Cerebral palsy research news

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Interventions and Management

1.Active upper-limb therapies for hand function, individual goal achievement, and self-care in children with cerebral palsy: A network meta-analysis

Andrea Burgess, Mark D Chatfield, Diana Hermith-Ramirez, Michelle Jackman, Megan Thorley, Sarah Reedman, Roslyn N Boyd, Leanne Sakzewski

Dev Med Child Neurol. 2025 Sep 5. Online ahead of print.

Aim: To compare active upper-limb therapies for children with cerebral palsy using a network meta-analysis.
Method: For this systematic review, five electronic databases were searched up to 2nd September 2024. Outcomes pertaining to improved hand use (Assisting Hand Assessment, AHA), goal attainment (Canadian Occupational Performance Measure, COPM), and self-care were analysed with therapies classified into 15 discrete categories.
Results: Quantitative analysis of 48 randomized controlled trials (n = 1629) was performed. Compared with control, treatment effect on hand function (AHA mean difference, standard error) was greater for bimanual therapy (BiM: 4.6, 1.0), modified constraint-induced movement therapy (mCIMT; 4.0, 1.0), goal-directed therapy (GDT; 3.8, 1.6), action observation (4.9, 1.1), and mCIMT + intensive (7.4, 2.5). For COPM performance, treatment effect was greater for cognitive orientation to occupational performance (CO-OP; 5.9, 1.4), BiM (3.3, 0.4), mCIMT (2.5, 0.5), GDT (2.3, 0.7), mirror therapy (2.6, 1.2), and mCIMT + GDT (4.2, 1.1). For self-care, treatment effect (standardized mean difference, standard error) was greater for BiM (0.39, 0.10), mCIMT (0.37, 0.08), and mCIMT + GDT (0.43, 0.32).
Interpretation: BiM and mCIMT were confirmed as effective interventions for hand function, self-care, and individual goal achievement. Mirror therapy, CO-OP, and four different combination approaches feature single studies, small sample sizes, and high risk of bias, requiring further clinical trials to confirm efficacy.
PMID: 40910998

2.Commentary on "Hand functions following prone-Weight bearing on upper limb with active elbow extension versus modified constraint induced Movement therapy in children with unilateral cerebral palsy - a randomised clinical trial"

Jyoti James, Antar Das, Sidharth Bansal

NeuroRehabilitation. 2025 Sep 4. Online ahead of print

Abstract
No abstract available.
PMID: 40905753

3.Comment on "Hand Functions Following Prone-weight Bearing on Upper Limb with Active Elbow Extension Versus Modified Constraint-Induced Movement Therapy in Children with Unilateral Cerebral Palsy: A Randomized Clinical Trial" by Narayan et al. (2025)

Hafsa Tariq, Tayba Arab Farooqi

NeuroRehabilitation. 2025 Sep 4. Online ahead of print

Abstract
No abstract available.
PMID: 40905743

4.Enhancement of postural control and upper limb function following selective dorsal rhizotomy: a retrospectively registered study

Pasquale Cardellicchio, Marta Bertamino, Anna Bruna Ronchetti, Ludovica Primavera, Luca Doglio, Alessia Aiello, Annalisa Calcagno, Marina Usai, Maria Grazia Calevo, Marco Pavanello, Chiara Tacchino

Eur J Pediatr. 2025 Sep 3;184(9):589

Abstract
Cerebral palsy is the most common pediatric disability, characterized by a spectrum of permanent disorders that hinder movement, posture, and overall activity, causing long-term functional limitations. For those unresponsive or unsuitable to conventional treatments, neurosurgical interventions such as selective dorsal rhizotomy or intrathecal baclofen may be considered. Selective dorsal rhizotomy (SDR) aims to reduce lower limb spasticity while preserving sensory and sphincteric functions. Despite its established effectiveness in the control of lower limb increased muscle tone, its impacts on the upper limb motor performance and the trunk control require further investigations. This study aims to systematically assess changes in neck, trunk, and upper limb functionality following Selective Dorsal Rhizotomy in children with cerebral palsy, highlighting the improvements and the timeline of recovery after surgery.
Conclusions: Selective dorsal rhizotomy improvements achieved are significant especially in the early post-surgical phase and already detectable three months after surgery and involved also a reduction in both upper limb function and trunk misalignment. Determining post-operative improvements and recovery times can help maximize post-operative outcomes through appropriate rehabilitation therapies.
PMID: 40900163

5.Severe Cerebral Palsy and Short Stature Predict Absent Baseline IONM Signals in Pediatric Neuromuscular Scoliosis Surgery

Pochih Shen, Alan Robert Bielsky, Thanh Nguyen, Carson Keeter, Susan Walczak, Tyler Sullivan, Nancy Hadley-Miller, Mark A Erickson

J Pediatr Orthop. 2025 Sep 3. Online ahead of print

Background: Intraoperative neurophysiological monitoring (IONM) is essential for detecting potential neurological injury during scoliosis surgery, but obtaining recordable baseline signals can be challenging in neuromuscular scoliosis (NMS) patients. Absent baseline IONM signals, characterized by unattainable initial IONM responses despite technical and anesthetic optimization, present significant challenges to intraoperative neurological assessment and surgical risk stratification. This study aims to identify predictive factors for absent baseline IONM signals in pediatric NMS patients and establish a clinically applicable risk prediction model.
Methods: This retrospective study initially identified 118 nonambulatory NMS patients under 18 years old who underwent spinopelvic fusion between 2013 and 2022. All patients received standardized total intravenous anesthesia (TIVA) protocol to optimize signal acquisition. After excluding 3 patients with spinal cord injuries, 115 patients were analyzed. Multimodality IONM, including somatosensory evoked potentials (SSEPs) and transcranial electrical motor evoked potentials (TcMEPs) was attempted in all cases. Clinical data and radiographic measurements were analyzed to determine predictive factors for absent baseline IONM signal. ROC curve analysis and logistic regression were used to determine optimal thresholds and predictive factors for absent baseline IONM signals.
Results: Thirty-eight (33%) had absent baseline lower extremity IONM signals. Cerebral palsy (CP) was the most significant predictive factor [odds ratio (OR): 9.615, P<0.001], with 53.1% of CP patients having absent baseline IONM signals. Within the CP cohort, Gross Motor Function Classification System (GMFCS) level V (OR: 11.501, P=0.028) and body height <128.5 cm (OR: 4.097, P=0.044) were significant risk factors. Three patients developed new-onset urinary incontinence postoperatively, though the relationship to IONM status remains undetermined.
Conclusion: Severe CP and shorter stature significantly increase the risk of absent baseline IONM signals in pediatric NMS patients. These findings inform preoperative risk assessment, enhance patient-specific surgical planning, and suggest the need for alternative monitoring approaches in high-risk cases. Such early identification of monitoring challenges can improve surgical preparation, consent processes, and ultimately patient care in this vulnerable population.
PMID: 40899495

6.Bracing for scoliosis in children with cerebral palsy—a systematic review

Niels Merkelbach, Alix De Pauw, Anja Van Campenhout

J Child Orthop. 2025 Aug 27. Online ahead of print

Purpose: Scoliosis is a prevalent condition among individuals with cerebral palsy, characterized by an inability to maintain spinal alignment due to diminished muscle tone. This progressive curvature becomes structural over time, resulting in physical impairment and challenges in daily activities. Consequently, therapeutic intervention is essential. Historically, brace therapy has been extensively utilized, but its efficacy remains uncertain.
Methods: A systematic review was conducted across four databases to compile all relevant studies and reviews pertaining to brace therapy in cerebral palsy patients. Each article was independently assessed by two researchers and evaluated using the SIGN tool.
Results: Eight studies were included, comprising six retrospective and two prospective studies, all rated as "acceptable" or "high quality." Brace therapy demonstrated a temporary positive effect, with improved Cobb angles observed during brace usage, particularly in patients under 15 years of age, due to incomplete spinal maturation. However, this improvement is transient, as Cobb angles tend to increase once the brace is removed, diminishing its effectiveness. In addition, brace therapy positively impacts quality of life by enhancing posture and reducing pain, although these benefits also diminish over time, potentially leading to a decline in quality of life.
Conclusions: Brace therapy offers temporary relief for physical and daily life challenges associated with cerebral palsy. However, its effects are not sustained, necessitating operative techniques for long-term management. This was a systematic review of Level-II studies or Level-I studies with inconsistent results.
PMID: 40896527

7.Femoral neck anteversion of the less involved side in unilateral cerebral palsy: kinematics and radiological considerations

Zhenkun Gu, Anisa Mujaj, Olivia C Tracey, Jennifer Jezequel, Silvia Zanini, Bridget Assip, Vishnu D Chandran, David Scher, Paulo R Selber

J Pediatr Orthop B. 2025 Aug 20. Online ahead of print

Abstract
This research aims to investigate femoral neck anteversion (FNA) on the less involved side in unilateral cerebral palsy (CP) and examine its impact on hip rotation during gait. Sixty-nine patients with unilateral CP, with a mean age of 21 years, were included in the study. Static and dynamic hip rotation ranges were quantified via physical examination and three-dimensional motion analysis. Patients were stratified into five levels of involvement according to modified Winters' classification. FNA differences between modified Winters' classification types and correlation with static and dynamic hip rotation were analyzed. Hip morphology was classified based on the Melbourne Cerebral Palsy Hip Classification Scale E&R.
Regarding FNA, our analysis suggested a moderate correlation ($r = 0.61$, $P < 0.05$) between both sides. Hip dysplasia was found in 20.5% and 23.1% of the less involved and more involved sides, respectively, in 39 patients. Increased FNA was associated with increased static hip internal and decreased external rotation for both sides ($P < 0.05$). A positive correlation was observed between FNA and dynamic hip rotation on the more involved side ($P < 0.05$). Conversely, on the less involved side, FNA showed no significant correlation with pelvic, hip, or knee rotation.
This study demonstrates that in unilateral CP, the less involved side is also significantly affected, a moderate correlation exists between the two sides, and both hips may exhibit dysplasia. These findings underscore the necessity for a comprehensive bilateral clinical assessment. Long-term surveillance of both hips and consideration of the less involved side for surgical planning may be warranted.
PMID: 40888798

8.Discrepancies between clinical assessments of lower limb torsional deformities and gait kinematics in ambulatory individuals with cerebral palsy

Brian Po-Jung Chen, Chao-Jan Wang, Chia-Ling Chen, Chia-Hsieh Chang

Gait Posture. 2025 Aug 26. Online ahead of print

Abstract
Background: Cerebral palsy (CP) often presents with lower limb torsional deformities that affect gait and mobility. Clinical assessments typically rely on static physical examinations, but discrepancies arise when compared with dynamic gait kinematics. Understanding the relationship between clinical assessments, including imaging, and gait analysis is essential for accurate diagnosis and treatment planning.
Methods: This cross-sectional study included 106 limbs from 53 ambulatory individuals with CP, classified as GMFCS levels I to III. Participants underwent standardized physical examinations to assess lower limb rotational deformities, along with three-dimensional CT imaging to quantify skeletal torsion. Instrumented gait analysis measured the foot progression angle (FPA) at angle at initial contact, foot off, and terminal swing. Linear regression analyses examined correlations among these measures, with subgroup analyses by GMFCS level.
Results: Weak correlations were observed between physical examination findings and gait kinematics ($R^2 < 0.5000$). Imaging, particularly tibial torsion, showed stronger associations with FPA, especially in GMFCS levels I and III (R^2 up to 0.9112). GMFCS level II participants showed weaker correlations, suggesting different compensatory mechanisms. Functional severity influenced how static assessments aligned with dynamic gait parameters.
Conclusion: While CT remains the gold standard for skeletal torsional deformities, static measurements do not necessarily reflect dynamic gait function. Gait is not solely dictated by skeletal alignment but also shaped by compensatory neuromotor strategies. Integrating gait analysis and imaging into clinical decision-making may improve surgical planning and outcomes, especially when stratified by GMFCS levels.
PMID: 40903368

9.A 5-year retrospective cohort study of changes in ICF-CY parameters in Cerebral Palsy (CP) children and adolescents with cITB versus Control Group

Anna Bruna Ronchetti, Giulia Biasotti, Angela Pistorio, Alessia Aiello, Marta Bertamino, Annalisa Calcagno, Pasquale Cardellicchio, Luca Doglio, Chiara Tacchino, Paolo Moretti, Gianluca Piatelli, Marco Pavanello

Am J Phys Med Rehabil. 2025 Sep 1. Online ahead of print

Objective: This study aims to compare the long-term results of cITB rehabilitation against those of conventional treatment for intractable spasticity in children with cerebral palsy using the International Classification of Functioning, Disability and Health of Children and Youth (ICF-CY).
Design: 5-year single-center retrospective cohort study.
Results: The ICF-CY data from 24 patients with CP of GMFCS levels IV-V (aged between 8 and 18 years) were retrospectively analyzed for 5 years. The results show different trends between the 12 patients who received cITB and the 12 who were excluded due to contraindications. The cITB group improved spasticity, pain and BMI z-scores over 12 months and during the 5-year follow-up with a continuous simple Baclofen administration at a maximum of 140 µg/d at a concentration of 2000 µg/mL.
Conclusions: cITB improves Structure and Function, Autonomy, and Participation in both short and long term. Overall, the cITB group, with its characteristics of initially greater pain and hypertonia, benefited significantly from the efficacy of intrathecal Baclofen treatment compared with the control group, which continued to receive conventional treatment. The ICF-CY outcome measures demonstrated an inter-relationship between spasticity and weakness and disease progression over childhood to adolescence. Follow-up will be vital for effective personalized treatment, quality of life, and research. Long-term ICF-CY data collection is key to comparing treatment outcomes.
PMID: 40907949

10.tACS-combined motor training for the rehabilitation of the upper limb in children and adolescents with cerebral palsy: A randomized, sham-controlled trial protocol

Viola Oldrati, Andrea Ciricugno, Renato Borgatti, Simona Orcesi, Elisa Fazzi, Jessica Galli, Verusca Gasparroni, Luigi Piccinini, Cristina Maghini, Zaira Cattaneo, Maria Arioli, Cosimo Urgesi, Alessandra Finisguerra

PLoS One. 2025 Sep 3;20(9):e0331360. eCollection 2025

Background: Children with cerebral palsy (CP) commonly face gross motor function impairments and manual dexterity deficits, significantly affecting their activity level and independence and, ultimately, quality of life. Rehabilitation often targets improving manual dexterity and activity levels, but standard therapies have limited efficacy. Hence, exploring novel methods to enhance upper limb functionality is crucial. Transcranial alternating current stimulation (tACS), by delivering currents oscillating at specific frequencies syncing with the brain's electrical rhythms, has been demonstrated to modulate neural oscillations and motor behavior.
Method: This randomized, double-blind, sham-controlled, pre-post test study involves 44 children and adolescents (6–17 yo) with CP treated in pairs, which will be randomly allocated to the experimental or control group receiving, respectively, active or sham fronto-cerebellar tACS delivered at the individual gamma frequency. After tACS, both groups will undergo bimanual training, including lower extremities (HABIT-ILE). Primary outcome measures will include the Assisting Hand Assessment, Box and Block Test, and a Visuomotor Task administered via computer for manual visuomotor control evaluation. Secondary outcomes will encompass the Children's Hand Experience Questionnaire, Canadian Occupational Performance Measure, Melbourne Assessment of Unilateral Upper Limb Function, Gross Motor Function Measure, Vineland version 2, Pediatric Quality of Life Inventory, and EEG power recorded in fronto-central regions at rest before (at T0), soon after (at T1), and 3 months after the end of (T2) the training. Safety and tolerability will be assessed by pre- and post-tACS recordings of oxygen saturation and heart rate, along with self-report questionnaires on sensations and side-effects.
Discussion: This study investigates whether an intensive HABIT-ILE program combined with fronto-cerebellar gamma tACS can boost training effects on manual dexterity in children and adolescents with CP, while ensuring safety and tolerability throughout the intervention period.
PMID: 40901773

11.Combining Whole-Body Vibration, Serial Casting, and Therapy to Treat Hemiplegic Cerebral Palsy: A Case Report

Emily J Quinn, Bethany M Sloane

Pediatr Phys Ther. 2025 Sep 4. Online ahead of print

Purpose: This case report describes the combined use of whole-body vibration (WBV), serial casting (SC), and physical therapy (PT) for a child with hemiplegic cerebral palsy (HCP).
Summary of key points: A 3-year 10-month-old male with HCP was followed for 10 months. Treatment included 9 weeks of SC due to ankle plantarflexion contracture, hypertonicity, poor orthotic tolerance, and gait limitations. WBV was introduced during week 4 to address hypertonicity and poor tolerance of manual therapy. PT sessions included stretching, gait training, and strengthening exercises, integrating SC and WBV into a comprehensive intervention.
Statement of conclusion and recommendations for clinical practice: This is the first report to explore combining WBV and SC within a PT program. WBV was safe and effective, potentially serving as a preparatory activity for SC. Improved orthotic wear tolerance, dorsiflexion range of motion, and gait efficiency suggest potential benefits of this multimodal approach, warranting further research.
PMID: 40901717

12.Enhanced Physical and Mental Function and Promotion of Social Participation in a Cerebral Palsy Patient Through Participation in Para-Jujutsu

Tadatoshi Inoue, Shogo Sawamura, Nayu Iwasa, Kato Miu, Lisa Senba

Case Reports Cureus. 2025 Aug 1;17(8):e89231. eCollection 2025 Aug

Abstract
While sports participation for individuals with disabilities is promoted by the Basic Act on Sport and policies for the promotion of parasports, the actual participation rate remains low (32.8% for individuals with disabilities compared to 52.5% for able-bodied individuals), and many challenges exist in continuing competitive sports. While international reports highlight the physical and mental benefits of Jujutsu participation for individuals with disabilities, there are few practical reports on this topic in Japan. This report aims to elucidate, from an occupational therapy perspective, the changes in physical function and quality of life (QOL) experienced by an adult male with cerebral palsy-induced motor paralysis who continuously engaged in Brazilian Jujutsu (BJJ), a combat sport. The subject was a right-handed male in his 30s with motor paralysis in his left upper and lower limbs due to cerebral palsy. He had prior experience in disabled professional wrestling and Judo from age 17, and began BJJ at age 22. We collected initial assessment data (Fugl-Meyer Assessment, Modified Ashworth Scale, range of motion, etc.) and qualitative data based on his narratives, documenting changes gained through BJJ practice and competition participation. During BJJ training, he received technical guidance tailored to his disability characteristics and diligently practiced with an occupational therapist, confirming body movements and techniques. His narratives revealed increased intrinsic motivation, stating things like, "It became easier to move by devising ways to use my left hand and foot", and "I started wanting to compete in matches". Twenty years after starting sports, in addition to improvements in physical function (Fugl-Meyer Assessment (FMA) upper extremity 20 points → 59 points, lower extremity 27 points → 47 points, increased range of motion (ROM), and reduced Modified Ashworth Scale (MAS)), the patient experienced an enhanced sense of fulfillment in life due to interpersonal interaction and a sense of achievement in competition. Furthermore, he competed not only in para-jujutsu but also in able-bodied divisions, progressing to the point of winning against able-bodied opponents in the purple belt category. This suggests that the benefits extended beyond mere physical improvement, contributing to the acquisition of psychological fulfillment, such as enhanced self-esteem and the formation of social connections. This case suggests the potential for multifaceted physical, psychological, and social benefits when individuals with disabilities proactively engage in combat sports like BJJ. Moreover, the style of support provided by an occupational therapist who actively participates in the sport alongside the individual is considered effective as a practice that goes beyond mere exercise instruction, closely aligning with the individual's life and values. Moving forward, it is necessary to accumulate more diverse case studies and research on the potential of disabled sports, including combat sports like Jujutsu, and explore how health support can contribute to the independence and social participation of people with disabilities.
PMID: 40901241

13.Corrigendum to "The efficacy of physical activity or exercise among individuals with cerebral palsy: An umbrella review of systematic reviews" [Complement Ther Med 93 (2025) 103228]

Majed M Alhumaid, Faris Yahya I Asiri, Mohamed A Said, Justin A Haegele

Complement Ther Med. 2025 Sep 1. Online ahead of print

Abstract
No abstract available.
PMID: 40897602

14.Low back pain in adults with cerebral palsy: Toward comprehensive, lifelong, and equitable care

Stefano Negrini, Carlotte Kiekens

Dev Med Child Neurol. 2025 Sep 5. Online ahead of print.

Abstract
No abstract available
PMID: 40911018

15.A pilot implementation study of a chronic pain core outcome set and decision tree for children and young people with cerebral palsy

Nadine L Smith, Noula Gibson, Christine Imms, Ashleigh L Thornton, Adrienne R Harvey

Disabil Rehabil. 2025 Sep 3:1–11. Online ahead of print

Purpose: This study aimed to (i) develop a decision tree to guide clinicians to use a core outcome set (COS) of chronic pain assessment tools specific to children and young people with cerebral palsy and (ii) pilot test the implementation of the decision tree and core set in clinical practice.
Materials and methods: The study involved two stages. Stage one was the development of the decision tree using a focus group with clinicians. Stage two implemented the decision tree and COS in one rehabilitation service over three months. Evaluation involved an online survey with clinicians (physiotherapists, occupational therapists, nurses and doctors). The Capability, Opportunity, Motivation-Behaviour model was used to guide qualitative analysis of survey responses and identify barriers and enablers to use of the decision tree.
Results: Eight clinicians participated, completing 103 pain assessments on 82 children during the implementation period. All clinicians reported increased knowledge and confidence after using the decision tree (capability) and ease of access to assessment tools (opportunity) as primary enablers to assessing pain in the clinic. Lack of time for pain assessment was the most common barrier reported.
Conclusion: The decision tree showed promise in assisting clinicians to include pain assessment in clinical care.
Plain language summary
Clinician knowledge of chronic pain assessment tools and lack of time were key barriers to psychosocial chronic pain assessment in clinical practice. The decision tree enhanced clinician capability in selecting appropriate chronic pain assessment tools. Strategies like pre-appointment action planning and utilisation of waiting-room time were identified strategies to improve efficiency in clinical practice. A scaled-up implementation study is required to ensure sustained and broader use of chronic pain assessment tools in rehabilitation.
PMID: 40899494

16.Muscle fatigue during spinal stimulation and resistive ankle exoskeleton use in children with cerebral palsy

Charlotte R DeVol, Victoria M Landrum, Siddhi R Shrivastav, Heather A Feldner, Kristie F Bjornson, Chet T Moritz, Katherine M Steele

medRxiv [Preprint]. 2025 Aug 26. Online ahead of print.

Abstract
Evaluating fatigue during rehabilitation can help prevent overexertion to improve motor learning. The purpose of this study was to quantify how walking with transcutaneous spinal cord stimulation (tSCS) impacts muscle fatigue during treadmill training with and without a resistive ankle exoskeleton (Exo) in children with cerebral palsy (CP). Nine children with CP (4–14 years old) participated in four walking conditions: (1) No Device, (2) tSCS only, (3) Exo only, and (4) tSCS+Exo. Plantarflexor maximum voluntary contraction (MVC) was performed before and after each condition. Soleus amplitude root mean square (RMS) and median frequency (MDF) from electromyography recordings were used as biomarkers for fatigue. Participants only showed signs of soleus fatigue in the first five minutes of the Exo only condition with increased RMS ($p < 0.001$) and decreased MDF ($p < 0.001$). After ten minutes of walking, there was a slight decrease in MDF in the No Device and tSCS only conditions ($p = 0.002$), but no change in RMS. There were no significant differences in changes in MVC force, RMS, or MDF between conditions. Walking with tSCS may reduce the impact of the Exo on soleus fatigue for children with CP.
PMID: 40909839

17.Cross-cultural adaptation of the West and Central African version of the ABILHAND-Kids questionnaire for children with cerebral palsy

Emmanuel Segnon Sogbossi, Ange Loutou, Darnelle Audrey Noukimi, Sourou Melkiade Ahouandjinou, Aurore Houssou, Yannick Bleyenheuft, Carlyne Arnould, Charles Sebiyo Batcho

Disabil Rehabil. 2025 Sep 3:1–13. Online ahead of print

Purpose: To adapt a West and Central African version of the widely used ABILHAND-Kids questionnaire for measuring manual ability in children with cerebral palsy (CP).
Materials and methods: This cross-sectional study included 136 children with CP from Benin (n = 67) and Cameroon (n = 69). Data were collected from parents using an experimental version with 64 items. A subsample of 107 parents responded again two weeks later. Calibration was based on the Rasch model using RUMM2030 software.
Results: The adapted version of ABILHAND-Kids consists of 21 items with well-discriminated response categories. It defines a unidimensional and linear measure of children's performance in daily activities involving upper extremities (mean chi-square = 41.87, p = 0.48). The measure is invariant across countries, parents' education, children's age and gender, MACS levels, and type of CP. It shows excellent internal consistency (R = 0.94) and high test-retest reliability for both item difficulty hierarchy (ICC = 0.98) and children's measures (ICC = 0.99). Significant correlations were found with the MACS (rho = -0.64), Box and Blocks Test (more-affected (r = 0.55), less-affected hand (r = 0.54)), and ACTIVLIM-CP-WA (r = 0.83).
Conclusions: The West and Central African version of ABILHAND-Kids is valid and reliable for assessing the manual ability of children with CP in daily activities within the African sociocultural context.
PMID: 40902160

18.Variation in Intensive Pediatric Physical Therapy Practice in the United States: Results From a National Survey

Kelly Greve, Dana Chole, Meaghan Rubsam, James B Hedgecock, Yuxiang Li, Nanhua Zhang, Jamie B Hall

Pediatr Phys Ther. 2025 Sep 4. Online ahead of print

Abstract
Purpose: Intensive pediatric physical therapy (PT) programs are increasingly common yet lack a clear definition. This study aimed to examine current practice patterns of intensive pediatric PT in the United States.
Methods: A survey was developed and administered using the FITT (frequency, intensity, time, type) model and Knowledge to Action Cycle for pediatric physical therapists providing intensive PT. Survey respondents included pediatric physical therapists providing intensive physical therapy in outpatient, non-acute settings. Data analysis used descriptive statistics and cluster analysis.
Results: Eighty pediatric physical therapists reported intensive programs involved children aged 4–6 years with cerebral palsy (90%), neuromuscular (78%), and neuromotor (44%) disorders. Greatest dose often-always ranged from 2–5 visits per week, ≤60–120 minute sessions over 3–8 weeks. Top interventions included locomotor training (80%), task-specific training (78%), and progressive resistive exercise (76%). Two clusters were identified based on therapist organization and dose.
Conclusions: This first study of intensive pediatric PT revealed marked variability, underscoring the need for a standardized definition to improve clinical care.
PMID: 40901716

19.Cerebral Palsy Associated With Neonatal Encephalopathy: Review of Te Rēhita a Hōkai Nukurangi Aotearoa—The New Zealand Cerebral Palsy Register (NZCPR) Data

M R Battin, A Mulqueeny, A Mackey, A Sorhage, W Alzaher, N Stott

J Paediatr Child Health. 2025 Sep 3. Online ahead of print

Background: In Aotearoa New Zealand (AoNZ), the cerebral palsy (CP) register (NZCPR) has collected national data since 2015. The dataset includes ethnicity and region of domicile; clinical characteristics; plus data on CP distribution and severity including GMFCS. Neonatal encephalopathy (NE) and hypoxic ischaemic encephalopathy (HIE) are potential causes of CP, so NZCPR data may assist prognostic counselling of whānau (family).
Methods: The NZCPR dataset was interrogated to identify individuals born between 1992 and 2020 inclusive, with NE/HIE as a potential cause of CP plus consent for research. The dataset was reviewed for evidence of other potential aetiologies for the CP and these plus preterm infants <35 weeks gestation were excluded. The distribution and severity of the CP for the NE/HIE cohort was then determined.
Results: In total, 139 records were identified with NE/HIE as the likely CP aetiology, after exclusion of other conditions including childhood cardiac arrest, meningitis, bilirubin encephalopathy, hypoglycaemic injury and metabolic diseases. The median (IQR) birth gestation was 40 (38, 40) weeks and median (IQR) birth weight was 3330 (2910, 3650) g. Ten (7%) had died and approximately 70% were Gross Motor Function Classification System (GMFCS) Level IV or V, with quadriparesis as the most common distribution (63%). Associated other morbidities included epilepsy (47%), intellectual impairment (45%), severe visual problems (18%) or non-verbal (34%). ACC cover was approved in circa 40.5%.
Conclusions: In this novel dataset, if CP occurs after NE/HIE it is frequently severe affecting four limbs and associated with other morbidities.
PMID: 40899614

20.Clinical characteristics, pregnancy outcomes, and neonatal effects of cytomegalovirus infection in pregnant women in Liuzhou city, North central Guangxi of Southern China: a retrospective study from 2018 to 2024

Ling Zhang, Weiyou Lv, Jiaolian Ya, Yuanxiu Li, Dejian Yuan, Pengfei Cai, Lizhu Chen, Ning Tang, Hui Chen, Bailing Liu, Xiangrong Tang, Qiurong Lai, Guang Cheng, Lifang Zhang, Xiaoni Wei, Qingyan Zhong

BMC Pregnancy Childbirth. 2025 Sep 1;25(1):909

Objective: To evaluate the clinical characteristics, pregnancy and neonatal outcomes of cytomegalovirus (CMV) infection in pregnant women.
Methods: This retrospective study included 22,673 pregnant women from Liuzhou, Guangxi, China, between 2018 and 2024. Amniotic fluid samples collected during mid-to-late pregnancy were tested for CMV DNA. Clinical data among CMV-infected pregnant women were collected, including prenatal diagnosis indicators, early-pregnancy CMV antibodies, pregnancy and neonatal outcomes, and offspring follow-up outcomes.
Results: Among 22,673 pregnant women, 36 (1.59‰) were tested positive for CMV DNA in amniotic fluid, among which 14 (38.9%) had adverse pregnancy outcomes, including 7 (19.4%) termination of pregnancy, 3 (8.3%) stillbirth, and 4 (11.1%) preterm delivery. Prenatal imaging modalities detected fetal abnormalities in 21 (58.3%) of the CMV-infected pregnant women, mainly ventriculomegaly, fetal growth restriction (FGR), pericardial effusion, ascites, cardiomegaly, placentomegaly, enlarged cisterna magna, and hyperechogenic bowel. Notably, fetuses of 2 pregnant women with primary CMV infection developed severe edema. Four newborns failed initial hearing screening during postnatal evaluation. Among them, two (50%) were diagnosed with severe sensorineural hearing loss (SNHL) and one child was diagnosed with cerebral palsy in subsequent clinical assessments.
Conclusion: Diagnosis of primary CMV infection during pregnancy is of critical importance. Current guidelines recommend implementing CMV serological screening during the first trimester, with subsequent CMV IgG avidity testing when CMV IgG antibodies are detected. Maternal CMV infection during the second and third trimesters may lead to fetal complications, including ventriculomegaly, FGR, and fetal hydrops. Congenital CMV (cCMV) infection predominantly manifests with sensorineural hearing loss (SNHL) and cerebral palsy. It is essential to screen all neonates from CMV-infected pregnant women for CMV DNA and provide mandatory 5-year follow-up for symptomatic cCMV children.
PMID: 40890649

21.Psychosocial impact on parents raising children with cerebral palsy at Gondar Comprehensive Specialized Hospital, Northwest Ethiopia

Kaleab Tesfaye Tegegne, Aemero Asmamaw Chalachew, Moges Tadesse Abebe, Tadele Kassahun Wudu, Abrham Degu Melese, Eleni Tesfaye Tegegne, Mekibib Kassa Tessema, Jenberu Mekurianew Kelkay

BMC Neurol. 2025 Sep 1;25(1):369

Background: Cerebral palsy (CP) is a complex and lifelong neurological disorder that affects movement, muscle tone, and coordination, often leading to significant physical and cognitive impairments in children. CP has significant long-term consequences not only for the child but also for their family, particularly parents who are responsible for the child's care and development.
Objective: The objective of the present study was to explicitly explore the psychosocial effects, challenges faced, coping mechanisms, and the nature of mother-child relationships among parents raising children with cerebral palsy in Northwest Ethiopia.
Method: The study employed a qualitative approach with a phenomenological research design. The researchers recruited ten biological mothers and eight biological fathers of children with CP using purposive sampling. Eight fathers participated in in-depth interviews and ten mothers participated in focus group discussions. Data were collected through semi-structured interviews and FGDs, then analyzed qualitatively using thematic analysis.
Result: Fathers experienced shock, grief, worry, and isolation, often struggling with depression and fears about their child's future. Despite these challenges, both parents showed resilience, finding strength in faith, spirituality, and community support. Mothers emphasized the emotional and physical demands of caregiving, the deep bonds with their children, and the importance of coping mechanisms like patience and religious practices in managing daily struggles.
Conclusion: Parenting children with cerebral palsy entails significant psychosocial challenges, including grief, anxiety, and caregiving stress. Despite this, parents demonstrate resilience through community and spiritual support. Our findings underscore the need for culturally sensitive interventions, such as accessible mental health services integrated into maternal and child health care, peer-led support groups, and mobile mental health units to reach underserved areas. Incorporating disability awareness and psychosocial support into physiotherapy, maternal health, and religious programs offers practical, culturally grounded strategies to enhance coping and promote family well-being.
PMID: 40890640

22.Disruptions of morphological brain networks and their associations with multi-symptoms in children with spastic cerebral palsy

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Quant Imaging Med Surg. 2025 Sep 1;15(9):7749–7760. Epub 2025 Aug 19

Abstract
Background: Spastic cerebral palsy (SCP) is associated with extensive alterations in regional cortical morphology. However, the specific effects of SCP on the topological organization of morphological brain networks remain largely unknown. This study aimed to investigate these effects and explore their potential correlations with clinical manifestations in SCP children.
Methods: Structural magnetic resonance imaging and clinical data were collected from 31 children with SCP and 29 sex- and age-matched children with typical development. Single-subject morphological brain networks were constructed separately based on four different morphological indices [i.e., the cortical thickness (CT), fractal dimension, gyrification index, and sulcus depth], which were further characterized using graph-based network approaches. Permutation tests were used to examine between-group differences in regional morphology, interregional morphological connectivity (MC), and graph-based network properties. For magnetic resonance imaging (MRI)-based features showing significant between-group differences, Spearman partial correlations were used to examine their relationships with the clinical variables in the patients.
Results: Compared with the control group, the SCP group only showed alterations in the CT-based morphological brain networks. Specifically, the SCP group displayed an increased characteristic path length ($t=3.909$, $P=4.0\times10^{-4}$), which was negatively correlated with the verbal comprehension index (rho=-0.435, P=0.023), processing speed index (rho=-0.452, P=0.018), and full-scale intelligence quotient (rho=-0.471, P=0.013) of the SCP children, and positively correlated with the Gross Motor Function Classification System (rho=0.399, P=0.039) and Manual Ability Classification System (rho=0.459, P=0.016). Further, the SCP group showed decreased MC for 161 connections. These connections were mainly linked to the right area 25 (a part of the anterior cingulate cortex) at the nodal level and to regions in the default mode network at the subnetwork level. Among these, the MC between the right area 11l, part of the orbital and polar frontal cortex, and the right medial belt complex, part of the early auditory cortex, was positively correlated with the Communication Function Classification System in the SCP children (rho=0.662, $P=1.7\times10^{-4}$). These results remained unchanged after excluding preterm children from the SCP group.
Conclusions: SCP is associated with abnormal morphological brain network topology, which may contribute to disturbances in motor and cognition in patients.
PMID: 40893532

23.Neural micro and macrostructural correlates of visual outcomes in children with unilateral cerebral palsy: A fixel-based study

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Abstract
Children with unilateral cerebral palsy (uCP) present with brain damage, predominantly lateralized to one hemisphere, and white matter (WM) lesions, which are known to affect visual functions. However, the relation between WM tract damage and visual outcomes remains unclear. Additionally, no prior study comprehensively investigated hemispheric-specific differences in WM visual pathways between children with left- and right-sided uCP. Therefore, this exploratory study aims to investigate differences in micro- and macrostructural properties of the visual pathways between children with left- and right-sided uCP and their relation to visual outcomes, using fixel-based analysis of diffusion MRI (dMRI). dMRI data and visual assessments, including visual acuity and stereoacuity (i.e., geniculostriate functions), motor-free visual perception, visuomotor integration, and functional vision, were analysed in 36 children with uCP (aged 7–15, 9 males, 17 left-sided, 15 preterm). Apparent fiber density (AFD), fiber-bundle cross-section (FC), and combined fiber density and cross-section (FDC) were calculated for 17 WM tracts related to visual functions. Differences between children with left- and right-sided uCP were investigated using the Mann-Whitney U-test (r) on the AFD and one-way analysis of covariance (ANCOVA) (ηp^2) on the FC and FDC, with age and intracranial volume as covariates. Correlations between visual outcomes and WM properties of the visual tracts were studied using (semi-partial) Spearman Rank correlations (rs). Children with left-sided uCP showed significantly lower fixel metrics in the right superior longitudinal fasciculus, inferior fronto-occipital fasciculus, and optic radiation. Children with right-sided uCP had lower AFD, FC, and FDC in the left superior longitudinal fasciculus only. Reduced geniculostriate visual functions and more impairments in functional vision were associated with lower fiber density (AFD), reduction in bundle size (FC), and their combination (FDC) of several WM tracts. Lower performance on motor-free visual perception and visuomotor integration showed more associations with lower fiber density (AFD). While the primary analyses were exploratory and uncorrected for multiple comparison, false discovery rate (FDR) correction was additionally performed for transparency: several differences in FC and FDC between children with left- and right-sided uCP, and correlations between AFD and visual function, remained significant and are reported in the Supplementary Materials.
In conclusion, our exploratory study highlights that fixel-based analysis can provide further insights into hemispheric differences in the visual system and the complex relations between visual functions and brain damage in children with uCP. Based on our results, future studies could refine regression models to target key WM tracts linked to visual outcomes, identifying potential biomarkers to predict visual impairments and enable early tailored support in children with uCP.
PMID: 40893449

Prevention and Cure

24.Face mask versus nasal mask device use for initial resuscitation in extremely and very preterm infants (FONDUE): an open-label, single-centre, randomised, controlled trial

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Background: More than 85% of very preterm infants (born <32 weeks' gestation) breathe spontaneously within 1 min of birth, however, more than 60% of infants receive positive pressure ventilation. Face mask application soon after birth might suppress breathing through the trigeminal nerve reflex, causing vocal cord closure and hypoxia. We aimed to investigate whether nasal mask continuous positive airway pressure (nCPAP) would improve CPAP success, reducing the need for positive pressure ventilation and intubation at birth, compared with face mask CPAP (fCPAP).
Methods: This open-label, randomised controlled trial was done at Monash Medical Centre (Melbourne, VIC, Australia). Eligible infants were very preterm (born at 23 weeks 0 days [23w0d]-31w6d of gestation) without known relevant congenital anomalies. Infants were randomly assigned (1:1) immediately before birth to receive initial respiratory support with nCPAP or fCPAP. Randomisation was done using a pre-generated randomisation schedule stratified by gestational age (23w0d-27w6d weeks vs 28w0d-31w6d gestation). Due to the nature of the intervention, investigators or clinicians were aware of treatment allocation, but the trial statistician was masked to allocations. The primary outcome was CPAP success, defined as adequate respiratory support with CPAP only, without escalation to positive pressure ventilation or intubation before neonatal unit admission. The primary outcome was assessed in the intention-to-treat population, which included all infants who were randomly assigned as per their allocated treatment. Safety was assessed in all randomly assigned infants. This study was prospectively registered with the Australian New Zealand Clinical Trials Registry, ACTRN12620001086954.
Findings: Between Dec 2, 2020, and March 17, 2023, we enrolled 151 infants: 74 were assigned to nCPAP and 77 to fCPAP. Mean gestation was 28 weeks and 6 days (SD 2 weeks and 6 days), mean birthweight was 1155 g (381), and 82 (54%) of 151 infants were female. 51 (34%) of 151 infants were born before 28 weeks' gestation. More infants in the nCPAP group were successfully managed without escalation to positive pressure ventilation than infants in the fCPAP group (43 [58%] of 74 infants vs 30 [39%] of 77 infants; risk ratio 1·49 [95% CI 1·06-2·10]). Two infants in each group died. Pneumothorax occurred in three (4%) of 77 infants in the fCPAP group (none in the nCPAP group). Intraventricular haemorrhage occurred in 26 (34%) of 77 infants in the fCPAP group and 19 (26%) of 74 infants in the nCPAP group. Three infants had periventricular leukomalacia (one in the fCPAP group and two in the nCPAP group). Two infants in each group underwent surgery for necrotising enterocolitis and one (1%) of 77 infants in the fCPAP group had surgery for intestinal perforation (none in the nCPAP group). 13 (17%) of 77 infants in the fCPAP group and 14 (19%) of 74 infants in the nCPAP group were treated for sepsis. Two (3%) of 77 infants in the fCPAP group and seven (9%) of 74 infants in the nCPAP group were treated for retinopathy of prematurity.
Interpretation: In very preterm infants, compared with fCPAP, the initial use of nCPAP at birth was more likely to result in CPAP success, avoiding the need for positive pressure ventilation and reducing exposure to higher level respiratory support.
Funding: Australian National Health and Medical Research Council and the Jack Brockhoff Foundation.
PMID: 40908053

25.Predicting long-term neurodevelopmental outcomes for children born very preterm: a systematic review

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Context: Children born very preterm (<32 weeks' gestation) have increased risk of neurodevelopmental difficulties compared with those born at term. While various neonatal exposures have been linked with later developmental challenges, identifying those at risk of difficulties later in childhood remains a challenge but is essential for targeting early intervention and counselling families.
Objective: To systematically review and synthesise the evidence regarding early medical and environmental factors for neurodevelopmental impairment, cognitive, motor and behavioural outcomes for children born very preterm.
Design: Ovid MEDLINE, Embase and PubMed were searched for articles between 1 January 1990 and 29 April 2024 reporting on a representative, prospective geographical, network-based or multisite cohorts of children born <32 weeks' gestation.
Main outcome measures: Neurodevelopmental impairment, cognitive, motor and emotional-behavioural functioning in children aged 36 months to 18 years. Data were extracted and reported descriptively due to heterogeneity in study measures.
Results: From 18 012 records, 29 studies from 16 cohorts were included. Brain injury, bronchopulmonary dysplasia, male sex and lower socioeconomic status were the most consistent predictors of neurodevelopmental impairment, IQ, working memory, cerebral palsy, fine motor skills and some behavioural measures. Emotional problems were generally not associated with neonatal variables investigated to date.
Conclusion: Numerous factors are independently associated with childhood outcomes after being born very preterm, with specific predictors varying across domains of functioning and limited available evidence for some predictor-outcome combinations. Knowledge of these factors may assist in targeting those at highest risk for closer surveillance and early intervention.
PMID: 40903214

26.Impact of chorionicity and histological chorioamnionitis on neurodevelopment and mortality in extremely preterm twins

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Early Hum Dev. 2025 Aug 27;210:106370. Online ahead of print

Abstract
Background: Histological chorioamnionitis (HCAM) is associated with adverse neurodevelopmental outcomes; however, its role in extremely preterm twin pregnancies (<28 weeks of gestation), particularly in relation to chorionicity, is unclear.
Objective: To evaluate the association between HCAM severity and neurodevelopmental outcomes at 3 years old in extremely preterm twins, focusing on the modifying effect of chorionicity.
Methods: Utilizing data from the Neonatal Research Network of Japan (2004–2020), this retrospective cohort study included twins born at <28 weeks' gestation and birth weight <1500 g. HCAM severity was classified based on Blanc's criteria. Primary outcomes were cerebral palsy (CP) and developmental quotient (DQ) <70 at 3 years old, assessed using the Kyoto Scale of Psychological Development. Secondary outcomes included death before neonatal intensive care unit (NICU) discharge and a composite outcome of death, including CP or DQ <70. Multivariate logistic regression was performed adjusting for confounders and including interaction terms.
Results: Among 1249 infants, HCAM severity was not significantly associated with CP or DQ <70 in monochorionic diamniotic (MD) or dichorionic diamniotic (DD) twins. MD twins exhibited a significantly higher mortality risk than DD twins (adjusted odds ratio: 1.73; 95% confidence intervals: 1.22–2.46). Moreover, significant interaction between HCAM and chorionicity was not observed for mortality.
Conclusion: In this large, multicenter cohort of extremely preterm twins, HCAM was not associated with adverse neurodevelopmental outcomes or early mortality. However, monochorionic status was independently associated with increased NICU mortality, highlighting the predominant role of chorionicity in twin pregnancy-related outcomes.
PMID: 40897162

27.General movements and head magnetic resonance imaging to predict cerebral palsy in preterm and low birth weight infants

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[Purpose] This study aimed to determine the accuracy of combining general movements assessment and head magnetic resonance imaging in predicting cerebral palsy in preterm and low birth weight infants.
[Participants and Methods] This retrospective observational study analyzed clinical routine data of patients admitted to the neonatal intensive care unit of a university hospital between 2010 and 2017. The study included 154 very low birth weight infants (mean gestational age 28.8 ± 3.1 weeks, birth weight 1003.7 ± 307.4 g). The infants were classified into a cerebral palsy group or a non-cerebral palsy group. We examined whether combining general movements assessment and head magnetic resonance imaging findings were associated with the development of cerebral palsy. Additionally, we calculated the sensitivity and specificity of each assessment.
[Results] All assessments were associated with the presence or absence of cerebral palsy. Among them, the highest sensitivity and specificity, 92.7% and 97.9%, respectively, were observed in infants with abnormal head magnetic resonance imaging findings or poor general movements, even if the head magnetic resonance imaging was not classified as abnormal.
[Conclusion] The combination of general movements assessment and head magnetic resonance imaging findings is useful for predicting cerebral palsy.
PMID: 40895758

28.Long-Term Neurodevelopmental Outcomes of the SAFE Early Intervention in Infants at Risk: A Randomised Controlled Trial

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Abstract
Background: Early intervention for infants at risk of cerebral palsy (CP) plays a critical role in improving neurodevelopmental outcomes. Recently, approaches emphasising infant active participation and family collaboration have shown greater effectiveness compared to traditional methods.
Aims: This study aimed to evaluate the effects of the SAFE early intervention approach on cognitive, language, and motor development in infants at risk for CP, in comparison to conventional neurodevelopmental treatment (NDT) practices.
Methods: In this randomised controlled trial, 46 infants were assigned to either the SAFE intervention group (n = 23) or the control group receiving NDT-based care (n = 23). The intervention lasted for 3 months, with developmental assessments conducted at 6 and 12 months using the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III).
Results: Significant improvements were observed in motor and language composite scores in the SAFE group between baseline (T1) and the 3-month follow-up (T2), while cognitive scores showed a non-significant increase. Compared to the control group, the SAFE group demonstrated significantly higher scores across all Bayley-III domains at T2. However, the time × group interaction was significant in favour of the SAFE group for motor scores, while cognitive scores favoured the control group. No significant interaction was observed for language scores. Over time, both groups showed developmental progress in various domains, with the SAFE group exhibiting significant motor gains from T1 to T3. The control group showed significant cognitive improvements from T1 and T2 to T3.
Conclusions: The SAFE early intervention model appears to be a feasible and effective approach for infants at risk for CP, especially before a formal diagnosis is made. Its focus on active infant participation, family engagement, and enriched environments supports improved motor development outcomes.
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