Wren, Robert M Kay

J Pediatr Orthop . 2025 Jul 14. doi: 10.1097/BPO.0000000000003040. Online ahead of print.

Objectives: Varus derotation osteotomy (VDRO) is a well-established surgery for displaced hips in children with cerebral palsy (CP). However, avascular necrosis (AVN) remains a significant postoperative complication that can result in negative outcomes. Previous studies report various AVN rates after VDRO, and the true incidence and associated risk factors remain poorly characterized. This study aimed to determine the incidence of AVN after VDRO in a large cohort and to identify patient -specific and surgical risk factors for developing AVN.
Methods: The study included 316 children with CP who underwent VDRO (593 osteotomies, 501 bilateral) for hip subluxation or dislocation [196 male; mean age 8.3 y, SD: 3.2, range: 2.4 to 17.7; 2 Gross Motor Function Classification System (GMFCS) level I, 34 level II, 38 level III, 115 level IV, 127 level V] at a tertiary referral center. Potential determinants of AVN were analyzed using Fisher exact test and univariate and multivariate logistic regressions.
Results: Ten of 593 hips (1.7%) developed AVN. The entire cohort's mean preoperative Reimers MP was 51.1, SD: 28.0, range: 0 to 100, and was 77.6 (SD: 27.3, range 32.2 to 100) in the hips in which AVN developed and 50.6 (SD: 27.9, range 0 to 100) in those in which it did not. In univariate analysis, Reimers MP (P=0.02), bilateral surgery (P<0.01), and pelvic osteotomy (PO) (P<0.01) were significant risk factors for developing AVN. In multivariate analysis, the sole significant risk factors was PO (P<0.01). Lastly, the Rutz and MCPHCS data reveal similar rates of AVN across these femoral hip classification systems, regardless of the change in Rutz (P=0.13) or MCPHCS (P=0.58).
Conclusions: This is the largest analysis of AVN in children with CP who underwent VDRO. PO was a significant risk factor for developing AVN after VDRO. Although the overall incidence is low, the increased odds of AVN in patients undergoing POs is a factor surgeons should consider when undertaking surgery for children with CP and displaced hips. The association with PO may explain why several factors were significant solely in univariate analysis. For example, children functioning at GMFCS level V underwent ~3.5 times the rate of POs than their higher-functioning peers (29.0% vs. 8.2%, P<0.01). Finally, the Rutz and MCPHCS classifications suggest that AVN may not significantly impact postoperative hip sphericity. In combination with the low incidence of AVN, these findings indicate that rather than focusing solely on AVN risk, sphericity preservation may be more critical for optimal health outcomes in children with CP.
PMID: 40654122

**4.Differential and Adjustable Stiffness Leaf Spring Ankle Foot Orthoses Enhance Gait Propulsion and Task Versatility in Cerebral Palsy**

Collin D Bowersock, Emmanuella A Tagoe, Samuel Hopkins, Shanpu Fang, Zachary F Lerner

Ann Biomed Eng . 2025 Jul 14. doi: 10.1007/s10439-025-03773-4. Online ahead of print.

Purpose: This study explored the effectiveness of a novel differential and adjustable stiffness leaf spring AFO (DAS-AFO) during standing, walking, and sit-to-stand tasks among individuals with cerebral palsy.
Methods: Eleven individuals with cerebral palsy, ages 12-41, completed treadmill walking trials with the DAS-AFO, a solid (i.e., rigid) AFO, and without an assistive device (shod). We quantified metabolic cost, muscle activity of the soleus and vastus lateralis, and lower body kinetics and kinematics. Participants also performed overground walking, sit-to-stand, and stable standing tasks while wearing the DAS-AFO and reported their preferred stiffness setting for each task. Additionally, we quantified center of pressure during the stable standing task.
Results: Walking with the DAS-AFO resulted in an average 24% increase in ankle push-off power when compared to the solid AFO ($p = .003$). Both AFO conditions resulted in an average 16% reduction in soleus activity compared to shod ($p < .040$); only the DAS-AFO reduced vastus lateralis activity compared to shod (13% average reduction, $p = .015$). Over half of the participants preferred a different AFO stiffness for at least one of the tasks of daily living. No stiffness setting was universally preferred for a single task. During the stable standing task, the high stiffness setting increased average anterior-posterior center of pressure excursion ($p = .022$) and velocity ($p = .001$) compared to shod.
Conclusion: Our findings highlight potential benefits of the DAS-AFO design over solid AFOs, including improved ankle joint motions and push-off power during walking. Customizability of the DAS-AFO positively influenced participant preference and task performance.
PMID: 40659983

**5.PREDICT-ITB: Predicting response in children with dystonic CP to ITB - study protocol**

Sruthi P Thomas, Darcy Fehlings, Sharon Ramey, Mark Conaway, Steven Kralik, Jeffrey Raskin

medRxiv [Preprint]. 2025 Jul 8:2025.07.08.25331080. doi: 10.1101/2025.07.08.25331080.

Introduction: Over 11,000 infants are diagnosed with cerebral palsy (CP) each year, with lifetime medical costs exceeding $1.4 million per person. Elevated muscle tone in CP, including dystonia and spasticity, significantly impairs function and quality of life. Intrathecal baclofen (ITB) is commonly used to manage dystonic CP, though evidence supporting its effectiveness is weak due to patient variability and study limitations. Spasticity may obscure dystonia symptoms, and factors like brain injury patterns and pain triggers are often overlooked in research. Despite uncertain effects on dystonia, ITB has shown benefits in pain relief, comfort, and caregiving ease. This proposal aims to evaluate ITB's overall impact on children with dystonic CP, identify responders, and develop a comprehensive outcome measure using a prospective cohort study.
Methods and analysis: We will conduct a prospective, observational study of 65 children with dystonia (Barry Albright Dystonia Scale (BADS) greater than 15) and CP who receive ITB. Changes in dystonia, spasticity, gross and fine motor function, and multiple patient-reported outcomes related to quality-of-life, depression, anxiety, pain and more. The primary analysis will use repeated measures models to estimate short and long-term changes from baseline in BADS scores at 3, 6 and 12-months. Secondary analysis will apply the same strategies to the other outcome measures. We will also conduct subgroup analysis and develop a multidimensional or composite measure.
Ethics and dissemination: Primary ethic approval was provided by the Baylor College of Medicine Institutional Review Board (H-54449). Results of the study will be disseminated via peer-reviewed presentations at scientific conferences and open access publication.
Trial registration number: NCT06606574 ( clinicaltrials.gov ).
Strengths and limitations: Unlike previous studies on ITB in dystonia and CP, a strength of this study is that it will directly measure effects of ITB beyond just dystonia, while also considering the child's co- existing spasticity if present, known triggers of dystonia, including pain, and CNS injury patterns contributing to dystonia.We consider multiple endpoints or the "total child" within the ICF Framework and whether concurrent therapeutic interventions appear to influence outcomes.A limitation of the study is the lack of randomization to placebo or blinding.
PMID: 40672491

**6.Cerebral palsy: A time for lumping and a time for splitting**

Monica S Cooper

Dev Med Child Neurol . 2025 Jul 16. doi: 10.1111/dmcn.16419. Online ahead of print.

No abstract available
PMID: 40671204

**7.A Randomized Clinical Trial Comparing the Effectiveness of Aerobic Training and Circuit Training on Balance in Ataxic Patients**

Hifza Ahmed, Ulvina Riaz, Haleema Sadia, Rimsha Khalil, Zuha Javed, Ishal Ayub

Randomized Controlled Trial Physiother Res Int . 2025 Jul;30(3):e70068. doi: 10.1002/pri.70068.

Background: The term ataxia refers to the inability to coordinate movement. It essentially happens when the cerebellum or any of its connections are damaged. A brain tumor, multiple sclerosis, stroke, cerebral palsy, certain drugs, and genetic illnesses are the few examples of the ailments that can result in ataxia. Although aerobic exercise helps ataxic people in decreasing whole disease severity, conventional training does not significantly aid in this regard. On the other hand, circuit training has also proved effective in reducing ataxic symptoms in some literatures.
Aim and purpose: This study's primary goal was to ascertain whether aerobic or circuit training provides a better course of treatment for the ataxic patients.
Methodology: Eighteen pre-diagnosed ataxic patients participated in a randomized clinical experiment (9 patients in each group) for this objective. Purposive sampling technique was used to collect samples, and patients were allocated into their groups using the lottery method. Group A was aerobic training group and Group B was circuit training group. The time duration for this study was approximately 4 months where data collection took almost 1 month. 30 min sessions consisting of 5 sessions per week were given to the patients for 1 month duration. Data were calculated from Allied hospital. Assessment and examination were carried out using Berg Balance Scale (BBS) and Functional staging for ataxia giving pre- and post-values.
Statistical analysis: Data were analyzed statistically through SPSS 24.
Results: In terms of indicating balance along with ataxia staging, the statistics showed only a slight difference in the aerobic training group than in the circuit training group. The given differences found between the pre and the post values in mean and standard deviation in Group 1 is -11.75 ± 1.48 and in Group 2 is -9.55 ± 3.67. The first treatment group had a mean rank of 9.50 prior to treatment and 7.50 following treatment. Conversely, the mean rank of the second treatment group was 10.33 at the post-treatment level and 9.50 at the pre-treatment level.
Discussion: In essence, these two tactics performed better than some other therapy approaches on a consistent basis. Although there have not been enough studies to compare these two treatments, their respective outcomes are enough to show their effectiveness. Eventually, the aerobic intervention was found only marginally superior to the circuit training, while both were helpful for improving balance in ataxia.
Trial registration: This study used a randomized clinical trial research design. It has been registered in IRCT, that is, the Iranian Registry of Clinical Trials under the registration Id IRCT20240323061354N1.
PMID: 40653445

**8.Smaller and thinner long bones in children and adolescents with cerebral palsy and other neuromotor impairments**

Erin Hodgson, Elizabeth G Condliffe, Leigh Gabel

Front Endocrinol (Lausanne) . 2025 Jun 30:16:1620573. doi: 10.3389/fendo.2025.1620573. eCollection 2025.

Introduction/background: Compromised bone and muscle health is a significant concern for children and youth with cerebral palsy (CP) and other non-progressive neuromotor impairments. Weak bones increase the incidence of fragility fractures and predispose individuals to lifelong problems, such as osteoporosis.
Objectives: This study quantified bone and muscle health in children and adolescents with CP and other neuromotor impairments across all five gross motor function classification system (GMFCS) levels.
Methods: Peripheral quantitative computed tomography (pQCT) scans of both tibiae were acquired at the 3%, 38%, and 66% of tibia length in 22 children and adolescents (4-17 years old) diagnosed with CP and "CP-like" neurodevelopmental conditions causing motor impairment. Age-, sex-, and ethnicity-matched Z-scores were generated in reference to a normative typically developing population for total bone mineral content (BMC), trabecular and cortical bone mineral density (Tb.BMD, Ct.BMD), cortical BMC (Ct.BMC), cortical area (Ct.Ar), cortical thickness (Ct.Th), periosteal and endosteal circumference, cortical section modulus (Z), and muscle cross-sectional area (MCSA).
Results: Tibial total BMC, Tb.BMD, Ct.BMC, Ct.Th, Ct.Ar, periosteal circumference, Z, and MCSA were significantly lower in children with CP and CP-like conditions compared to typically developing peers (median Z-scores ranged from -2.66 to -1.09; $p = 0.019$ to $<0.001$) and showed greater deficits in children and adolescents with lower levels of motor function than those with higher functional abilities (GMFCS I-II vs III-V; $p = 0.042$ to $<0.001$). Endosteal circumference was not different from zero ($p = 0.756$) but was smaller in children and adolescents with lower levels of motor function ($p = 0.042$). Ct.BMD did not differ compared to typically developing youth ($p = 0.202$) or between functional abilities ($p = 0.168$).
Conclusions: Results reveal that bone and muscle size, total and cortical content, and trabecular density are impaired in children with CP and CP-like conditions; however, cortical mineralization is not impaired. Therefore, the heightened risk of fragility fractures in children and adolescents with CP and CP-like conditions is likely due to smaller and thinner bone structure. Future investigation into bone microarchitecture is warranted.
PMID: 40661739

**9.Development and Validation of Health Educational Videos to Enhance the Oral Health Awareness Among the Parents and Caregivers of Children With Cerebral Palsy**

D Diana Constance, Aparna Sugumaran, Parangimalai Diwakar Madan Kumar, K Balabaskar, Nachiketa Rout

Spec Care Dentist . 2025 Jul-Aug;45(4):e70072. doi: 10.1111/scd.70072.

Introduction: Globally, around 3.5 billion people are affected by oral disease, with individuals with disabilities being more affected due to physical and cognitive limitations. They rely on their parents or caregivers to maintain their oral health.
Aim: To develop and validate educational videos for promoting oral health through a YouTube channel for the parents/caregivers of children with cerebral palsy (CP).
Methodology: The preparation of the script/storyboard was based on scientific articles addressing oral health promotion. The content was divided into eighteen videos, which were validated by a panel of experts.
Results: All the items in the script board content scored CVR greater than 0.80, and videos were considered valid. The Cohen's kappa for all the questions for the audiovisual content ranges between 0.86 and 1.00, showing strong agreement ($\kappa > 0.80$) among the content experts.
Conclusion: The developed educational videos demonstrated strong content validity scores, indicating their potential to significantly enhance oral health knowledge among parents and caregivers of children with CP.
PMID: 40658021

**10.Parental perceptions and gender as predictors of changes in children's understanding of how to use a power wheelchair**

Naomi J Aldrich, Dominik Vanderest, Kevin Slowik, John P Farris, Daniel K Zondervan, Lisa K Kenyon

Disabil Rehabil Assist Technol . 2025 Jul 18:1-16. doi: 10.1080/17483107.2025.2533510. Online ahead of print.

Purpose: To explore: (1) Whether parental perceptions predicted children's understanding of how to use a power wheelchair (PWC), as assessed via the Assessment of Learning Powered mobility use (ALP) across a study period, and (2) Relationships between child characteristics and ALP scores.
Materials and methods: Data for this prospective observational study were collected during an open-label, single-arm clinical trial wherein children participated in a three-week PWC skills training intervention. Semi-structured parental interviews were conducted at baseline (T0) and post-intervention (T1). The ALP was administered at T0, T1, and at a retention trial (T2). Parental perceptions were quantified using the Linguistic Inquiry and Word Count 2015 (LIWC2015).
Results: Twenty-five child-parent dyads completed the study. Each parent completed two interviews (50 interviews total). Paired-samples t-tests showed significant improvements in children's ALP scores across timepoints and shifts in parental perceptions across the study (e.g. increased Authenticity from T0 to T1). Bivariate correlations were used to identify potential predictors (i.e. child characteristics, age and gender, etc.; and parental perceptions identified via LIWC2015) for regression analyses. Regressions revealed: (1) Parents' focus on Biological processes (e.g. diagnoses) at T0 predicted children's T0 ALP scores; (2) Parents' analytical thinking and references to relativity (e.g. space, motion) at T1 predicted improvements in ALP scores from T1 to T2; and (3) Child gender predicted changes in ALP scores from T0 to T1 and T0 to T2, with boys exhibiting greater improvements.
Conclusion: Findings highlight the importance of parental sensitivity and emotional attunement in supporting children's learning of PWC use.
Plain language summary
Study findings underscore the complex interplay between parental perceptions, parent language, and children’s understanding of how to use a power wheelchair (PWC).Clinicians should consider parent dynamics and linguistic patterns when providing interventions to support children in learning to use a PWC.Gender differences emerged in the study with boys exhibiting both higher Assessment of Learning Powered mobility use (ALP) scores and greater changes in ALP scores as compared to girls.
PMID: 40679481

**11.Standing behaviour of non-ambulant children and youth using powered wheelchair standing devices (PWSDs): an interrupted time series pilot study**

Debra A Field, Jaimie Borisoff, Franco H N Chan, Roslyn W Livingstone, William C Miller

Disabil Rehabil Assist Technol . 2025 Jul 12:1-18. doi: 10.1080/17483107.2025.2529509. Online ahead of print.

Abstract
This study investigated "What is the standing behaviour for children and youth with substantial motor impairment due to a neuromotor disorder and does it change over the first three months of use after introducing a powered wheelchair standing device (PWSD) intervention?" As part of a larger interrupted time series with five timepoints, dataloggers measured PWSD seat angle range, frequency and duration for five days, at one-week, one-month and three-months post-PWSD provision with a purposefully-selected sample. Two males and four females aged 7-18 years with diagnoses of spina bifida or cerebral palsy participated; all had minimal experience standing and walking. PWSD seat angle movement relative to horizontal (typical wheelchair seat orientation) was categorised as sitting ≤ 30 degrees (°), weightbearing 31°-60°, and standing > 60°. Descriptive statistics and visual analysis described sample and recordings. Standing behaviours, individualised across participants, varied across timepoints. Total frequency (number of events over 5 days) ranged from 0-13 times in weightbearing and 0-12 times in standing. The two youngest stood more frequently. Duration (minutes) ranged from 0.4-71.5 for weightbearing and 0.4-80.2 for standing; most lasted <3 min. Although PWSDs hold potential for increasing standing behaviour, contextual factors strongly influenced use. Findings reinforce the importance of considering children's and youth's participation goals and how those may affect weightbearing or standing behaviour. For those considered non-ambulatory since birth, additional instruction and support is needed to optimise use of PWSD standing functions for independent body position changes as they engage in functional activities and fully integrate PWSD use into daily life.
Plain language summary
For non-ambulant children and youth with substantial chronic motor impairments, PWSDs have the potential for promoting independent weightbearing and standing, enabling one’s own control over body positioning in daily life. Data logger technology offers important objective information about children’s and youth’s PWSD use. When implementing PWSD interventions, a multitude of personal and environmental factors can influence weightbearing and standing behaviour, including engagement in meaningful life activities such as self-care, play, learning and social interaction. Children and youth who have little to no experience standing or moving about in an upright standing posture independently may benefit from specific training and ongoing therapy support to optimise PWSD use utilising a variety of body posture orientations to promote participation in daily life with family and friends.
PMID: 40650476

**12.A Pre-Registered, Open Pipeline for Early Cerebral Palsy Risk Assessment from Infant Videos**

Melanie Segado, Laura A Prosser, Andrea F Duncan, Michelle J Johnson, Konrad P Kording

medRxiv [Preprint]. 2025 Jun 26:2024.11.06.24316844. doi: 10.1101/2024.11.06.24316844.

Abstract
Cerebral Palsy (CP), affecting approximately 1 in 500 children due to abnormal brain development, impacts movement control. Early risk assessment via the General Movements Assessment (GMA) at 3-4 months is highly predictive for CP but relies on trained clinicians. Machine-learning-based approaches for predicting GMA score from video have shown considerable promise, but are not openly available and rely on fine-tuned pre-processing steps, hand-crafted feature sets, and experimenter-driven hyperparameter selection. This, combined with strict privacy constraints on sharing data, limits the extent to which models can be trained and tested across datasets, thus reducing clinical impact. There is therefore a need to develop approaches that will work across different datasets to enable multi-site dataset aggregation and model training. To address this gap, we developed an end-to-end pipeline that uses off-the-shelf pose estimation, general-purpose feature extraction, and automated machine learning, none of which are tuned to a specific dataset. We applied this approach to a newly generated large dataset of 1063 infants (with approximately 12% positive class for adverse GMA outcome, drawn from a high-risk clinical cohort) within a preregistered study design. Model performance was evaluated on a strict "lock-box" validation set, which remained untouched during any phase of model development or pre-processing optimization. The developed model achieved moderate predictive accuracy for clinician-assessed GMA scores (Area Under the Receiver Operating Characteristic Curve, ROC-AUC = 0.79; Area Under the Precision-Recall Curve, PR-AUC = 0.34). The moderate accuracy is noteworthy given the 12% positive class prevalence. By releasing de-identified feature data and open-source code, and simplifying the training pipeline using automated machine learning, our work establishes essential groundwork for future robust, globally relevant CP screening tools suitable for low-resource settings.
PMID: 40666343

**13.Robot-assisted gait training in children with cerebral palsy: a randomized comparative study**

Sevgi Esra Özdemir Tekeş, Birkan Sonel Tur, Şehim Kutlay, Derya Gökmen, Aslı Çiftci

Dev Neurorehabil . 2025 Jul 13:1-10. doi: 10.1080/17518423.2025.2533218. Online ahead of print.

Objective: The primary aim of this study was to evaluate the effect of robot-assisted gait training (RAGT) in addition to conventional therapy (ConT) on gross motor function in children with cerebral palsy (CP) compared to ConT alone.
Methods: A total of 57 children (5-18 years) were randomly assigned to one of two groups, and then evaluated four times: before and immediately after treatment, then at 6 and 12 weeks using the Gross Motor Function Measure-88 (GMFM-88).
Results: Only the ConT+RAGT group showed improvement in GMFM-D and total score and GAS between T1-T2 and T1-T4, whereas both groups showed improvement in GMFM-E at all time points.
Conclusions: It was concluded that RAGT in addition to ConT improves gross motor function in CP.
PMID: 40653440

**14.Agreement Between the Gross Motor Ability Estimator-3 and the Reduced Gross Motor Function Measure-66 Based on Artificial Intelligence**

Stefanie Steven, Carlotta Müller, Karoline Spiess, Christiane Bossier, Eckhard Schönau, Ibrahim Duran

J Clin Med . 2025 Jun 25;14(13):4512. doi: 10.3390/jcm14134512.

Abstract
Background: The reduced Gross Motor Function Measure-66 (rGMFM-66) has already demonstrated its validity compared to the standard GMFM-66 using the Gross Motor Ability Estimator-2 (GMAE-2). This study aimed to evaluate its validity using the updated Gross Motor Ability Estimator-3 (GMAE-3) and to compare agreement between GMFM-66v2 and GMFM-66v3.
Methods: A retrospective analysis was conducted on 250 children with cerebral palsy (CP) enrolled in a rehabilitation program between 2015 and 2024. All GMFCS levels (I-V) were represented. The sample included 107 females and 143 males, with a mean age of 6.9 years (SD 3.4). Agreement between scoring methods was assessed using intraclass correlation coefficients (ICCs) and Bland-Altman analyses. Results: The rGMFM-66 showed excellent agreement with GMFM-66v3 (ICC = 0.994; 95% CI 0.992-0.996). Similar agreement was found between GMFM-66v2 andGMFM-66v3 (ICC = 0.994; 95% CI 0.991-0.996). Bland-Altman plots confirmed close agreement across all comparisons. The rGMFM-66 reduces administration time from 45 to 26 min, offering a 42% time saving in clinical use. Conclusions: The rGMFM-66 demonstrates very high agreement with GMFM-66v3 and appears to be a valid alternative. Its strong concordance supports its applicability in both clinical and research settings. Although agreement was high, minor differences between scoring methods indicate that results should be interpreted in light of the scoring algorithm applied.
PMID: 40648886

**15.Entropy, Irreversibility, and Time-Series Deep Learning of Kinematic and Kinetic Data for Gait Classification in Children with Cerebral Palsy, Idiopathic Toe Walking, and Hereditary Spastic Paraplegia**

Alfonso de Gorostegui, Massimiliano Zanin, Juan-Andrés Martín-Gonzalo, Javier López-López, David Gómez-Andrés, Damien Kiernan, Estrella Rausell

Sensors (Basel) . 2025 Jul 7;25(13):4235. doi: 10.3390/s25134235.

Abstract
The use of gait analysis to differentiate among paediatric populations with neurological and developmental conditions such as idiopathic toe walking (ITW), cerebral palsy (CP), and hereditary spastic paraplegia (HSP) remains challenging due to the insufficient precision of current diagnostic approaches, leading in some cases to misdiagnosis. Existing methods often isolate the analysis of gait variables, overlooking the whole complexity of biomechanical patterns and variations in motor control strategies. While previous studies have explored the use of statistical physics principles for the analysis of impaired gait patterns, gaps remain in integrating both kinematic and kinetic information or benchmarking these approaches against Deep Learning models. This study evaluates the robustness of statistical physics metrics in differentiating between normal and abnormal gait patterns and quantifies how the data source affects model performance. The analysis was conducted using gait data sets from two research institutions in Madrid and Dublin, with a total of 81 children with ITW, 300 with CP, 20 with HSP, and 127 typically developing children as controls. From each kinematic and kinetic time series, Shannon's entropy, permutation entropy, weighted permutation entropy, and time irreversibility metrics were derived and used with Random Forest models. The classification accuracy of these features was compared to a ResNet Deep Learning model. Further analyses explored the effects of inter-laboratory comparisons and the spatiotemporal resolution of time series on classification performance and evaluated the impact of age and walking speed with linear mixed models. The results revealed that statistical physics metrics were able to differentiate among impaired gait patterns, achieving classification scores comparable to ResNet. The effects of walking speed and age on gait predictability and temporal organisation were observed as disease-specific patterns. However, performance differences across laboratories limit the generalisation of the trained models. These findings highlight the value of statistical physics metrics in the classification of children with different toe walking conditions and point towards the need of multimetric integration to improve diagnostic accuracy and gain a more comprehensive understanding of gait disorders.
PMID: 40648490

**16.Tactile Interaction with Socially Assistive Robots for Children with Physical Disabilities**

Leila Mouzehkesh Pirborj, Caroline Mills, Robert Gorkin 3rd, Karthick Thiyagarajan

Review Sensors (Basel) . 2025 Jul 6;25(13):4215. doi: 10.3390/s25134215.

Abstract
Children with physical disabilities are increasingly using socially assistive robots (SARs) as part of therapy to enhance motivation, engagement, enjoyment, and adherence. Research on SARs in rehabilitation has primarily focused on verbal and visual interaction, but little is known about tactile interaction (physical touch). The objective of this scoping review was to examine empirical studies published between 2010 and 2024 focusing on tactile interaction between SARs and children with physical disabilities, such as cerebral palsy (CP). Nine studies were identified as being eligible after a rigorous selection process, showing that although touch-based SAR interventions have been used in pediatric rehabilitation, structured methodologies and standardized tools are lacking for measuring tactile engagement. In light of the studies' findings, it is evident that few studies evaluate the therapeutic effects of touch-sensitive SARs, underscoring the need for validated frameworks to assess their efficacy. In this review, SAR and tactile sensing researchers, rehabilitation specialists, and designers are given critical insights into how tactile interaction can enhance the role of SARs in physical therapy.
PMID: 40648470

**17.Incidence of developmental disorders and special educational needs and disabilities in children in the UK**

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Dev Med Child Neurol . 2025 Jul 16. doi: 10.1111/dmcn.16396. Online ahead of print.

Aim: To investigate the incidence of developmental disorders (including cerebral palsy, attention-deficit/hyperactivity disorder, and autism spectrum disorder) and special educational needs provision and to explore associations with gestational age and ethnicity.
Method: Cumulative incidence of developmental disorders and special educational needs provision up to age 12 years/end of school year 7 respectively was explored using multivariable logistic regression in the Born in Bradford cohort, UK. Incidence rates of individual developmental disorders were calculated.
Results: There were 13 172 children included in the analysis cohort. Birth before full term was associated with increased odds of developmental disorder compared with birth at full term: adjusted odds ratio (aOR) for those born before 34 weeks 2.22 (95% confidence interval [CI] 1.58-3.12); 34 to 36 weeks aOR 1.43 (95% CI 1.12-1.81); 37 to 38 weeks aOR 1.18 (95% CI 1.03-1.34). Effect sizes were larger among Pakistani heritage children: aOR for those born before 34 weeks 2.59 (95% CI 1.55-4.33); 34 to 36 weeks aOR 1.57 (95% CI 1.08-2.27); 37 to 38 weeks aOR 1.29 (95% CI 1.06-1.56). Unadjusted incidence rates of developmental disorders varied with ethnicity; compared with Pakistani heritage children, White British children had higher rates (per 1000 person-years) of attention-deficit/hyperactivity disorder (1.8, 95% CI 1.5-2.1 vs. 0.3, 95% CI 0.2-0.4), and lower incidences of learning disabilities (0.7, 95% CI 0.5-1.0 vs. 1.6, 95% CI 1.4-1.9).
Interpretation: Irrespective of ethnicity, children born before full term are at increased risk of developmental disorders and/or special educational needs.
PMID: 40671178

**18.Cultural Adaptation, Validity and Reliability of the Turkish Version of Canadian Occupational Performance Measure in Children With Cerebral Palsy**

Emine Sağlamoğlu, Ege Temizkan, Meral Huri, Gamze Ekici

Child Care Health Dev . 2025 Jul;51(4):e70139. doi: 10.1111/cch.70139.

Background: Due to its complex nature, cerebral palsy (CP) leads to impairments in body structure and functions, decreased participation and affected occupational performance. The Canadian Occupational Performance Measure (COPM) is commonly used with both children diagnosed with CP and their parents, but it has not been culturally adapted in this population. The primary aim of this study was to evaluate the psychometric properties (validity and reliability) of the COPM when used directly with children with CP. A secondary aim involved translating the specific administration instructions into Turkish to facilitate child self-report.
Methods: All analyses conducted to examine validity and reliability were performed using the COSMIN (Consensus-based Standards for the selection of health status Measurement Instruments) guideline. The scale and instructions were translated following Beaton's procedure.
Results: The discriminative construct validity analysis revealed no significant gender-based differences in COPM performance and satisfaction scores ($p = 0.75$, $p = 0.11$), indicating consistency across genders. Item analysis showed acceptable internal consistency (Cronbach's alpha: 0.76-0.81). Test-retest analysis demonstrated excellent reliability for time-related equability in COPM performance and satisfaction parameters (ICC > 0.9).
Conclusion: The COPM is a valid and reliable measurement tool for children aged 8-18 with CP, with adapted instruction in Turkish.
PMID: 40660963

**19.The Impact of Child Disability on Parental Outcomes: Evidence From Sweden**

Derek Asuman, Ulf-G Gerdtham, Ann I Alriksson-Schmidt, Martin Nordin, Johan Jarl

Health Econ . 2025 Jul 14. doi: 10.1002/hec.70017. Online ahead of print.

Abstract
Parents of children with disabilities may face higher labor-market penalties given the extra care and support required. Using Swedish administrative data, we focus on first-born children with Cerebral Palsy (CP) to estimate impacts on parental labor-market outcomes. We apply an event study approach to identify effects up to 10 years after the birth of the child. Our results show that employment and earnings of mothers decrease in the short run and increase in the long run whereas for fathers, a marginal decrease is observed in the short run. The effects differ by severity of the disability, with mothers of children with severe impairments driving the increases in the long run, whilst mothers of children with mild impairments appear to experience a penalty. Further, transfers and benefits from the Swedish social insurance system compensate parents for some of the potential costs associated with caring for a child with CP.
PMID: 40658362

**20.Employment is associated with manual ability in adults with cerebral palsy - a population-based study**

Jenny Hedberg-Graff, Elisabet Rodby-Bousquet, Anna Lindgren, Evgenia Manousaki, Erika Cloodt, Katina Pettersson

Disabil Health J . 2025 Jul 10:101926. doi: 10.1016/j.dhjo.2025.101926. Online ahead of print.

Background: Employment rates are lower in adults with cerebral palsy (CP). Even though reduced manual ability is associated with limitations in daily activities, it is unclear whether employment rates are associated with manual ability in adults with CP.
Objective: To analyze regular employment and employment rates (hours/week) in adults with CP and estimate their associations with manual ability relative to age and sex.
Methods: This was a cross-sectional study of adults with CP, aged 20-64 years, from the combined Swedish CP follow-up program and registry. Manual ability was classified as levels I-V using the Manual Ability Classification System (MACS). Logistic regression analysis was used.
Results: The study included 2304 adults with CP (1271 men; median age 28 years, interquartile range 20-64 years). Fewer than one in five (19 %) were employed, and about half (52 %) of these worked full time. The probability of employment in adults with MACS level II was almost half that of those with level I (OR 0.44; 95 % CI 0.34-0.57) and decreased with each MACS level to OR 0.01 (95 % CI 0.00-0.03) for MACS V. Limited manual ability was associated with a lower probability of working full time: ORs of 0.46 (95 % CI 0.30-0.72) for MACS II and 0.29 (95 % CI 0.16-0.56) for MACS III-V.
Conclusion: Limited manual ability in adults with CP impacts both their likelihood of employment and employment rate. Greater manual ability is associated with a higher probability of regular employment and working full time.
PMID: 40653400

**21.Turkish Version of the Montreal Children's Hospital Feeding Scale: Validity and Reliability Study in Children With Cerebral Palsy**

Özgü İnal Özün, Sevilay Karahan, Mustafa Cemali, Selen Serel Arslan

Int J Lang Commun Disord . 2025 Jul-Aug;60(4):e70074. doi: 10.1111/1460-6984.70074.

Background: This study was conducted to translate The Montreal Children's Hospital Feeding Scale (MCH-FS) into Turkish and to evaluate the psychometric properties of the Turkish version (T-MCH-FS) in children with cerebral palsy (CP).
Method: The study involved 160 children (70 children with CP and 90 typically developing children) aged 18 to 72 months. Karaduman Chewing Performance Scale (KCPS), Paediatric version of the Eating Assessment Tool-10 (PEDI-EAT-10) and Behavioral Pediatrics Feeding Assessment Scale (BPFAS) were used to examine the construct validity of the T-MCH-FS.
Results: Internal consistency was sufficient with a Cronbach's alpha value of 0.820. There were correlations between the T-MCH-FS and the KCPS ($r = 0.377$, $p < 0.001$), the PEDI-EAT-10 ($r = 0.655$, $p < 0.001$) and the BPFAS scores for total frequency, child frequency, parent frequency, restriction and poor strategies ($p < 0.001$).
Conclusions: The T-MCH-FS was found to be a reliable and valid instrument to evaluate feeding problems in children with CP and typically developing children.
What this paper adds: What is already known on the subject Feeding problems are very common in children with CP and cause stress for the individual and their caregivers. What this paper adds to existing knowledge The MCH-FS is a practical and quick tool which provides a comprehensive overview regarding feeding problems. What are the potential or actual clinical implications of this work? The T-MCH-FS has been shown to be a reliable and valid tool for assessing feeding problems in children with CP.
PMID: 40650399

**22.The proposed updated description of cerebral palsy: Through the lens of lived experience**

Georgina Henry, Natasha Garrity, Leanne Diviney; Cerebral Palsy Alliance

Dev Med Child Neurol . 2025 Jul 17. doi: 10.1111/dmcn.16418. Online ahead of print.

No abstract available
PMID: 40676755

**23.Emphasizing neuroplasticity in the proposed updated description of cerebral palsy**

Mehmet N Cizmeci

Dev Med Child Neurol . 2025 Jul 16. doi: 10.1111/dmcn.16417. Online ahead of print.

No abstract available
PMID: 40671210

**24.Addressing conceptual gaps between the clinical and plain-language versions of the proposed updated description of cerebral palsy**

Nilly Waiserberg, Hanoch Cassuto, Nava Gelkop

Dev Med Child Neurol . 2025 Jul 16. doi: 10.1111/dmcn.16423. Online ahead of print.

No abstract available
PMID: 40671205

**25.Insights into the genetic landscape of cerebral palsy**

Yangong Wang, Changlian Zhu, Qinghe Xing

Clin Transl Med . 2025 Jul;15(7):e70412. doi: 10.1002/ctm2.70412.

No abstract available
PMID: 40665602

**26.Lasting Impact of Patient-Led Medical Education**

Bonita Sawatzky, Cathy Kline

Clin Teach . 2025 Aug;22(4):e70147. doi: 10.1111/tct.70147.

Background: Our university offers an interprofessional program to medical students in Year 1 of a 4-year undergraduate medical program: Health professional students learn from a health mentor-someone living with a chronic condition. This helps foster patient-centredness, empathy and communication skills. Long-term assessment of patient involvement in medical education is rare; thus, this study explores the lasting effects of 3-year post-program at entry-to-practice.
Methods: We conducted a case-based study of fourth-year medical students to evaluate the impact of learning from patients in the Health Mentors Program (HMP). Students analysed a video case of a person with cerebral palsy who fell at home and created a care plan. We compared students who participated in the HMP with those who did not, assessing how often they considered the patient's and caregiver's perspectives, the number of diagnostic tests ordered and referrals to other professionals and community services.
Findings: T-tests showed that HMP students significantly prioritised the patient's and caregiver's voices ($p = 0.014$, Cohen's $d = 0.6$) and ordered fewer diagnostic tests than non-HMP students ($p = 0.001$, Cohen's $d = 3.3$). However, there were no significant differences in medical consults, referrals to allied health professionals or community services.
Conclusions: This was the first, limited attempt to use case-based assessments to measure the long-term impact of patient-centred learning. Integrating patient perspectives into preclinical education may enhance students' ability to work collaboratively with patients in care planning. Designing structured assessments around patient-centred care can help ensure that students retain and apply these skills in their clinical careers.
PMID: 40650495

**27.YouTube as a Source of Patient Information for Cerebral Palsy**

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Healthcare (Basel) . 2025 Jun 23;13(13):1492. Doi: 10.3390/healthcare13131492.

Abstract
Background/objectives: Social media has significantly enhanced access to medical knowledge by enabling rapid information sharing. With YouTube being the second-most popular website, we intended to evaluate the quality of its content as a source of information for patients and relatives for information about cerebral palsy. Methods: The first 30 videos for search terms “Cerebral palsy”, “Spastic cerebral palsy”, “Dyskinetic cerebral palsy”, “Worster-Drought syndrome”, and “Ataxic cerebral palsy” were selected for inquiry. Out of 150 films, a total of 83 were assessed with a mixed method approach by two independent raters utilizing evidence-based quality scales such as Quality Criteria for Consumer Health Information (DISCERN), the Journal of the American Medical Association instrument (JAMA), and the Global Quality Score (GQS). Furthermore, audience engagement was analyzed, and the Video Power Index (VPI) was calculated for each video. Results: The mean total DISCERN score excluding the final question (subjective assessment of the video) was $30.5 \pm 8.7$ (out of 75 points), implying that the quality of the videos was poor. The global JAMA score was $2.36 \pm 0.57$ between the raters. The mean GQS score reached $2.57 \pm 0.78$. The videos had statistically higher DISCERN scores when they included treatment options, risk factors, anatomy, definition, information for doctors, epidemiology, doctor as a speaker, and patient experience. Conclusions: YouTube seems to be a poor source of information for patients and relatives on cerebral palsy. The analysis can contribute to creating more engaging, holistic, and informative videos regarding this topic.
PMID: 40648517

# Prevention and Cure

**28.Lessons from using the Normalisation Process Theory to understand adherence to guidance on MgSO4 in preterm labour**

Christalla Pithara-McKeown, Tracey Stone, Emma Treloar, Jenny Donovan, Karen Luyt, Sabi Redwood

Implement Sci Commun . 2025 Jul 16;6(1):75. doi: 10.1186/s43058-025-00758-1.

Background: The administration of magnesium sulphate (MgSO4) in preterm labour is an evidence-based intervention recommended by the United Kingdom's National Institute for Health and Care Excellence (NICE) to prevent neurological damage to the infant. However, uptake varies across UK maternity units. We used findings from three studies in England, Scotland and Wales investigating implementation of guidance on MgSO4 as neuroprotectant in preterm-labour to understand how knowledge mobilisation can drive scaling and spread of improvement.
Methods: Remote semi-structured interviews were carried out as part of an evaluation of (1) the PReCePT (Preventing Cerebral Palsy in Pre-Term Labour) National Programme, and (2) the PReCePT cRCT study, and as part of a qualitative study investigating MgSO4 guidance implementation in Scotland and Wales. Normalisation Process Theory informed data collection and analysis. Data were analysed using the framework method.
Results: Interviews with 86 strategic and clinical leads and implementers from the three nations suggested that despite evidence being necessary and important for policy decision-making and clinical buy-in, improvement interventions were motivated by audit data and benchmarking. Scaling of improvement was driven by knowledge sharing, diffusion of innovation, and capacity building through relational structures (e.g. networks, communities) spanning the perinatal ecosystem. Local champions operating in multiple communities and networks as boundary-spanners connected national and regional leadership, patient group representatives, implementers i.e. clinical leads and champions, and perinatal clinical teams to enable knowledge mobilisation. Their work relied on backfill funding and protected time, and social-cognitive and social-structural resources in their settings. Sense-making, cognitive participation, collective action and reflexive monitoring work took place iteratively and dynamically within and across these structures on each level of the system.
Conclusions: QI interventions driven by knowledge mobilisation can drive scaling and spreading of improvement, but require knowledge sharing and an infrastructure within the system to support improvement capacity building. Strong leadership with the ability to address power imbalances between co-actors, and secure protected funding for local champions is also required.
PMID: 40671127

**29.What Is the Safest Population-Level Caesarean Delivery Rate? A National Cohort Study Using Natural Variation**

Dag Moster, Allen J Wilcox, Rolv Terje Lie

BJOG. 2025 Jul 14. doi: 10.1111/1471-0528.18301. Online ahead of print.

Objective: Ten to fifteen per cent has been proposed for many decades as the optimal level of caesarean section, with little supporting data. Norway provides a natural experiment in which local variations in the use of caesarean section can be related to health outcomes in the context of free access to high-quality medical services.
Design: Prospective national cohort.
Setting: Norway.
Population: Norwegian deliveries 1995-2014.
Methods: We calculated annual rates of caesarean delivery and health outcomes for 435 municipalities. To avoid hospital referral bias, the mother's municipality of residence was the unit of analysis. Caesarean-delivery rates in each year were based on the 2 years before and after, avoiding indication bias. Analyses were adjusted for year, with additional adjustments in sensitivity analyses.
Main outcome measures: Maternal mortality, severe maternal haemorrhage and perineal tears; stillbirth and neonatal death, neonatal encephalopathy and cerebral palsy.
Results: There were 1 172 546 deliveries across 8647 municipality-year combinations over a 20-year period. Caesarean rates across municipalities ranged from about 10% to 20%, with quartile values of 13%, 16% (median) and 18%. Most adverse outcomes were least frequent in municipalities with caesarean rates above 15%. Lower rates of caesarean delivery were associated with more frequent occurrence of perineal tears (OR 1.41, 95% confidence interval 1.36-1.46), neonatal encephalopathy (OR 1.91, 1.71-2.13), cerebral palsy (1.48, 1.24-1.77) and stillbirths (OR 1.07, 0.99-1.17), but also with less frequent maternal haemorrhage (OR 0.81, 0.77-0.85). Further adjustments had minimal effect on estimates.
Conclusion: In Norway, a country with free access to high-quality medical care, a local caesarean-delivery rate of 10% was associated with nearly a two-fold risk of neonatal encephalopathy and a 50% higher occurrence of cerebral palsy compared with areas with a caesarean-delivery rate of 20%.
PMID: 40654044