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## Interventions and Management

### 1. Identifying the most representative actigraphy variables reflecting standardized hand function assessments for remote monitoring in children with unilateral cerebral palsy

Youngsub Hwang, Jeong-Yi Kwon

BMC Pediatr. 2024 Apr 25;24(1):273. doi: 10.1186/s12887-024-04724-z.

**Background:** Accurate assessment of physical activity and motor function in children with cerebral palsy is crucial for determining the effectiveness of interventions. This study aimed to investigate the correlation between real-world activity monitoring outcomes and in-laboratory standardized hand function assessments in children with unilateral cerebral palsy. **Methods:** Actigraphy data were collected over 3 days from children aged 4-12 years with unilateral cerebral palsy before in-laboratory assessments. To tackle the high dimensionality and collinearity of actigraphy variables, we first applied hierarchical clustering using the Pearson correlation coefficient as the distance metric and then performed a principal component analysis (PCA) to reduce the dimensionality of our data. **Results:** Both hierarchical clustering and PCAs revealed a consistent pattern in which magnitude ratio variables ( $\ln[\text{affected side magnitude}/\text{less-affected side magnitude}]$ ) were more strongly associated with standardized assessments of hand function than with activity time and distance domain variables. Hierarchical clustering analysis identified two distinct clusters of actigraphy variables, with the second cluster primarily consisting of magnitude ratio variables that exhibited the strongest correlation with Melbourne Assessment 2, Pediatric Motor Activity Log, Assisting Hand Assessment, and Manual Ability Classification System level. Principal component 2, primarily representing the magnitude ratio domain, was positively associated with a meaningful portion of subcategories of standardized measures, whereas principal component 1, representing the activity time and distance component, showed limited associations. **Conclusions:** The magnitude ratio of actigraphy can provide additional objective information that complements in-laboratory hand function assessment outcomes in future studies of children with unilateral cerebral palsy. TRIAL REGISTRATION IN CLINICALTRIALS.GOV: NCT04904796 (registered prospectively; date of registration: 23/05/2021).

PMID: [38664706](https://pubmed.ncbi.nlm.nih.gov/38664706/)

### 2. A Training Program Using Modified Joystick-Operated Ride-on Toys to Complement Conventional Upper Extremity Rehabilitation in Children with Cerebral Palsy: Results from a Pilot Study

Sudha Srinivasan, Patrick Kumavor, Kristin Morgan

Bioengineering (Basel). 2024 Mar 23;11(4):304. doi: 10.3390/bioengineering11040304.

The pilot study assessed the utility of a training program using modified, commercially available dual-joystick-operated ride-on toys to promote unimanual and bimanual upper extremity (UE) function in children with cerebral palsy (CP). The ride-on-toy training was integrated within a 3-week, intensive, task-oriented training camp for children with CP. Eleven children with hemiplegia between 4 and 10 years received the ride-on-toy training program 20-30 min/day, 5 days/week for 3 weeks. Unimanual motor function was assessed using the Quality of Upper Extremity Skills Test (QUEST) before and after the camp. During ride-on-toy training sessions, children wore activity monitors on both wrists to assess the duration and intensity of bimanual UE activity. Video data from early and late sessions were coded for bimanual UE use, independent navigation, and

movement bouts. Children improved their total and subscale QUEST scores from pretest to post-test while increasing moderate activity in their affected UE from early to late sessions, demonstrating more equal use of both UEs across sessions. There were no significant changes in the rates of movement bouts from early to late sessions. We can conclude that joystick-operated ride-on toys function as child-friendly, intrinsically rewarding tools that can complement conventional therapy and promote bimanual motor functions in children with CP.

PMID: [38671726](#)

### **3. Efficacy of Kinesiotape to Improve Upper-Extremity Function in Children and Adolescents with Cerebral Palsy: A Systematic Review**

Victoria Calvo-Fuente, Concepción Soto-Vidal, Ana Ramón-Corcoba, Ester Cerezo-Téllez, Yolanda Pérez-Martín, Soraya Pacheco-da-Costa

Review Children (Basel). 2024 Apr 17;11(4):480. doi: 10.3390/children11040480.

Background: Cerebral palsy (CP) is one of the primary causes of physical disabilities in children that affects posture and movement. Upper-extremity (UE) function is frequently impaired, which may result in activity and participation limitations in people with CP. The use of kinesiotape (KT) has increased in the treatment of CP for various purposes. The aim of this systematic review was to assess the efficacy of KT for improving UE function in children and adolescents with CP. Methods: The literature search was carried out in PubMed, Cochrane, PEDro, Web of Science and SCOPUS databases. The methodological quality was analyzed with the PEDro scale. Review Manager (RevMan 5.4.1) was used for data extraction and risk of bias assessment. Results: A total of five randomized clinical trials were included. The use of KT showed improvement in UE functionality in three studies, with significant outcomes for range of motion (ROM) (three studies), fine motor skills (two studies), grip strength (one study) and manual dexterity (one study). Moreover, it also showed significant improvements in spasticity and gross motor function (one study). Overall, methodological quality was moderate, and the risk of bias was high in the domains related to blinding. Conclusion: The use of KT showed improvement in UE function in children and adolescents with CP. However, further research is needed to reinforce the conclusions on the efficacy of KT as a therapeutic tool.

PMID: [38671697](#)

### **4. A Pilot Feasibility Study on the Use of Dual-Joystick-Operated Ride-on Toys in Upper Extremity Rehabilitation for Children with Unilateral Cerebral Palsy**

Sudha Srinivasan, Patrick D Kumavor, Kristin Morgan

Children (Basel). 2024 Mar 29;11(4):408. doi: 10.3390/children11040408.

Children with unilateral cerebral palsy (UCP) require task-oriented practice several hours per week to produce meaningful gains in affected upper extremity (UE) motor function. Clinicians find it challenging to provide services at the required intensity and sustain child engagement. This pilot study assessed the acceptance and utility of a child-friendly program using dual-joystick-operated ride-on toys incorporated into an intensive UE rehabilitation camp. Eleven children with UCP between four and 10 years received ride-on-toy navigation training for 20-30 min/day, five days/week, for three weeks as part of camp programming. We report session adherence and percent time children spent in task-appropriate attention/engagement across sessions. The overall effects of camp programming on children's motor function were assessed using the Shriner's Hospital Upper Extremity Evaluation (SHUEE) from pretest to posttest and using training-specific measures of bimanual UE use and navigational accuracy. Children showed excellent adherence and sustained task-appropriate engagement across sessions. The combined program led to improved navigational accuracy ( $p$ -values  $\leq 0.007$ ) as well as spontaneous affected UE use during bimanual activities outside the training context ( $p < 0.001$ ). Our pilot study provides promising evidence for using modified, commercially available ride-on toys to incentivize rehabilitation and boost repetitive, task-oriented UE practice among children with UCP.

PMID: [38671624](#)

### **5. Exploring harmonic walking development in children with unilateral cerebral palsy and typically developing toddlers: Insights from walking experience**

Daniela De Bartolo, Marzieh Borhanazad, Marije Goudriaan, Annike Bekius, Coen S Zandvoort, Annemieke I Buizer, Daniela Morelli, Carla Assenza, R Jeroen Vermeulen, Brian H M Martens, Marco Iosa, Nadia Dominici

Hum Mov Sci. 2024 Apr 20;95:103218. doi: 10.1016/j.humov.2024.103218. Online ahead of print.

This longitudinal study investigated the impact of the first independent steps on harmonic gait development in unilateral cerebral palsy (CP) and typically developing (TD) children. We analysed the gait ratio values (GR) by comparing the duration of stride/stance, stance/swing and swing/double support phases. Our investigation focused on identifying a potential trend

towards the golden ratio value of 1.618, which has been observed in the locomotion of healthy adults as a characteristic of harmonic walking. Locomotor ability was assessed in both groups at different developmental stages: before and after the emergence of independent walking. Results revealed that an exponential fit was observed only after the first unsupported steps were taken. TD children achieved harmonic walking within a relatively short period (approximately one month) compared to children with CP, who took about seven months to develop harmonic walking. Converging values for stride/stance and stance/swing gait ratios, averaged on the two legs, closely approached the golden ratio in TD children ( $R^2 = 0.9$ ) with no difference in the analysis of the left vs right leg separately. In contrast, children with CP exhibited a trend for stride/stance and stance/swing ( $R^2 = 0.7$ ), with distinct trends observed for the most affected leg which did not reach the golden ratio value for the stride/stance ratio ( $GR = 1.5$ ), while the least affected leg exceeded it ( $GR = 1.7$ ). On the contrary, the opposite trend was observed for the stance/swing ratio. These findings indicate an overall harmonic walking in children with CP despite the presence of asymmetry between the two legs. These results underscore the crucial role of the first independent steps in the progressive development of harmonic gait over time.

PMID: [38643727](#)

## 6. Machine learning applied to gait analysis data in cerebral palsy and stroke: A systematic review

Farshad Samadi Kohneshahri, Andrea Merlo, Davide Mazzoli, Maria Chiara Bò, Rita Stagni

Review Gait Posture. 2024 Apr 10:111:105-121. doi: 10.1016/j.gaitpost.2024.04.007. Online ahead of print.

**Background:** Among neurological pathologies, cerebral palsy and stroke are the main contributors to walking disorders. Machine learning methods have been proposed in the recent literature to analyze gait data from these patients. However, machine learning methods still fail to translate effectively into clinical applications. This systematic review addressed the gaps hindering the use of machine learning data analysis in the clinical assessment of cerebral palsy and stroke patients. **Research question:** What are the main challenges in transferring proposed machine learning methods to clinical applications? **Methods:** PubMed, Web of Science, Scopus, and IEEE databases were searched for relevant publications on machine learning methods applied to gait analysis data from stroke and cerebral palsy patients until February the 23rd, 2023. Information related to the suitability, feasibility, and reliability of the proposed methods for their effective translation to clinical use was extracted, and quality was assessed based on a set of predefined questions. **Results:** From 4120 resulting references, 63 met the inclusion criteria. Thirty-one studies used supervised, and 32 used unsupervised machine learning methods. Artificial neural networks and k-means clustering were the most used methods in each category. The lack of rationale for features and algorithm selection, the use of unrepresentative datasets, and the lack of clinical interpretability of the clustering outputs were the main factors hindering the clinical reliability and applicability of these methods. **Significance:** The literature offers numerous machine learning methods for clustering gait data from cerebral palsy and stroke patients. However, the clinical significance of the proposed methods is still lacking, limiting their translation to real-world applications. The design of future studies must take into account clinical question, dataset significance, feature and model selection, and interpretability of the results, given their criticality for clinical translation.

PMID: [38663321](#)

## 7. Assessing walking adaptability in children with cerebral palsy: validity and reliability of the walking adaptability ladder test for kids

Emel Taşvuran Horata, Yunus Emre Kundakcı, Rabia Kundakcı

Physiother Theory Pract. 2024 Apr 26:1-10. doi: 10.1080/09593985.2024.2346726. Online ahead of print.

**Introduction:** Assessing gait adaptation in children with cerebral palsy (CP) requires cost-effective and easily applicable methods. **Objective:** To evaluate the reliability and validity of the Walking Adaptability Ladder Test for Kids (WAL-K) in assessing gait adaptation in children with CP. **Methods:** Sixty-six participants (40 children with CP and 26 controls), aged 6-18 years, underwent WAL-K testing under single- and double-run conditions with video recording. Test-retest reliability, interrater reliability, concurrent validity, and known-group validity were assessed. Concurrent validity was assessed using the Timed Up and Go Test (TUGT), Four-Square Step Test (FSST), and Five Times Sit-to-Stand Test. **Results:** Interrater intraclass correlation coefficients (ICC3,k) values were  $> 0.999$  for the WAL-K single- and double-run tests. The test-retest reliability ICC3,k values were 0.988 for the WAL-K single-run, and 0.963, 0.962, and 0.963 for the WAL-K double-run ( $p < .05$ ). WAL-K double-run showed a strong correlation with FSST ( $r = 0.791$ ), while WAL-K single-run correlated weakly with TUGT ( $r = 0.394$ ) ( $p < .01$ ). Moderate correlations were observed between other tests ( $p < .01$ ). Children with CP had higher scores in all WAL-K tests compared to controls ( $p < .001$ ). **Conclusion:** The WAL-K test demonstrated validity and reliability, making it suitable for clinical use without requiring specialized laboratory settings. It enables repeated assessments of gait adaptation in children with CP.

PMID: [38666568](#)

## 8. Anterior Proximal Tibial Screw Hemiepiphyodesis Decreases Posterior Tibial Slope in Knee Flexion Contracture: A Case Report

Fabio Müller, Hanspeter Huber

Case Reports JBJS Case Connect. 2024 Apr 26;14(2). doi: 10.2106/JBJS.CC.23.00680. eCollection 2024 Apr 1.

Case: A 13-year-old adolescent boy with hemiplegic cerebral palsy suffering from fixed knee flexion deformity of 10° despite extensive conservative treatment. Owing to a posterior tibial slope (PTS) of 16°, anterior hemiepiphyodesis was applied to the proximal tibia. The 2 screws were removed after 9 months. Final follow-up at 16 months showed complete knee extension and a PTS of 4°. Conclusion: The presented technique is a good alternative in knee flexion deformity with an increased PTS and has surprisingly not been described in the literature. This might be worth considering for other pathologies such as pediatric anterior cruciate ligament injury with an increased PTS.

PMID: [38669444](#)

## 9. Ubiquitous Gait Analysis through Footstep-Induced Floor Vibrations

Yiwen Dong, Hae Young Noh

Sensors (Basel). 2024 Apr 13;24(8):2496. doi: 10.3390/s24082496.

Quantitative analysis of human gait is critical for the early discovery, progressive tracking, and rehabilitation of neurological and musculoskeletal disorders, such as Parkinson's disease, stroke, and cerebral palsy. Gait analysis typically involves estimating gait characteristics, such as spatiotemporal gait parameters and gait health indicators (e.g., step time, length, symmetry, and balance). Traditional methods of gait analysis involve the use of cameras, wearables, and force plates but are limited in operational requirements when applied in daily life, such as direct line-of-sight, carrying devices, and dense deployment. This paper introduces a novel approach for gait analysis by passively sensing floor vibrations generated by human footsteps using vibration sensors mounted on the floor surface. Our approach is low-cost, non-intrusive, and perceived as privacy-friendly, making it suitable for continuous gait health monitoring in daily life. Our algorithm estimates various gait parameters that are used as standard metrics in medical practices, including temporal parameters (step time, stride time, stance time, swing time, double-support time, and single-support time), spatial parameters (step length, width, angle, and stride length), and extracts gait health indicators (cadence/walking speed, left-right symmetry, gait balance, and initial contact types). The main challenge we addressed in this paper is the effect of different floor types on the resultant vibrations. We develop floor-adaptive algorithms to extract features that are generalizable to various practical settings, including homes, hospitals, and eldercare facilities. We evaluate our approach through real-world walking experiments with 20 adults with 12,231 labeled gait cycles across concrete and wooden floors. Our results show 90.5% (RMSE 0.08s), 71.3% (RMSE 0.38m), and 92.3% (RMSPE 7.7%) accuracy in estimating temporal, spatial parameters, and gait health indicators, respectively.

PMID: [38676114](#)

## 10. Creating an autoencoder single summary metric to assess gait quality to compare surgical outcomes in children with cerebral palsy: The Shriners Gait Index (SGI)

Shou-Jen Wang, Thasina Tabashum, Karen M Kruger, Joseph J Krzak, Adam Graf, Ross S Chafetz, Judi Linton, Jon Davids, Anita Bagley, Kanav Bengani, Mark V Albert

J Biomech. 2024 Apr 15;168:112092. doi: 10.1016/j.jbiomech.2024.112092. Online ahead of print.

Gait for individuals with movement disorders varies widely and the variability makes it difficult to assess outcomes of surgical and therapeutic interventions. Although specific joints can be assessed by fewer individual measures, gait depends on multiple parameters making an overall assessment metric difficult to determine. A holistic, summary measure can permit a standard comparison of progress throughout treatments and interventions, and permit more straightforward comparison across varied subjects. We propose a single summary metric (the Shriners Gait Index (SGI)) to represent the quality of gait using a deep learning autoencoder model, which helps to capture the nonlinear statistical relationships among a number of disparate gait metrics. We utilized gait data of 412 individuals under the age of 18 collected from the Motion Analysis Center (MAC) at the Shriners Children's - Chicago. The gait data includes a total of 114 features: temporo-spatial parameters (7), lower extremity kinematics (64), and lower extremity kinetics (43) which were min-max normalized. The developed SGI score captured more than 89% variance of all 144 features using subject-wise cross-validation. Such summary metrics holistically quantify an individual's gait which can then be used to assess the impact of therapeutic interventions. The machine learning approach utilized can be leveraged to create such metrics in a variety of contexts depending on the data available. We also utilized the SGI to compare overall changes to gait after surgery with the goal of improving mobility for individuals with gait disabilities such as Cerebral Palsy.

PMID: [38669795](#)

### 11. The effect of proprioceptive neuromuscular facilitation on functional skills, muscle strength, and trunk control in children with cerebral palsy: A randomized controlled trial

Hatice Adiguzel, Zekiye Ipek Katirci Kirmaci, Mehmet Gogremis, Yusuf Sinasi Kirmaci, Cengiz Dilber, Deniz Tuncel Berktaş

Early Hum Dev. 2024 Apr 15:192:106010. doi: 10.1016/j.earlhumdev.2024.106010. Online ahead of print.

Background: Proprioceptive neuromuscular facilitation (PNF) is generally used for the lower limbs in children with Cerebral Palsy (CP). This study aimed to determine the effect of PNF and Neurodevelopmental Therapy (NDT) on functional abilities, muscle strength, and trunk control in children with CP. Methods: Thirty spastic CP children classified as either level I-II in the Gross Motor Function Classification System (GMFCS) or level I-II in the Manual Ability Classification System (MACS) were included. The PNF (n = 15) and the NDT group (n = 15) had physiotherapy for six weeks. The ABILHAND-Kids scale, the Purdue Pegboard Test (PBPT), the Nine-Hole Peg Test (9-HPT), and the Jebson-Taylor Hand Function Test (JTHFT) were employed. Pinch meters, Jamar handheld dynamometers, and digital muscular strength assessments were used. Results: The PNF group increased shoulder flexion (p < 0.05), adduction (p < 0.05), elevation (p < 0.05), scapular abduction (p < 0.05), elbow extension (right) (p < 0.05), grip (p < 0.05), and pinch strengths (left p < 0.05, right p < 0.05). The PNF group had significantly lower 9-HPT (p < 0.05), JTHFT (card turning), JTHFT (simulated feeding), JTHFT (lifting light cans), and JTHFT (lifting weight cans) durations (p < 0.05), and significantly higher PBPT (right-left) PBPT (bimanual), PBPT (assembly). (p < 0.05), ABILHAND (p < 0.05), and TCMS total scores (p < 0.001). While JTHFT (simulated feeding-left), JTHFT (stacking checkers-left), JTHFT (lifting light cans-left), and JTHFT (lifting weight cans-right/left) (p < 0.05) durations decreased in the NDT group, PBPT (right) (p < 0.05) had an increase in duration. Conclusion: PNF improves trunk control, upper extremity functional skills, selective proximal muscle strength, and distal upper extremity muscle and grip strength.

PMID: [38653163](#)

### 12. Community-based physical activity interventions for adolescents and adults with complex cerebral palsy: A scoping review

No authors listed

Dev Med Child Neurol. 2024 Apr 25. doi: 10.1111/dmcn.15950. Online ahead of print.

No abstract available

PMID: [38662653](#)

### 13. An accurate and rapidly calibrating speech neuroprosthesis

Nicholas S Card, Maitreyee Wairagkar, Carrina Iacobacci, Xianda Hou, Tyler Singer-Clark, Francis R Willett, Erin M Kunz, Chaofei Fan, Maryam Vahdati Nia, Darrel R Deo, Aparna Srinivasan, Eun Young Choi, Matthew F Glasser, Leigh R Hochberg, Jaimie M Henderson, Kiarash Shahlaie, David M Brandman, Sergey D Stavisky

medRxiv [Preprint]. 2024 Apr 10:2023.12.26.23300110. doi: 10.1101/2023.12.26.23300110.

Brain-computer interfaces can enable rapid, intuitive communication for people with paralysis by transforming the cortical activity associated with attempted speech into text on a computer screen. Despite recent advances, communication with brain-computer interfaces has been restricted by extensive training data requirements and inaccurate word output. A man in his 40's with ALS with tetraparesis and severe dysarthria (ALSFRS-R = 23) was enrolled into the BrainGate2 clinical trial. He underwent surgical implantation of four microelectrode arrays into his left precentral gyrus, which recorded neural activity from 256 intracortical electrodes. We report a speech neuroprosthesis that decoded his neural activity as he attempted to speak in both prompted and unstructured conversational settings. Decoded words were displayed on a screen, then vocalized using text-to-speech software designed to sound like his pre-ALS voice. On the first day of system use, following 30 minutes of attempted speech training data, the neuroprosthesis achieved 99.6% accuracy with a 50-word vocabulary. On the second day, the size of the possible output vocabulary increased to 125,000 words, and, after 1.4 additional hours of training data, the neuroprosthesis achieved 90.2% accuracy. With further training data, the neuroprosthesis sustained 97.5% accuracy beyond eight months after surgical implantation. The participant has used the neuroprosthesis to communicate in self-paced conversations for over 248 hours. In an individual with ALS and severe dysarthria, an intracortical speech neuroprosthesis reached a level of performance suitable to restore naturalistic communication after a brief training period.

PMID: [38645254](#)

### 14. Fatigue in children using motor imagery and P300 brain-computer interfaces

Joanna Rg Keough, Brian Irvine, Dion Kelly, James Wrightson, Daniel Comaduran Marquez, Eli Kinney-Lang, Adam Kirton

J Neuroeng Rehabil. 2024 Apr 24;21(1):61. doi: 10.1186/s12984-024-01349-2.

**Background:** Brain-computer interface (BCI) technology offers children with quadriplegic cerebral palsy unique opportunities for communication, environmental exploration, learning, and game play. Research in adults demonstrates a negative impact of fatigue on BCI enjoyment, while effects on BCI performance are variable. To date, there have been no pediatric studies of BCI fatigue. The purpose of this study was to assess the effects of two different BCI paradigms, motor imagery and visual P300, on the development of self-reported fatigue and an electroencephalography (EEG) biomarker of fatigue in typically developing children. **Methods:** Thirty-seven typically-developing school-aged children were recruited to a prospective, crossover study. Participants attended three sessions: (A) motor imagery-BCI, (B) visual P300-BCI, and (C) video viewing (control). The motor imagery task involved an imagined left- or right-hand squeeze. The P300 task involved attending to one square on a 3 × 3 grid during a random single flash sequence. Each paradigm had respective calibration periods and a similar visual counting game. Primary outcomes were self-reported fatigue and the power of the EEG alpha band both collected during resting-state periods pre- and post-task. Self-reported fatigue was measured using a 10-point visual analog scale. EEG alpha band power was calculated as the integrated power spectral density from 8 to 12 Hz of the EEG spectrum. **Results:** Thirty-two children completed the protocol (age range 7-16, 63% female). Self-reported fatigue and EEG alpha band power increased across all sessions ( $F(1,155) = 33.9, p < 0.001$ ;  $F = 5.0(1,149), p = 0.027$  respectively). No differences in fatigue development were observed between session types. There was no correlation between self-reported fatigue and EEG alpha band power change. BCI performance varied between participants and paradigms as expected but was not associated with self-reported fatigue or EEG alpha band power. **Conclusion:** Short periods (30-minutes) of BCI use can increase self-reported fatigue and EEG alpha band power to a similar degree in children performing motor imagery and P300 BCI paradigms. Performance was not associated with our measures of fatigue; the impact of fatigue on usability and enjoyment is unclear. Our results reflect the variability of fatigue and the BCI experience more broadly in children and warrant further investigation.

PMID: [38658998](#)

### **15. Profiles of functioning of a group of children with cerebral palsy in Argentina: Preliminary data from the first national study [Article in English, Spanish] [Abstract in English, Spanish]**

L Johana Escobar, Verónica Schiariti, Mercedes Ruiz Brunner, Eduardo Cuestas

Arch Argent Pediatr. 2024 Apr 25:e202310257. doi: 10.5546/aap.2023-10257.eng. Online ahead of print.

Cerebral palsy (CP) affects body posture and movement coordination and is the most common cause of severe disability in the pediatric population. The diagnosis of CP is not a description of a person's functioning or interaction with their environment. Therefore, the diagnosis should be complemented with a description of functioning, using tools based on the biopsychosocial model proposed by the World Health Organization's International Classification of Functioning, Disability and Health (ICF). This report describes the preliminary data from a multicenter study conducted in Argentina with the aim of standardizing the description of the profiles of functioning of children and adolescents with CP. These data showed that the participants had some skills in sleep functions, mental functions of language, seeing functions, and in some environmental factors. They showed significant difficulties in categories such as maintaining body position, walking, and toileting.

PMID: [38656786](#)

### **16. Quality of life of families and siblings of children with cerebral palsy treated at a reference neurorehabilitation center in Brazil**

Bruno Leonardo Scofano Dias, Maura Calixto Cecherelli de Rodrigues, José Luiz Muniz Bandeira Duarte

J Pediatr (Rio J). 2024 Apr 22:S0021-7557(24)00043-3. doi: 10.1016/j.jped.2024.03.010. Online ahead of print.

**Objectives:** To investigate the associations between caregivers' burden, family quality of life (QoL), and siblings' QoL in Brazilian families of children with cerebral palsy, and to analyze siblings' QoL using as a parameter the QoL of typically developed Brazilian children. **Methods:** It was a cross-sectional study. The 212 families, 212 caregivers and 131 siblings completed the Family Quality of Life Scale, Burden Interview, and KIDSCREEN-27 Child and Adolescent Version and Parents Version questionnaires at a neurorehabilitation center in southeast Brazil. Univariable and multivariable models were used. **Results:** Family QoL significantly worsened as caregivers' burden increased (95 % CI -0.66 to -0.38). Caregivers' burden was significantly lower with increasing family QoL scores (95 % CI -0.52 to -0.30). Self-reported siblings' QoL was significantly worse than that of their typically developed peers (95 % CI -7.6 to -3.6). Self-reported siblings' QoL was significantly lower as siblings' age (95 % CI -2.52 to -0.59) and caregivers' burden (95 % CI -0.35 to -0.05) increased. Parent-reported siblings' QoL was significantly lower with increasing caregivers' burden (95 % CI -0.45 to -0.16) and higher as family QoL increased (95 % CI 0.09 to 0.37). **Conclusions:** The cross-sectional nature of these data precludes any statement of causality. Family QoL worsened with higher caregivers' burden levels. Lower caregivers' burden scores were associated with a higher family QoL. Siblings' QoL was impaired as compared to typically developed peers, worse among older siblings, and as caregivers' burden increased and better with higher family QoL levels. Future multicenter studies may validate the generalizability of the present findings.

PMID: [38663449](#)

### **17. The influence of advanced maternal age on congenital malformations, short- and long-term outcomes in offspring of nulligravida: a Korean National Cohort Study over 15 years**

Su Jin You, Danbee Kang, Ji-Hee Sung, Hyejeong Park, Juhee Cho, Suk-Joo Choi, Soo-Young Oh, Cheong-Rae Roh

Obstet Gynecol Sci. 2024 Apr 26. doi: 10.5468/ogs.24005. Online ahead of print.

**Objective:** To assess the influence of advanced maternal age on congenital malformations, and short- and long-term outcomes in offspring of nulligravida. **Methods:** A retrospective study was conducted using the Korean National Health Insurance Service database spanning from January 2005 to December 2019. All live-born offspring of nulligravida (n=3,685,817) were included. The maternal age was subdivided into the following subgroups: <25 years (n=153,818), 25-29 years (n=845,355), 30-34 years (n=1,738,299), 35-39 years (n=787,530), 40-44 years (n=151,519), and >44 years (n=9,296). Outcomes were assessed based on ICD-10 codes. Adjusted odds ratios (aORs) were calculated with the group of 25-29 years as a reference using logistic regression and Cox proportional hazards model analysis. **Results:** Most congenital malformations showed an age-dependent increase, but cleft lip and abdominal wall defect exhibited a U-shape curve, indicating an increase even in those <25 years old. Similarly, various disorders included in the neonatal composite outcomes from short-term outcomes showed an age-dependent escalation. However, preterm birth from the short-term outcomes and most of the long-term developmental outcomes, except for motor developmental delays and Tics, showed a U-shaped pattern. The aOR of autism and cerebral palsy, showing the most obvious U-shaped curved in the long-term outcomes, was 1.50 (95% CI 1.24-1.82) and 1.54 (95% CI 1.17-2.03), respectively in the >44 years old group and 1.18 (95% confidence interval [CI], 1.11-1.25) and 1.19 (95% CI, 1.09-1.30) in the <25 years old group. **Conclusion:** Overall, an advanced maternal age shows an age-dependent correlation with most congenital malformations, as well as short- and long-term outcomes of neonates.

PMID: [38666294](#)

### **18. The Functional Vision for Communication Questionnaire (FVC-Q): Exploring Parental Report of Non-Speaking Children's Fixation Skills Using a Structured History-Taking Approach**

Jenefer Sargent, Tom Griffiths, Michael T Clarke, Kim Bates, Katrina Macleod, John Swettenham

Dev Neurorehabil. 2024 Apr 27:1-7. doi: 10.1080/17518423.2024.2346254. Online ahead of print.

This paper explores whether a structured history-taking tool yields useful descriptions of children's looking skills. Parents of 32 children referred to a specialist communication clinic reported their child's looking skills using the Functional Vision for Communication Questionnaire (FVC-Q), providing descriptions of single object fixation, fixation shifts between objects and fixation shifts from object to person. Descriptions were compared with clinical assessment. 24/32 children were reported to have some limitation in fixation. Limitation was subsequently seen in 30/32 children. Parental report and assessment agreed fully in 23/32 (72%). The largest area of discrepancy was object-person fixation shifts, with five children not observed to show this behavior despite its being reported. Findings indicate a structured questionnaire yields description of fixations, which correspond well with clinical assessment. Descriptions supported discussion between parents and clinicians. It is proposed that the FVC-Q is a valuable tool in supporting clinicians in eliciting information about fixation skills.

PMID: [38676395](#)

### **19. No Impact of Enteral Nutrition on Fecal Short-Chain Fatty Acids in Children with Cerebral Palsy**

Dorota Mickiewicz-Góra, Katarzyna Sznurkowska, Arleta Drozd, Anna Borkowska, Maciej Zagierski, Joanna Troch, Karolina Skonieczna-Żydecka, Agnieszka Szlagatys-Sidorkiewicz

Biomedicines. 2024 Apr 18;12(4):897. doi: 10.3390/biomedicines12040897.

Bacteria can impact the host organism through their metabolites, with short-chain fatty acids (SCFAs) being the most important, including acetate (C2), propionate (C3), butyrate (C4), valerate (C5n), and isovalerate (C5i). This study aimed to identify the impact of enteral nutrition on SCFAs in children with cerebral palsy and to test the hypothesis that the type of nutrition in cerebral palsy affects gut SCFA levels. Cerebral palsy is a heterogeneous syndrome resulting from non-progressive damage to the central nervous system. The study group included 30 children diagnosed with cerebral palsy, receiving enteral nutrition (Cerebral Palsy Enteral Nutrition (CPEN)) via gastrostomy. The first reference group (Cerebral Palsy Controls (CPCs)) consisted of 24 children diagnosed with cerebral palsy and fed orally on a regular diet. The second reference group (Healthy Controls (HCs)) consisted of 24 healthy children with no chronic disease and fed on a regular diet. Isolation and measurement of SCFAs were conducted using gas chromatography. Differences were observed in the median contents of isobutyric acid, valeric acid, and isovaleric acid between the CPC group, which had significantly higher levels of those acids than the HC group. No differences were found between the CPEN and CPC groups nor between the CPEN and HC groups. We

conclude that enteral nutrition in cerebral palsy has no influence on the levels of SCFAs.

PMID: [38672250](#)

## 20. Promoting sustainability at health and disability conferences: It is our responsibility

Sarah McIntyre, Alicia Spittle

Editorial Dev Med Child Neurol. 2024 Apr 26. doi: 10.1111/dmcn.15947. Online ahead of print.

No abstract available

PMID: [38669471](#)

## 21. The Role of Botulinum Toxin Type-A in Spasticity: Research Trends from a Bibliometric Analysis

Salvatore Facciorusso, Stefania Spina, Alessandro Picelli, Alessio Baricich, Gerard E Francisco, Franco Molteni, Jörg Wissel, Andrea Santamato

Review Toxins (Basel). 2024 Apr 9;16(4):184. doi: 10.3390/toxins16040184.

Botulinum toxin type-A (BoNT-A) has emerged as a key therapeutic agent for the management of spasticity. This paper presents a comprehensive bibliometric and visual analysis of research concerning BoNT-A treatment of spasticity to elucidate current trends and future directions in this research area. A search was conducted in the Web of Science database for articles focused on the use of BoNT-A in spasticity published between 2000 and 2022. We extracted various metrics, including counts of publications and contributions from different countries, institutions, authors, and journals. Analytical methods in CiteSpace were employed for the examination of co-citations, collaborations, and the co-occurrence of keywords. Our search yielded 1489 publications. Analysis revealed a consistent annual increase in research output. The United States, United Kingdom, and Italy were the leading contributors. The top institution in this research was Assistance Publique Hopitaux, Paris. The journal containing the highest number of relevant publications was Toxins. Key frequently occurring keywords were 'stroke', 'cerebral palsy', 'adult spasticity', and 'upper extremity'. This study identified 12 clusters of keywords and 15 clusters of co-cited references, indicating the main focus areas and emerging themes in this field. This study comprehensively analyzed and summarized trends in BoNT-A research in the field of spasticity over the past 22 years.

PMID: [38668609](#)

## 22. Embracing complexity to find simplicity in designing and assessing rehabilitation interventions

Jenny Carroll

Dev Med Child Neurol. 2024 Apr 26. doi: 10.1111/dmcn.15946. Online ahead of print.

No abstract available

PMID: [38666523](#)

## 23. An unusual case of severe asphyxia with the fetal position unexpectedly inverted in a malformed uterus: a case report

Jiro Abe, Takashi Nasu, Ayumu Noro, Junko Tsubaki

Case Reports J Med Case Rep. 2024 Apr 26;18(1):209. doi: 10.1186/s13256-024-04524-0.

**Background:** We present a severe neonatal consequence due to the unexpected and crucial inversion of the fetal position after sudden termination of tocolysis during early labor of a woman with congenital uterine anomaly. It has been reported that congenital uterine anomalies latently affect the fetal position. The clinical pitfalls in childbirth with uterine anomalies are discussed here on the basis of clinical evidence. **Case presentation:** At a perinatal medical center in Japan, a 29-year-old Japanese mother who had a history of bicornuate uterus, received tocolysis to prolong her pregnancy for 5 days during the late preterm period after preterm-premature rupture of the membrane. She gave birth to a 2304 g male neonate of the gestational age of 35 weeks and 5 days with severe asphyxia by means of crash cesarean section for fetal sustained bradycardia after sudden termination of tocolysis. We found the fetal position to reverse from cephalic to breech position during early labor. He ended up having severe cerebral palsy after brain cooling against hypoxic-ischemic encephalopathy for 3 days. The mechanism of inversion from cephalic to breech position without amniotic fluid remains unclear, although women with a known diagnosis of a uterine anomaly have higher risk of adverse outcomes such as malpresentation. **Conclusions:** When considering the clinical



course of this case on the basis of the medical reports, we suspected that uterine anomalies and changes in intrauterine pressure could cause fetal malpresentation and adverse neonatal outcomes.

PMID: [38664817](#)

#### **24. MRCT and CT in the diagnosis of pediatric disease imaging: assessing imaging performance and clinical effects**

Xiaofei Wang, Wen Hu

Comparative Study BMC Med Imaging. 2024 Apr 25;24(1):96. doi: 10.1186/s12880-024-01273-w.

Objective: This study focused on analyzing the clinical value and effect of magnetic resonance imaging plus computed tomography (MRCT) and CT in the clinical diagnosis of cerebral palsy in children. Methods: From February 2021 to April 2023, 94 children diagnosed with cerebral palsy were selected from our hospital for study subjects. These patients were divided into CT and MRI groups, with CT examination given to the CT group and MRI examination given to the MRI group. The positive rate of the two examination methods in the diagnosis of cerebral palsy was compared, different imaging signs in two groups of children with cerebral palsy were compared, and the diagnostic test typing results between two groups were further analyzed. Results: The diagnostic positivity rate of the children in the MRI group was 91.49%, which was significantly higher than that of the children in the CT group (70.21%) ( $P < 0.05$ ). In both groups, encephalomalacia, bilateral frontal subdural effusions, and gray-white matter atrophy of the brain were the main signs, and the difference in the proportion of these three imaging signs between the two groups was not significant ( $P > 0.05$ ). Differences between the two groups examined for cerebral palsy subtypes were not significant ( $P > 0.05$ ). Conclusion: The positive rate of pediatric cerebral palsy examined by MRI is higher than that of CT diagnosis, but the clinic should organically combine the two to further improve the detection validity and accuracy.

PMID: [38664762](#)

#### **25. Author Correction: The complex aetiology of cerebral palsy**

Steven J Korzeniewski, Jaime Slaughter, Madeleine Lenski, Peterson Haak, Nigel Paneth

Published Erratum Nat Rev Neurol. 2024 Apr 25. doi: 10.1038/s41582-024-00964-w. Online ahead of print.

No abstract available

Erratum for

The complex aetiology of cerebral palsy.

Korzeniewski SJ, Slaughter J, Lenski M, Haak P, Paneth N.

Nat Rev Neurol. 2018 Sep;14(9):528-543. doi: 10.1038/s41582-018-0043-6.

PMID: 30104744

PMID: [38664569](#)

#### **26. Neurologic Dysphagia**

Jillian Nyswonger Sugg, Janet Waimin Lee

Review Otolaryngol Clin North Am. 2024 Apr 24:S0030-6665(24)00046-X. doi: 10.1016/j.otc.2024.03.005. Online ahead of print.

Dysphagia is commonly associated with neurologic/neuromuscular disorders including prematurity, cerebral palsy, traumatic brain injury, brain tumors, genetic disorders, and neuromuscular diseases. This article aims to review the major categories of neurologic dysphagia, to outline specific findings and special considerations for each population, and to acknowledge the importance of integrating each patient's medical prognosis, goals of care, and developmental stage into a multidisciplinary treatment plan.

PMID: [38664090](#)

#### **27. Dystonic cerebral palsy like presentation caused by a novel TCF20 variant**

Pankaj Prasun, Kylie Vermeire, Stephanie Ferimer

J Mov Disord. 2024 Apr 26. doi: 10.14802/jmd.24007. Online ahead of print.

No abstract available

PMID: [38664070](#)

## 28. Motor Impairment Referrals to an International Child Development Clinic: It is Not Always Cerebral Palsy

Christie Zheng, Susanne P Martin-Herz, Christina Briscoe Abath, Rebecca J Scharf

*Pediatr Neurol.* 2024 Feb 21;155:167-170. doi: 10.1016/j.pediatrneurol.2024.02.004. Online ahead of print.

**Background:** The majority of the estimated 50 to 100 million children living with disability worldwide reside in low- or middle-income countries. As families migrate to avoid humanitarian crises, children with developmental disability and delay warrant particular attention in refugee and international health settings. During transitions, medical documentation may be lost and diagnoses may not be fully understood, contributing to the challenges of determining etiologies of motor impairment. **Methods:** Of the first 100 refugee children who were referred to the Child Development Clinic, we identified a subset of children referred for motor impairment or cerebral palsy. Data on their presentation, diagnoses following evaluation, and therapeutic services required was collected by retrospective chart review. **Results:** Twenty children were referred for motor impairment and cerebral palsy. Average age was 8.9 years; 45% were female. Eight children were eventually diagnosed with cerebral palsy, and 12 had alternate or inconclusive diagnoses. Microcephaly was more common in children diagnosed with cerebral palsy. **Conclusions:** The frequent differences between referral and final diagnoses in refugee children referred for cerebral palsy highlights the need for pediatricians' careful examination and diagnostic reasoning upon initial presentation.

PMID: [38663153](#)

## 29. Euterpe music therapy method for children with cerebral palsy

Tommaso Liuzzi, Sarah Bompard, Massimiliano Raponi, Fiammetta D'Arienzo, Susanna Staccioli, Eleonora Napoli, Martina Frascari Diotallevi, Simone Piga, Roberto Giuliani, Enrico Castelli

*Front Neurol.* 2024 Apr 10;15:1388712. doi: 10.3389/fneur.2024.1388712. eCollection 2024.

**Introduction:** The main purpose of our study was to evaluate whether involvement in a personalized music therapy program (Euterpe method), could improve the condition of children with cerebral palsy and their parents, compared to a control group. It investigated whether it could positively affect children's sleep quality, temperament and quality of life, quality of family life, and parental stress. **Methods:** A prospective single-center experimental study was conducted at "Bambino Gesù" Children's Hospital (Rome, Italy). All subjects involved attended an intensive rehabilitation program in the Neurorehabilitation Unit. In a group of patients (n = 25), a music therapy treatment was applied to evaluate the effect before and after the intervention. This group was also compared with a control group (n = 10) undergoing a standard protocol without music therapy. **Results:** In the experimental group, the analysis shows statistically significant effects in the Disorders of initiating and maintaining sleep (p = 0.050) and the Sleep wake transition disorders (p = 0.026) factors, and the total score (p = 0.031) of Sleep Disturbances Scale for Children; the Positive emotionality scale (p = 0.013) of Italian Questionnaires of Temperament (QUIT); the Emotional Functioning (p = 0.029), Social Functioning (p = 0.012), Worry (p = 0.032), Daily Activities (p = 0.032), Total Score (p = 0.039) and Parent HRQL Summary Score (p = 0.035) dimensions of Pediatric Quality of Life for family. While in the control group, only the Attention scale of QUIT (p = 0.003) reaches statistical significance. **Discussion:** Our study suggests that music therapy with the Euterpe Method has beneficial effects on fundamental aspects of the child's and his parents' lives, such as sleep, emotion control, and quality of family life.

PMID: [38660092](#)

## 30. Changes in metabolic acidosis following birth in intensive care unit neonates

Natalie T Simon, Patricia M Hagan, Karilynn M Rockhill, Kent D Heyborne

*Eur J Obstet Gynecol Reprod Biol.* 2024 Apr 20;297:161-168. doi: 10.1016/j.ejogrb.2024.04.025. Online ahead of print.

**Background:** Little is known about how and why metabolic acidosis changes within the first six hours of life in intensive care unit neonates. **Objective:** To determine changes in pH and base excess between paired umbilical cord arterial and neonatal arterial blood samples during the first 6 h of life, to identify factors associated with the direction and magnitude of change, and to examine morbidity and mortality in newborns with acidosis at birth or as neonates. **Study design:** Retrospective cohort study of all deliveries from a single institution between 2016-2020 with paired umbilical cord arterial and neonatal arterial samples obtained within 6 h of life meeting rigorous criteria to ensure sample integrity. The primary outcomes were the direction and magnitude of change of pH and base excess. Multiple factors were assessed for possible correlation with pH and base excess change. The secondary outcome was the association between a composite outcome of death or cerebral palsy and pathologic acidosis (pH ≤ 7.1) at birth or as a neonate. **Results:** 102 patients met inclusion criteria. Newborn arterial gasses were obtained at a median of 1.5 h (74 % < 2 h). pH improved in 71 % of cases and worsened in 29 %, and base excess improved in 52 % and

worsened in 48 %, with wide observed ranges in both parameters. The paired pH and base excess values were moderately ( $r = 0.38$ ) and strongly ( $r = 0.63$ ) positively correlated, respectively, but were not correlated with time since birth ( $r = 0.14$ ). Low birth weight, prematurity or respiratory failure were associated with worsening or less improvement, while worse initial acidosis was associated with greater improvement. Death or survival with cerebral palsy was more common with pathologic acidosis in either cord or newborn sample as compared with those without acidosis (27.3 % vs 3.7 %,  $p = 0.003$ ), and was more common in those with isolated neonatal acidosis as compared to those without acidosis (50 % vs 3.7 %,  $p = 0.016$ ). Conclusions: Changes in pH and base excess occurred over a wide range between delivery and the first newborn blood gas in the first 6 h of life, and we identified several factors associated with direction of change. Metabolic acidosis at birth cannot reliably be inferred from neonatal arterial values. Neonatal acidosis, including acidosis following a normal pH and base excess at birth, was associated with morbidity and mortality.

PMID: [38657521](#)

### 31. Neuroanatomical correlates of gross manual dexterity in children with unilateral spastic cerebral palsy

Elena Beani, Veronica Barzacchi, Elena Scaffei, Beatrice Ceragioli, Fabrizia Festante, Silvia Filogna, Giovanni Cioni, Simona Fiori, Giuseppina Sgandurra

Front Hum Neurosci. 2024 Apr 9;18:1370561. doi: 10.3389/fnhum.2024.1370561. eCollection 2024.

Unilateral spastic Cerebral Palsy (UCP) results from congenital brain injury, and Magnetic Resonance Imaging (MRI) has a role in understanding the etiology and severity of brain insult. In UCP, functional impairment predominantly occurs in the upper limb (UL) of the more affected side, where manual ability and dexterity are typically reduced. Also, mirror movements (MMs), are often present in UCP, with a further possible negative functional impact. This study aims to investigate the relationships among neuroanatomical characteristics of brain injury at MRI, manual functional impairment and MMs, in children with UCP. Thirty-five children with UCP participated in the study (20, M = 15, F, mean age  $9.2 \pm 3.5$  years). Brain lesions at MRI were categorized according to the Magnetic Resonance Classification System (MRICS) and by using a semi-quantitative MRI (sqMRI) scale. Gross manual performance was assessed through Manual Ability Classification System (MACS) and the Box and Block Test (BBT), and MMs by Woods and Teuber scale, for both hands. Non-parametric correlation analyses were run to determine the relationship between neuroanatomical and functional features. Regression models were run to explore the contribution of neuroanatomical features and MMs to UL function. Correlation analyses revealed moderate to strong associations between sqMRI scores contralateral to the more affected side and UL functional impairment on MACS and BBT, with more severe brain injuries significantly correlating with poorer function in the more affected hand. No association emerged between brain lesion severity scores and MMs. MRICS showed no association with MACS or BBT, while a significant correlation emerged between MRICS category and MMs in the more affected hand, with brain lesion category that are suggestive of presumed earlier injury being associated with more severe MMs. Finally, exploratory regression analyses showed that neuroanatomical characteristics of brain injury and MMs contributed to the variability of UL functional impairment. This study contributes to the understanding of the neuroanatomical and neurological correlates of some aspects of manual functional impairment in UCP by using a simple clinical brain MRI assessment.

PMID: [38655371](#)

### 32. The association between the degree of cervical dilatation before ultrasound and physical examination indicated cerclage and subsequent neonatal outcomes

Ümran Kılıncdemir Turgut, Ebru Erdemoğlu, Cem Dağdelen, Osman Gürdal, Mehmet Okan Özkaya, Mekin Sezik

Qatar Med J. 2024 Apr 4;2024(1):20. doi: 10.5339/qmj.2024.20. eCollection 2024.

Introduction: Preterm identification of cervical dilation in pregnant women leads to the application of emergency cervical cerclage with an expectation of achieving term delivery. However, this is not always feasible. Short- and long-term neonatal complications post-preterm birth pose a significant challenge. It is crucial to anticipate potential complications and understand the possibilities of postpartum development as they can be encountered. We aimed to evaluate the effect of the degree of cervical dilatation before ultrasound and physical examination-indicated cerclage in singleton pregnancies presenting with premature cervical dilatation with bulging fetal membranes (rescue cerclage) on subsequent neonatal outcomes. Materials and methods: In this retrospective clinical study, over a 10-year period between January 2009 and January 2019, 72 singleton pregnancies undergoing rescue cerclage were included and divided into two groups according to pre-cerclage cervical dilatation: Group 1 ( $n = 33$ ) and Group 2 ( $n = 39$ ) with cervical dilatation  $\leq 3$  cm and  $> 3$  cm, respectively. Latency period for pregnancy prolongation, gestational age at delivery, birth weight, and neonatal morbidity and mortality were compared across the groups. Logistic regression was used to delineate the independent effect of cervical dilatation at cerclage placement on neonatal mortality. Results: Group 2 had a higher delivery rate at  $\leq 28$  weeks' gestation ( $p = 0.007$ ) and lower birth weight ( $p = 0.002$ ) compared to Group 1, with an increased mean latency period in Group 2 ( $90 \pm 55$  days versus  $52 \pm 54$  days,  $p = 0.005$ ). The newborn intensive care unit (NICU) requirement, respiratory distress syndrome (RDS), neonatal jaundice and sepsis, and retinopathy of prematurity (ROP) were more frequent in Group 2. Neonatal mortality rate was higher (52.6% versus 24.2%,  $p = 0.015$ ) and intact survival was lower (23.1% versus 48.4%,  $p = 0.013$ ) in Group 2, whereas rates of cerebral palsy (8% and 9%,

respectively) were similar between the groups ( $p = 0.64$ ). Conclusion: Advanced cervical dilatation ( $>3$  cm) during physical examination-indicated cerclage in singleton pregnancies is associated with earlier delivery, leading to increased neonatal morbidity and mortality when compared with pregnancies having lesser degrees of cervical dilatation at cerclage. However, short-term poor neurological outcomes seem comparable.

PMID: [38654815](#)

### **33. A prospective assessment of readiness to implement an early detection of cerebral palsy pathway in a neonatal intensive care setting using the PARIHS framework**

Amy Mulqueeny, Malcolm Battin, Ann McKillop, N Susan Stott, Angelica Allermo-Fletcher, Sian A Williams

Implement Sci Commun. 2024 Apr 23;5(1):46. doi: 10.1186/s43058-024-00581-0.

**Background:** Early detection of cerebral palsy (CP) is possible through targeted use of assessment tools. Changes in practice are needed to facilitate this shift towards earlier diagnosis of CP in New Zealand. The aim of this study was to prospectively evaluate readiness to implement an early detection of CP pathway within a level 3 neonatal intensive care unit (NICU) setting prior to any implementation taking place. The PARIHS (Promoting Action on Research Implementation in Health Services) framework was engaged to assess readiness by highlighting determinants that influence implementation outcomes as either barriers or enablers. **Methods:** A mixed methods approach was used. Firstly, an online staff survey assessed PARIHS sub-elements using Likert scores and free text with the intent to develop a baseline understanding of staff views. Secondly, focus groups were conducted to gain deeper understanding of barriers and enablers to implementation. Participants included health professionals involved in the first 6 months of life. Data were analysed to outline the barriers and enablers of implementation under the Evidence and Context constructs of the PARIHS framework. **Results:** Twenty-seven participants completed the survey, and 20 participants participated in eight focus groups and two individual interviews. Quantitative (survey) findings found 65% agreement around the usefulness of research evidence on early CP detection; however,  $\leq 45\%$  felt current resources (i.e. human, financial and IT) were sufficient for implementation. Qualitative findings (survey and focus groups) highlighted key staff concerns around resources, family impact (creating unnecessary stress), and equity (barriers to participation). Staff wanted information regarding how international evidence translates to the local context and availability of timely follow-up services. Sub-elements within the Evidence and Context constructs were rated as either mixed or low (except for Evidence - Research, rated as high), overall indicating that Auckland NICU is at the early stages of readiness to implement the early CP detection pathway. **Conclusion:** This work may resonate with other neonatal services preparing to implement CP early detection pathways. Resourcing has a major role in facilitating implementation of pathways and uncertainty about resources is a barrier to implementation. Ongoing focus on building consensus and funding is required to ensure optimal uptake.

PMID: [38654322](#)

### **34. Current Status and Associated Factors of Post-Hemorrhagic Hydrocephalus in Infants of 22 to 28 Weeks Gestation With Severe Intraventricular Hemorrhage in Korea: A Nationwide Cohort Study**

Misun Yang, Sumin Kim, Se In Sung, Yun Sil Chang, Won Soon Park, So Yoon Ahn

J Korean Med Sci. 2024 Apr 22;39(15):e139. doi: 10.3346/jkms.2024.39.e139.

**Background:** Post-hemorrhagic hydrocephalus (PHH), a common complication of severe intraventricular hemorrhage (IVH) in very low birth weight (BW) infants, is associated with significant morbidity and poor neurological outcomes. The objective of this study was to assess the current status of PHH and analyze the risk factors associated with the necessity of treatment for PHH in infants born between 22 and 28 weeks of gestation, specifically those with severe IVH (grade 3 or 4). **Methods:** The analysis was conducted on 1,097 infants who were born between 22-28 gestational weeks and diagnosed with severe IVH, using data from the Korean Neonatal Network. We observed that the prevalence of PHH requiring treatment was 46.3% in infants with severe IVH. **Results:** Higher rates of mortality, transfer during admission, cerebral palsy, and ventriculoperitoneal shunt after discharge were higher in infants with PHH than in those without PHH. PHH in severe IVH was associated with a higher rate of pulmonary hemorrhage, seizures, and IVH grade 4 in the entire cohort. In addition, it was associated with a lower rate of small for gestational age and chorioamnionitis. In the subgroup analysis, high BW, outborn status, pulmonary hemorrhage, seizure, sepsis, and IVH grade 4 were associated with a higher incidence of PHH between 22 and 25 gestational weeks (GW). In infants born between 26 and 28 GW, a higher incidence of PHH was associated with seizures and IVH grade 4. **Conclusion:** It is necessary to maintain meticulous monitoring and neurological intervention for infants with PHH not only during admission but also after discharge. In addition, identifying the clinical factors that increase the likelihood of developing PHH from severe IVH is crucial.

PMID: [38651224](#)

### 35. A Case of Necrotic Colonic Volvulus in Cerebral Palsy With Severe Scoliosis

Abdullah Alhelal, Ali M Assiri, Anas A Alqarni, Abdulrazak Tamim, Yazeed M Mohammad

Case Reports Cureus. 2024 Mar 22;16(3):e56743. doi: 10.7759/cureus.56743. eCollection 2024 Mar.

Cerebral palsy (CP) is a neurodevelopmental disorder that affects motor function and is often accompanied by secondary musculoskeletal issues. Severe scoliosis, a lateral curvature of the spine over 40 degrees, poses a significant challenge for individuals with CP, impacting their mobility and overall well-being. While the association between scoliosis and gastrointestinal complications is acknowledged, the occurrence of colonic volvulus with necrosis in the context of CP and severe scoliosis is rare and complex. This case report emphasizes the importance of clinical awareness in managing gastrointestinal complications in patients with CP and severe scoliosis. An 11-year-old female presented with gastroenteritis and a concurrent viral upper respiratory tract infection. She experienced complications such as greenish vomiting, hematemesis, abdominal distention, and constipation. The patient has a medical history of epilepsy and was diagnosed with quadriplegic CP at four months old due to viral meningitis. She is currently on anti-epileptic medications and receives regular follow-ups with neurology. Severe lumbar scoliosis of more than 50 degrees Cobb angle is also noted. Physical examination revealed dehydration, bilious content in nasogastric tube (NGT) aspiration, tender abdomen, and an empty digital rectal examination. Some laboratory findings showed elevated levels of erythrocyte sedimentation rate (ESR), prothrombin time (PT), blood urea nitrogen (BUN), and sodium, while albumin levels were decreased, and white blood cell (WBC) count was mildly elevated. Abdominal computed tomography (CT) with contrast showed a distended ascending colon with air and swirling of the mesentery. The distal half of the large bowel was not dilated, and fecal matter was present. The small bowel appeared to be collapsed, and there was moderate free fluid in the peritoneal cavity, indicating colonic volvulus involving the proximal large bowel. The patient underwent surgery, which involved deflating and removing the distended colon, resecting the gangrenous colon, and performing an ilio-sigmoid anastomosis to restore gastrointestinal continuity. Postoperatively, the patient received close monitoring in the pediatric intensive care unit (PICU), received total parenteral nutrition (TPN) for five days, gradually progressed feeding, and showed overall improvement in her condition. In conclusion, this case report highlights a rare occurrence of colonic volvulus in a patient with CP and severe scoliosis. It emphasizes the complex relationship between neurological and musculoskeletal disorders in gastrointestinal complications. A multidisciplinary approach is important for optimal management. It shows the importance of musculoskeletal factors in patients with neurological conditions. Overall, it contributes to the medical literature and emphasizes tailored management strategies for gastrointestinal issues in such patients.

PMID: [38650790](#)

### 36. Protocol for combined N-of-1 trials to assess cerebellar neurostimulation for movement disorders in children and young adults with dyskinetic cerebral palsy

Marta San Luciano, Carina R Oehr, Sarah S Wang, John S Tolmie, Allisun Wiltshire, Rebecca E Graff, Jennifer Zhu, Philip A Starr

Res Sq [Preprint]. 2024 Apr 1:rs.3.rs-4077387. doi: 10.21203/rs.3.rs-4077387/v1.

**Background:** Movement and tone disorders in children and young adults with cerebral palsy are a great source of disability. Deep brain stimulation (DBS) of basal ganglia targets has a major role in the treatment of isolated dystonias, but its efficacy in dyskinetic cerebral palsy (DCP) is lower, due to structural basal ganglia and thalamic damage and lack of improvement of comorbid choreoathetosis and spasticity. The cerebellum is an attractive target for DBS in DCP since it is frequently spared from hypoxic ischemic damage, it has a significant role in dystonia network models, and small studies have shown promise of dentate stimulation in improving CP-related movement and tone disorders. **Methods:** Ten children and young adults with DCP and disabling movement disorders with or without spasticity will undergo bilateral DBS in the dorsal dentate nucleus, with the most distal contact ending in the superior cerebellar peduncle. We will implant Medtronic Percept, a bidirectional neurostimulator that can sense and store brain activity and deliver DBS therapy. The efficacy of cerebellar DBS in improving quality of life and motor outcomes will be tested by a series of N-of-1 clinical trials. Each N-of-1 trial will consist of three blocks, each consisting of one month of effective stimulation and one month of sham stimulation in a random order with weekly motor and quality of life scales as primary and secondary outcomes. In addition, we will characterize abnormal patterns of cerebellar oscillatory activity measured by local field potentials from the intracranial electrodes related to clinical assessments and wearable monitors. Pre- and 12-month postoperative volumetric structural and functional MRI and diffusion tensor imaging will be used to identify candidate imaging markers of baseline disease severity and response to DBS. **Discussion:** Our goal is to test a cerebellar neuromodulation therapy that produces meaningful changes in function and well-being for people with CP, obtain a mechanistic understanding of the underlying brain network disorder, and identify physiological and imaging-based predictors of outcomes useful in planning further studies. Trial registration: ClinicalTrials.gov NCT06122675, first registered November 7, 2023.

PMID: [38645256](#)

**37. Caregiver perspectives of scoliosis surgery for children with cerebral palsy: a qualitative study**

Kirsty Stewart, Georgia Price, Jayne Kelderman, Sarah Carman, Christine Imms, Margaret Wallen

Disabil Rehabil. 2024 Apr 21:1-10. doi: 10.1080/09638288.2024.2342501. Online ahead of print.

Purpose: To explore the perspectives of primary caregivers of children with cerebral palsy (CP) who had spinal surgery for scoliosis. Materials and methods: A qualitative study was conducted using semi-structured interviews and guided by qualitative description methodology. Participants were caregivers of children with CP aged 5-18, who had undergone spinal surgery for scoliosis in Australia. The research team included a parent with lived experience. Results: Fourteen participants (8 biological mothers), aged 40-49 years, completed online semi-structured interviews. Four themes were identified emerged. Life with a child with CP underpinned all experiences which were founded on familiarity with their child, medical procedures, and hospitalisation. Three subthemes were parents are the experts in knowing their child, children are vulnerable, and impact on caregivers. Theme 2 involved the significance of decision making to proceed with surgery. Theme 3 underscored a need to be prepared for the surgical journey and, in Theme 4, participants spoke of needing to expect the unexpected. Conclusion: The findings highlight the importance of understanding caregiver experiences and can help inform health professionals and other families in the decision-making process, preparing for and navigating spinal surgery.

PMID: [38644614](#)

**38. [Psychological dysfunctions and management of cerebral palsy patients] [Article in French]**

Michèle Chazot-Balcon, Jean-Pierre Bouchard

Rev Infirm. 2024 Apr;73(300):24-26. doi: 10.1016/j.revinf.2024.03.009. Epub 2024 Apr 8.

Cerebrospinal patients are victims of acquired brain lesions of multiple etiologies: head trauma, stroke, brain tumors, arteriovenous malformations, progressive degenerative diseases. Their care requires a combination of neurological, neuropsychological, psychiatric and psychopathological knowledge. Psychological follow-up of patients with cerebral palsy is one of the dimensions of their care.

PMID: [38643996](#)

**39. [Follow-up of cerebral palsy patients in neurological rehabilitation departments] [Article in French]**

Frédérie Bouterin, Alexandre Luria, Claire Trochet

Rev Infirm. 2024 Apr;73(300):22-23. doi: 10.1016/j.revinf.2024.03.008. Epub 2024 Apr 8.

Patients suffering from head trauma or hemorrhagic cardiovascular accident can be cared for in special facilities. Located near Grenoble, the Fondation santé des étudiants de France Grenoble La Tronche (ex-clinique du Grésivaudan) (38) provides post-resuscitation care for brain-damaged patients. This article presents the department, its specific features and their daily routine, as shared with us by Mélanie, Leslie and her fellow nurses in the neurological rehabilitation department.

PMID: [38643995](#)

**40. [Acute care of patients with cerebral palsy in neuro-resuscitation surgery] [Article in French]**

Chiara Mugnier, Marc Guilloux

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Severe head trauma, with or without polytrauma, subarachnoid haemorrhage due to aneurysm rupture, is an unexpected tragedy for patients and their families. These accidents are likely to result in extremely serious neurological damage, with many of the patients under our care facing a life-threatening prognosis. To protect the brain, one solution is to put the patient into a deep sleep during the so-called "acute" phase, making it impossible to assess the repercussions of the initial injuries at the time: this is what we call "waiting resuscitation".

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**41. Hypercapnic hypoxia as a rehabilitation method for patients after ischemic stroke**

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**Introduction:** Experimental studies on animals have demonstrated a higher neuroprotective efficacy of hypercapnic hypoxia compared to normocapnic hypoxia. Respiratory training with hypercapnic hypoxia has shown a positive impact on the functional state of the nervous system in children with cerebral palsy (CP). It can be presumed that the combined effect of moderate hypercapnia and hypoxia will be promising for clinical application within the context of early rehabilitation after ischemic stroke. **Methods:** A randomized triple-blind placebo-controlled study was conducted on 102 patients with ischemic stroke, aged  $63.07 \pm 12.1$  years. All patients were diagnosed with ischemic stroke based on neuroimaging criteria and/or clinical criteria within the 48-72 hour timeframe. The experimental group ( $n = 50$ ) underwent daily respiratory training with hypercapnic hypoxia (FetCO<sub>2</sub> 5-6%, FetO<sub>2</sub> 15-16%) using the 'Carbonic' device for 7-11 sessions of 20 minutes each day during the treatment process. The control group (placebo,  $n = 52$ ) underwent training on a similar device modified for breathing atmospheric air. Neurological examinations were conducted on all patients before the study and on the day after completing the training course. **Results:** The standard treatment demonstrated effectiveness in terms of neurological status scales in both groups. Intermittent exposure to hypercapnic hypoxia proved more effective in improving neurological function indicators in patients compared to the placebo group: NIHSS scale scores were 40% lower than in the placebo group ( $p < 0.001$ ); mRS scale scores were 35% lower ( $p < 0.001$ ); B-ADL-I and RMI indices were higher by 26% ( $p < 0.01$ ) and 36% ( $p < 0.001$ ), respectively; MoCA scale results were 13% higher ( $p < 0.05$ ); HADS and BDI-II scale scores were lower by 35% ( $p < 0.05$ ) and 25% ( $p < 0.05$ ), respectively. The increase in MMSE scale scores in the intervention group was 54% higher ( $p < 0.001$ ), and MoCA scale scores increased by 25% ( $p < 0.001$ ). **Conclusion:** Respiratory training with hypercapnic hypoxia improves the functional state of the nervous system in patients with ischemic stroke. After conducting further clarifying studies, hypercapnic hypoxia can be considered as an effective method of neurorehabilitation, which can be used as early as 48-72 hours after the onset of stroke.

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