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Interventions and Management

1. Altered excitation-inhibition balance in the primary sensorimotor cortex to proprioceptive hand stimulation in cerebral palsy

Mia Illman, Julia Jaatela, Jaakko Vallinoja, Timo Nurmi, Helena Mäenpää, Harri Piitulainen

Clin Neurophysiol. 2023 Nov 14;157:25-36. doi: 10.1016/j.clinph.2023.10.016. Online ahead of print.

Objective: Our objective was to clarify the primary sensorimotor (SM1) cortex excitatory and inhibitory alterations in hemiplegic (HP) and diplegic (DP) cerebral palsy (CP) by quantifying SM1 cortex beta power suppression and rebound with magnetoencephalography (MEG). **Methods:** MEG was recorded from 16 HP and 12 DP adolescents, and their 32 healthy controls during proprioceptive stimulation of the index fingers evoked by a movement actuator. The related beta power changes were computed with Temporal Spectral Evolution (TSE). Peak strengths of beta suppression and rebound were determined from representative channels over the SM1 cortex. **Results:** Beta suppression was stronger contralateral to the stimulus and rebound was weaker ipsilateral to the stimulation in DP compared to controls. Beta modulation strengths did not differ significantly between HP and the control group. **Conclusions:** The emphasized beta suppression in DP suggests less efficient proprioceptive processing in the SM1 contralateral to the stimulation. Their weak rebound further indicates reduced intra- and/or interhemispheric cortical inhibition, which is a potential neuronal mechanism for their bilateral motor impairments. **Significance:** The excitation-inhibition balance of the SM1 cortex related to proprioception is impaired in diplegic CP. Therefore, the cortical and behavioral proprioceptive deficits should be better diagnosed and considered to better target individualized effective rehabilitation in CP.

PMID: [38039924](#)

2. Early Intensive Bimanual Stimulation Program (BB-Bim) for Infants at Risk of Unilateral Cerebral Palsy: A Randomized, Multiple-Baseline, Single-Case Study

Rachel Bard-Pondarré, Carole Vuillerot, Nahime Al-Abiad, Stéphane Verdun, Stéphane Chabrier, Emmanuelle Chaléat-Valayer

Am J Occup Ther. 2023 Nov 1;77(6):7706205070. doi: 10.5014/ajot.2023.050232.

Importance: Clinical practice guidelines for infants at high risk of cerebral palsy (CP) emphasize the importance of very early and intensive intervention. **Objective:** To determine the feasibility of a new, home-based, early intensive bimanual stimulation program (BB-Bim) and its impact on hand function in infants at risk of unilateral CP. **Design:** Single case experimental design, multiple baseline across subjects, lasting from 12 to 15 wk, including a 4- to 7-wk randomized baseline, followed by 8 wk of BB-Bim. **Setting:** Home. **Participants:** Infants (ages 3-12 mo) with suspected unilateral CP, whose parents agreed to participate in the stimulation program. **Intervention:** Parent-provided bimanual stimulation 20 min/day, 6×/wk, with weekly occupational therapist coaching visits. **Measures:** Weekly repeated measures were the Hand Assessment in Infants (HAI) and Goal Attainment Scaling (GAS). Feasibility and relevance were assessed with a logbook and a parental report, including 10 continuous 0-10 scaled questions. **Results:** Six infants were included (2 with left and 4 with right brain lesions). Parents provided a mean 3.4 to 6.2 stimulation sessions/wk. Feasibility and relevance were highly rated ($M_s = 8.2-9.6$, $SD_s = 0.2-1.3$).

Stimulation significantly improved HAI bimanual and total scores for all infants, with no impact on HAI unilateral scores. GAS scores improved with stimulation (significant for 3 infants). Conclusions and relevance: BB-Bim was feasible and tended to improve bimanual function in infants at risk of unilateral CP. What This Article Adds: Parent-provided daily bimanual stimulation at home is feasible when parents are coached weekly by an occupational therapist. Bimanual stimulation seems to improve functional interactions between the hands among infants at high risk of unilateral CP.

PMID: [38032289](#)

3. Baclofen pumps do not increase risk of complications following spinal fusion

Kenneth H Levy, Burt Yaszay, Mark F Abel, Suken A Shah, Amer F Samdani, Paul D Sponseller; HARMS Study Group

Spine Deform. 2023 Nov 25. doi: 10.1007/s43390-023-00786-8. Online ahead of print.

Purpose: To assess the complication risks associated with intrathecal baclofen (ITB) pumps in cerebral palsy (CP) patients undergoing posterior spinal fusion (PSF) and to determine if timing of pump implantation before or during PSF impacts the risk of complications. Methods: A prospectively collected multicenter database was retrospectively reviewed to identify CP patients undergoing PSF from 2008 to 2023. Patients were divided into 2 cohorts: those with an ITB pump (ITB cohort) and those without (non-ITB cohort). The ITB cohort was further categorized by placement of the pump prior to or during PSF. Cohorts were then compared in terms of postoperative complications, perioperative complications, and need for revision surgery. Results: Four hundred six patients (ITB n = 79 [53 prior to, 26 during PSF], non-ITB n = 326) were included in this analysis. At an average follow-up of 4.0 years (range 2-10 years), there were no significant differences between the ITB and non-ITB cohorts in the rate of perioperative complications (5.0% vs 6.5%, $p = 0.80$), revision surgeries (2.5% vs 4.6%, $p = 0.54$), or any complication type, regardless of whether pumps were placed prior to or during PSF, aside from longer surgical times in the latter group. Conclusion: Complication rates are similar for ITBs placed prior to and during PSF. Patients with spastic CP may safely be treated with ITB pumps without increased risks of complication or further reoperation/revision following PSF. Level of evidence: Level III.

PMID: [38006455](#)

4. Trunk postural reactions to the force perturbation intensity and frequency during sitting astride in children with cerebral palsy

Shijun Yan, Seoung Hoon Park, Weena Dee, Renee Keefer, Ana-Marie Rojas, William Zev Rymer, Ming Wu

Exp Brain Res. 2023 Nov 28. doi: 10.1007/s00221-023-06744-0. Online ahead of print.

The purpose of this study was to examine kinematic and neuromuscular responses of the head and body to pelvis perturbations with different intensities and frequencies during sitting astride in children with CP. Sixteen children with spastic CP (mean age 7.4 ± 2.4 years old) were recruited in this study. A custom designed cable-driven robotic horse was used to apply controlled force perturbations to the pelvis during sitting astride. Each participant was tested in four force intensity conditions (i.e., 10%, 15%, 20%, and 25% of body weight (BW), frequency = 1 Hz), and six force frequency conditions (i.e., 0.5 Hz, 1 Hz, 1.5 Hz, 2 Hz, 2.5 Hz, and 3 Hz, intensity = 20% of BW). Each testing session lasted for one minute with a one-minute rest break inserted between two sessions. Kinematic data of the head, trunk, and legs were recorded using wearable sensors, and EMG signals of neck, trunk, and leg muscles were recorded. Children with CP showed direction-specific trunk and neck muscle activity in response to the pelvis perturbations during sitting astride. Greater EMG activities of trunk and neck muscles were observed for the greater intensities of force perturbations ($P < .05$). Participants also showed enhanced activation of antagonistic muscles rather than direction-specific trunk and neck muscle activities for the conditions of higher frequency perturbations ($P < .05$). Children with CP may modulate trunk and neck muscle activities in response to greater changes in intensity of pelvis perturbation during sitting astride. Perturbations with too high frequency may be less effective in inducing direction-specific trunk and neck muscle activities.

PMID: [38015245](#)

5. Protocol for Electrical Conductivity Signal Collection and Processing in Scoliosis Surgery

Elie Saghbiny, Jimmy Da Silva, Celia Chaimi, Thibault Chandanson, Raphael Vialle

Adv Orthop. 2023 Nov 7:2023:9955520. doi: 10.1155/2023/9955520. eCollection 2023.

Introduction: Pedicle screw placement is a common procedure in spinal surgery. The misplacement rate with lateral and medial cortical perforation is 5-11%. Several techniques are used to decrease this rate. Many studies proved that electrical conductivity increases accuracy during pedicle screw placement but no study has interpreted conductivity values. Methods: The data are collected from patients operated for scoliosis in a single university hospital. After the posterior surgical approach is made, each pedicle is prepared classically. Instead of the classic curved pedicle probe, the surgeon uses a probe with the same shape that

measures the conductivity at its tip. Conductivity values are recorded through a Bluetooth application. Each pedicle trajectory is then qualified after manual palpation with a feeler. A trajectory is qualified as optimal when palpation shows a bone tunnel without any breach, breached when there was a breach, and a modification of the probe direction was needed. A trajectory that does not meet the abovementioned definitions is excluded from the statistical analysis. Results: 21 patients with 457 pedicles are recorded. The average age of the population is 14.71 ± 1.86 years. 17 patients (81%) have idiopathic adolescent scoliosis. One patient has Rett syndrome, one has hypotonia, one has cerebral palsy, and one has congenital malformation. The depth of the instrument is measured semiautomatically. This technique is validated when compared with the manual technique using the Bland-Altman agreement method (mean differences = -0.279 mm, upper limit = 2.2 mm, and lower limit = -2.7 mm) and Deming regression (slope = 1.06 ± 0.004). Conclusion: This study establishes a protocol to collect electrical conductivity signals in spine surgery with synchronization to the depth of the instrument. Real-time conductivity signal feedback alerts the surgeon of a probable breach in the spinal canal, so he can change the direction of the pedicle aim.

PMID: [38024482](#)

6. Beyond Words: Embracing Migration Percentage as the Universal Measurement for Hip Displacement in Children With Cerebral Palsy by Radiologists and Orthopedic Surgeons

Daniel Raftis, Sarah Dance, Laura Mazudie Ndjoko, Ahmed Elabd, Sean Tabaie

Cureus. 2023 Nov 14;15(11):e48786. doi: 10.7759/cureus.48786. eCollection 2023 Nov.

Introduction: Migration percentage (MP) is the standard radiographic measurement to quantify hip displacement in cerebral palsy (CP) hip surveillance programs. We aim to evaluate the use of MP and other descriptors of hip displacement in radiographic impressions by radiologists and orthopedic surgeons before and after the introduction of hip surveillance guidelines at our institution. Methods: CP patients who underwent hip surveillance imaging at our institution in 2016 were retrospectively identified, and their radiographic impressions were collected between 2016 and 2019. Only patients with radiology and orthopedic impressions for the same image were included. The inclusion of MP was documented and compared between the two groups before and after the hip guidelines were implemented in 2018. We also examined the use of other qualitative descriptors for hip displacement within the impressions. Fisher's Exact test was used for statistical significance ($p < 0.05$). Results: Two hundred and fifty-one radiographs were analyzed. One radiology (0.40%) and 33 orthopedic impressions (13.15%) incorporated MP ($p < 0.001$). No statistical significance was found between the inclusion of MP before and after 2018 in the radiology group. In contrast, the orthopedic group showed a significant increase in MP inclusion following guideline implementation, rising from 12 to 21 incidences ($p = 0.013$). Descriptors for hip displacement were more commonly utilized than MP for both orthopedic surgeons and radiologists. Conclusion: MP is underutilized in radiologic and orthopedic impressions in hip surveillance programs. Extensive education for both specialties regarding MP is crucial for the successful management of hip displacement in CP hip surveillance programs.

PMID: [38024039](#)

7. Ankle proprioception in children with cerebral palsy

Elizabeth Boyer, Qiyin Huang, Stacy Ngwesse, Jennifer Nelson, Jinseok Oh, Jürgen Konczak

J Pediatr Rehabil Med. 2023 Nov 23. doi: 10.3233/PRM-220140. Online ahead of print.

Purpose: There is no established clinical standard to evaluate ankle proprioception in children with cerebral palsy (CP). This study compared ankle position sense of children with CP to age-matched children who are typically developing (TD). Methods: Children aged 6-17 years participated (15 CP, 58 TD). Using a custom-built device, the ankle was passively rotated to two positions for 25 trials. Using a psychophysical forced-choice paradigm, participants indicated which position was more plantarflexed. A psychometric function was fitted to the response data to determine the just noticeable difference (JND) threshold and the associated uncertainty (random error) for ankle position sense. Results: Median JND thresholds for the CP group were elevated (CP: 4.3° , TD: 3.0°). Three children with CP exceeded the 95th percentile of TD. No differences in random error were found. Conclusion: This method assessed ankle proprioception relative to norm data and identified position sense impairments in children with CP. Using this method can provide data on proprioceptive status in CP, augmenting the assessment of motor impairment.

PMID: [38007680](#)

8. Crouch Gait in Cerebral Palsy: Current Concepts Review

Ritesh Arvind Pandey, Ashok N Johari, Triveni Shetty

Review Indian J Orthop. 2023 Sep 30;57(12):1913-1926. doi: 10.1007/s43465-023-01002-5. eCollection 2023 Dec.

Background and objective: Crouch gait is the most common pathological gait pattern in cerebral palsy and is commonly seen in patients with spastic diplegia. It is characterized by excessive knee flexion throughout the stance phase of gait cycle. The aim of this review is to discuss the current literature about CG for a more comprehensive understanding. **Methods:** A literature review about various aspects of crouch gait in cerebral palsy was undertaken. This included its etiology and pathophysiology, biomechanics in crouch gait, natural history of untreated crouch gait, clinical and radiological evaluation and different modalities of available treatment. **Results:** The etiology is multifactorial and the pathophysiology is poorly understood. This makes its management challenging, thereby leading to a variety of available treatment modalities. Inadvertent lengthening of muscle-tendon units is an important cause and can be avoided. A meticulous clinical and radiological evaluation of patients, supplemented by observational and instrumented gait analysis is mandatory in choosing correct treatment modality and improving the treatment outcome. Younger children can be managed satisfactorily by various non-operative methods and spasticity reduction measures. However, crouch gait in cerebral palsy has a progressive natural history and surgical interventions are needed frequently. The current literature supports combination of various soft tissue and bony procedures as a part of single event multilevel surgery. Growth modulation in the form of anterior distal femur hemiepiphyodesis for correction of fixed flexion deformity of knee has shown encouraging results and can be an alternative in younger children with sufficient growth remaining. **Conclusions:** In spite of extensive research in this field, the current understanding about crouch gait has many knowledge gaps. Further studies about the etiopathogenesis and biomechanics of crouch using instrumented gait analysis are suggested. Similarly, future research should focus on the long term outcomes of different treatment modalities through comparative trials.

PMID: [38009172](#)

9. Muscle coactivation during gait in children with and without cerebral palsy

P Ippersiel, C Dussault-Picard, S G Mohammadyari, G B De Carvalho, V D Chandran, S Pal, P C Dixon

Gait Posture. 2023 Nov 21;108:110-116. doi: 10.1016/j.gaitpost.2023.11.012. Online ahead of print.

Background: Children with Cerebral Palsy (CP) walk with an uncoordinated gait compared to Typically Developing (TD) children. This behavior may reflect greater muscle co-activation in the lower limb; however, findings are inconsistent, and the determinants of this construct are unclear. **Research objectives:** (i) Compare lower-limb muscle co-activation during gait in children with, and without CP, and (ii) determine the extent to which muscle co-activation is influenced by electromyography normalization procedures and Gross Motor Function Classification System (GMFCS) class. **Methods:** An electromyography system measured muscle activity in the rectus femoris, semitendinosus, gastrocnemius, and tibialis anterior muscles during walking in 46 children (19 CP, 27 TD). Muscle co-activation was calculated for the tibialis anterior-gastrocnemius (TA-G), rectus femoris-gastrocnemius (RF-G), and rectus femoris-semitendinosus (RF-S) pairings, both using root mean squared (RMS)-averaged and dynamically normalized data, during stance and swing. Mann-Whitney U and independent t-tests examined differences in muscle co-activation by group (CP vs. TD) and GMFCS class (CP only), while mean difference 95% bootstrapped confidence intervals compared electromyography normalization procedures. **Results:** Using dynamically normalized data, the CP group had greater muscle co-activation for the TA-G and RF-G pairs during stance ($p < 0.01$). Using RMS-averaged data, the CP group had greater muscle co-activation for TA-G (stance and swing, $p < 0.01$), RF-G (stance, $p < 0.05$), and RF-S (swing, $p < 0.01$) pairings. Muscle co-activation calculated with dynamically normalized, compared to RMS-averaged data, were larger in the RF-S and RF-G (stance) pairs, but smaller during swing (RF-G). Children with CP classified as GMFCS II had greater muscle co-activation during stance in the TA-G pair ($p < 0.05$). **Significance:** Greater muscle co-activation observed in children with CP during stance may reflect a less robust gait strategy. Although data normalization procedures influence muscle co-activation ratios, this behavior was observed independent of normalization technique.

PMID: [38029482](#)

10. Engaging the Lower Extremity via Active Therapy Early (ELEVATE) Is Feasible and May Improve Gross Motor Function in Children with Spastic Bilateral Cerebral Palsy: A Case Series [Abstract in English, French]

Caitlin L Hurd, Donna Livingstone, Allison Smith, Jaynie F Yang

Physiother Can. 2023 Nov 27;75(4):311-321. doi: 10.3138/ptc-2023-0005. eCollection 2023 Nov.

Purpose: The feasibility of ELEVATE with respect to adherence and preliminary efficacy was determined for children with spastic bilateral cerebral palsy (CP) from encephalopathy of prematurity. **Methods:** A case series was used. Participants were randomized to receive ELEVATE immediately or delay the intervention by 3 months before receiving the intervention. The outcomes included feasibility measures of (1) number of children recruited, (2) percentage of sessions attended, (3) stride counts during the intervention, and preliminary efficacy measures of change over the intervention period in (4) Gross Motor Function Measure-66 (GMFM-66), and (5) kinematics and weight-bearing during treadmill walking. **Results:** Four boys under 3 years of age participated. All participants tolerated 60-minute intervention sessions four times/week for 12 weeks, and attended 75%-94% (min-max) of the targeted sessions. The median step count per session ranged from 833 to 2484 steps (min-max) during the final week of training. Participants showed an increase in GMFM-66 score of 2.4-7.5 points (min-max) over the 3-month intervention phase, as compared to a decrease of 1.7 for one participant and an increase of 1.3 for another over the

delay period. Three participants demonstrated small improvements in their gait with the intervention. Conclusions: Engaging young children with bilateral CP in intensive rehabilitation targeting gross motor function was feasible and demonstrated preliminary efficacy. The results have guided the design of a larger clinical trial to assess efficacy of early, active interventions for children with spastic bilateral CP.

PMID: [38037582](#)

11. Agreement Between the Gross Motor Ability Estimator-2 and the Gross Motor Ability Estimator-3 in Young Children With Cerebral Palsy

Samuel R Pierce, Julie Skorup, Thubi H A Kolobe, Beth A Smith, Laura A Prosser

Pediatr Phys Ther. 2023 Nov 30. doi: 10.1097/PEP.0000000000001065. Online ahead of print.

Purpose: The purpose of this study was to determine the agreement between Gross Motor Ability Estimator-2 (GMAE-2) and Gross Motor Ability Estimator-3 (GMAE-3) calculations of Gross Motor Function Measure-66 (GMFM-66) scores in infants and young children with cerebral palsy. Methods: Data from 53 children 5 to 53 months of age were analyzed. Agreement between GMFM-66 scores using the GMAE-2 and the GMAE-3 was calculated using Bland-Altman plots and interclass correlation coefficients (ICCs). Eleven participants who had at least 1 GMFM-66 score of less than 25 using either method were identified for further analysis. Results: The average difference between GMFM-66 scores was 0.27 for all participants and 0.63 for the subset of lower-scoring participants. Good agreement was found for GMFM-66 scores for all participants (ICC = 0.998) and for subset of lower-scoring participants (ICC = 0.879). Conclusions: High levels of agreement exist between the GMAE-2 and the GMAE-3, which suggests that scores are comparable using either algorithm.

PMID: [38033276](#)

12. Age-Related Differences in Muscle Size and Strength between Individuals with Cerebral Palsy and Individuals with Typical Development

Mattie E Pontiff, Noelle G Moreau

Phys Occup Ther Pediatr. 2023 Nov 30:1-14. doi: 10.1080/01942638.2023.2287463. Online ahead of print.

Aim: Examine age-related differences in muscle size and strength of the knee extensors in individuals with cerebral palsy (CP) and individuals with typical development (TD). Methods: 54 individuals with CP (14.5 ± 4.5 years, GMFCS I-V) and 33 individuals with TD (16.2 ± 5.5 years) were included. Relationships between rectus femoris (RF) and vastus lateralis (VL) muscle volume and isokinetic knee extensor strength with age were examined with linear regression and ANCOVA to test age-related differences between groups. Results: Linear regression for muscle volume with age was statistically significant in TD (VL: $r_2 = 0.48$, RF: $r_2 = 0.56$, $p < .05$) and those with CP (VL: $r = 0.36$, RF: $r_2 = 0.27$, $p < .05$) with no differences in regression slopes between groups ($p > .05$). Age-related strength differences were observed in TD ($r_2 = 0.66$, $p < .001$) and those with CP ($r_2 = 0.096$, $p = .024$), but the slopes were significantly different between CP and TD ($p < .001$). Conclusion: Age-related linear differences in muscle volume and strength were observed in both groups. The linear slope of the age-related differences in knee extensor muscle strength and strength-to-body mass ratio were significantly lower in individuals with CP compared to individuals with TD, suggesting that strength is insufficient to keep up with gains in body mass during growth.

PMID: [38037369](#)

13. The increased risk of cerebral palsy associated with assisted reproductive technology is mainly attributable to multiple pregnancies

Stian Lydersen, Torstein Vik, Sandra Julsen Hollung; all authors

Acta Obstet Gynecol Scand. 2023 Nov 27. doi: 10.1111/aogs.14723. Online ahead of print.

No abstract available

PMID: [38009370](#)

14. [Current approaches to the use of robotic devices in rehabilitation complex of children with cerebral palsy] [Article in Russian] [Abstract in English, Russian]

T F Golubova, S V Vlasenko, I I Marusich, M D Otinov, F S Vlasenko, E A Osmanov

Vopr Kurortol Fizioter Lech Fiz Kult. 2023;100(5):36-44. doi: 10.17116/kurort202310005136.

Cerebral palsy is a neurological disease that is associated with multiple motor impairments and dysfunctions in children. The effective recovery of motor activity in both the upper and lower limbs is an important condition for the patient's social independence throughout his life. Robotic systems are new devices which are becoming increasingly popular as a part of the treatment of cerebral palsy. They have become a good addition to comprehensive rehabilitation therapy, including conducted at the sanatorium-resort stage. Further research is needed to clarify and prove the extent to which these devices help in treatment of children with cerebral palsy.

PMID: [38016055](#)

15. Feasibility and safety study of wearable cyborg Hybrid Assistive Limb for pediatric patients with cerebral palsy and spinal cord disorders

Kazushi Takahashi, Masafumi Mizukami, Hiroki Watanabe, Mayumi Matsuda Kuroda, Yukiyo Shimizu, Takashi Nakajima, Hirotaka Mutsuzaki, Hiroshi Kamada, Kayo Tokeji, Yasushi Hada, Kazunori Koseki, Kenichi Yoshikawa, Tomohiro Nakayama, Nobuaki Iwasaki, Hiroaki Kawamoto, Yoshiyuki Sankai, Masashi Yamazaki, Akira Matsumura, Aiki Marushima

Front Neurol. 2023 Nov 3;14:1255620. doi: 10.3389/fneur.2023.1255620. eCollection 2023.

Introduction: The wearable cyborg Hybrid Assistive Limb (HAL) is the world's first cyborg-type wearable robotic device, and it assists the user's voluntary movements and facilitates muscle activities. However, since the minimum height required for using the HAL is 150 cm, a smaller HAL (2S size) has been newly developed for pediatric use. This study aimed to (1) examine the feasibility and safety of a protocol for treatments with HAL (2S size) in pediatric patients and (2) explore the optimal method for assessing the efficacy of HAL. **Methods:** This clinical study included seven pediatric patients with postural and motor function disorders, who received 8-12 sessions of smaller HAL (2S size) treatment. The primary outcome was the Gross Motor Function Measure-88 (GMFM-88). The secondary outcomes were GMFM-66, 10-m walk test, 2- and 6-min walking distances, Canadian Occupational Performance Measure (COPM), a post-treatment questionnaire, adverse events, and device failures. Statistical analyses were performed using the paired samples t-test or Wilcoxon signed-rank test. **Results:** All participants completed the study protocol with no serious adverse events. GMFM-88 improved from 65.51 ± 21.97 to 66.72 ± 22.28 ($p = 0.07$). The improvements in the secondary outcomes were as follows: GMFM-66, 53.63 ± 11.94 to 54.96 ± 12.31 , $p = 0.04$; step length, 0.32 ± 0.16 to 0.34 ± 0.16 , $p = 0.25$; 2-MWD, 59.1 ± 57.0 to 62.8 ± 63.3 , $p = 0.54$; COPM performance score, 3.7 ± 2.0 to 5.3 ± 1.9 , $p = 0.06$; COPM satisfaction score, 3.3 ± 2.1 to 5.1 ± 2.1 , $p = 0.04$. **Discussion:** In this exploratory study, we applied a new size of wearable cyborg HAL (2S size), to children with central nervous system disorders. We evaluated its safety, feasibility, and identified an optimal assessment method for multiple treatments. All participants completed the protocol with no serious adverse events. This study suggested that the GMFM would be an optimal assessment tool for validation trials of HAL (2S size) treatment in pediatric patients with posture and motor function disorders.

PMID: [38020664](#)

16. A wearable system to assist impaired-neck patients: Design and evaluation

Ali Ghasemi, Majid Sadedel, Majid Mohammadi Moghaddam

Proc Inst Mech Eng H. 2023 Nov 29;9544119231211362. doi: 10.1177/09544119231211362. Online ahead of print.

Patients with neurological disorders, such as amyotrophic lateral sclerosis, Parkinson's disease, and cerebral palsy, often face challenges due to head-neck immobility. The conventional treatment approach involves using a neck collar to maintain an upright head position, but this can be cumbersome and restricts head-neck movements over prolonged periods. This study introduces a wearable robot capable of providing three anatomical head motions for training and assistance. The primary contributions of this research include the design of an optimized structure and the incorporation of human-robot interaction. Based on human head motion data, our primary focus centered on developing a robot capable of accommodating a significant range of neutral head movements. To ensure safety, impedance control was employed to facilitate human-robot interaction. A human study was conducted involving 10 healthy subjects who participated in an experiment to assess the robot's assistance capabilities. Passive and active modes were used to evaluate the robot's effectiveness, taking into account head-neck movement error and muscle activity levels. Surface electromyography signals (sEMG) were collected from the splenius capitis muscles during the experiment. The results demonstrated that the robot covered nearly 85% of the overall range of head rotations. Importantly, using the robot during rehabilitation led to reduced muscle activation, highlighting its potential for assisting individuals with post-stroke movement impairments.

PMID: [38031465](#)

17. Decoding motor plans using a closed-loop ultrasonic brain-machine interface

Whitney S Griggs, Sumner L Norman, Thomas Deffieux, Florian Segura, Bruno-Félix Osmanski, Geeling Chau, Vasileios

Christopoulos, Charles Liu, Mickael Tanter, Mikhail G Shapiro, Richard A Andersen
Nat Neurosci. 2023 Nov 30. doi: 10.1038/s41593-023-01500-7. Online ahead of print.

Brain-machine interfaces (BMIs) enable people living with chronic paralysis to control computers, robots and more with nothing but thought. Existing BMIs have trade-offs across invasiveness, performance, spatial coverage and spatiotemporal resolution. Functional ultrasound (fUS) neuroimaging is an emerging technology that balances these attributes and may complement existing BMI recording technologies. In this study, we use fUS to demonstrate a successful implementation of a closed-loop ultrasonic BMI. We streamed fUS data from the posterior parietal cortex of two rhesus macaque monkeys while they performed eye and hand movements. After training, the monkeys controlled up to eight movement directions using the BMI. We also developed a method for pretraining the BMI using data from previous sessions. This enabled immediate control on subsequent days, even those that occurred months apart, without requiring extensive recalibration. These findings establish the feasibility of ultrasonic BMIs, paving the way for a new class of less-invasive (epidural) interfaces that generalize across extended time periods and promise to restore function to people with neurological impairments.

PMID: [38036744](#)

18. The Danish child and parent Gait Outcomes Assessment List questionnaires were reliable and valid for cerebral palsy

Kirsten Nordbye-Nielsen, Thomas Maribo, Ole Rahbek, Unni Narayanan, Bjarne Møller-Madsen

Acta Paediatr. 2023 Nov 27. doi: 10.1111/apa.17046. Online ahead of print.

Aim: We investigated the reliability and validity of the Danish child and parent versions of the Gait Outcomes Assessment List (GOAL) questionnaires for ambulatory children with cerebral palsy (CP). **Methods:** Translation and cultural adaptations were performed and content validity evaluated. Participants were enrolled between 2016 and 2018 from Aarhus University Hospital, Denmark. Children and parents completed the GOAL questionnaires twice for test-retest reliability. Discriminative validity was evaluated by comparing the child and parent GOAL scores between children with Gross Motor Function Classification System (GMFCS) levels I and II. The concurrent validity of the GOAL questionnaires were investigated by comparing them with Challenge-20, which assesses motor skills in children with CP. **Results:** We studied 59 children (57% boys) with CP and GMFCS I-II at a mean age of 10.6 years. Test-retest intra-class correlations were excellent for the children (0.91, 95% confidence interval (CI) 0.83-0.96) and good for the parents (0.83, 95% CI 0.67-0.91). GOAL scores decreased with increasing GMFCS ($p < 0.05$). Both versions correlated well. The mean children's scores were significantly (6.2/100) higher than the parents' ($p < 0.001$). The GOAL scores correlated positively with Challenge-20. **Conclusion:** The Danish GOAL child and parent questionnaires demonstrated good reliability and content and discriminative and concurrent validity.

PMID: [38009533](#)

19. Preferred Communication Strategies for People with Communication Disabilities in Health Care Encounters: a Qualitative Study

Erin Hickey, Bernice Man, Kaila V T Helm, Steven Lockhart, Jennifer Duffecy, Megan A Morris

J Gen Intern Med. 2023 Nov 27. doi: 10.1007/s11606-023-08526-4. Online ahead of print.

Background: People with communication disabilities (CDs), which includes disabilities in speech, language, voice and/or hearing, experience health and healthcare disparities. A barrier to accessing high-quality, equitable care is the lack of effective communication between patients and their providers. **Objective:** In designing a patient-prompted tool to facilitate communication, we analyzed qualitative feedback on communication strategies and the experience of people with CDs, caregivers, and providers in healthcare encounters. We aimed to describe communication strategies that patients with CDs find most useful and optimize a tool for patients to share their communication strategy preferences during clinical encounters. While patient-provider communication is paramount in every interaction, we aimed to highlight the intricacies of optimizing communication for this population. **Design:** We performed a qualitative study utilizing focus groups and interviews with patients with CDs, their caregivers, and healthcare providers. **Participants:** A total of 46 individuals participated in focus groups or interviews; 26 participants self-reported a CD, nine were caregivers, and 11 were providers. Participants represented diverse types of CDs, including stuttering, aphasia, hearing loss, and people with autism or cerebral palsy who use assistive technology to communicate. **Approach:** Analysis of qualitative interview and focus group data was guided by a qualitative content analysis approach. **Key results:** We identified three themes: (1) While communication strategies should be individualized, participants agreed upon a consolidated list of best strategies and accommodations. We used this consolidated list to finalize tool development. (2) Patients and providers preferred disclosure of the CD and desired communication strategies before the appointment. (3) Providers often do not use communication strategies and accommodations during clinical encounters. **Conclusions:** For patients with CDs, it is critical to acknowledge and document the CD and individualize communication strategies during healthcare visits to facilitate communication. Studies are needed to evaluate whether improved communication strategy usage leads to improved health outcomes for this population.

PMID: [38010462](#)

20. Parental acceptance of silver fluoride as a treatment option for carious lesions among South African children with special health care needs

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Front Oral Health. 2023 Nov 16;4:1294227. doi: 10.3389/froh.2023.1294227. eCollection 2023.

Providing dental care for children with neurological special health care needs, including Down syndrome, Cerebral palsy and Autism spectrum disorders, is challenging. They often require repeat exposure to sedation or general anaesthesia for routine dental care. 51 parents of children with special needs completed a questionnaire regarding the acceptance of Silver Fluoride as a treatment option. Background: Silver Diamine Fluoride has become popular as a minimally invasive treatment option for providing oral health care to young or uncooperative children. Silver Fluoride (SF) is a newer development with similar but improved properties. The aim was to determine the acceptance of SDF/SF as treatment option for Children with Special Health Care Needs (CSHCN), including Down Syndrome, Autism Spectrum Disorder and Cerebral Palsy. Methods: 51 Parents of CSHCN completed a questionnaire on the overall acceptance of SF; aesthetic concerns related to the location of application; the use of SDF as an alternative to general anaesthesia; and the composition of SF. Results: The use of SF on posterior teeth were more acceptable (70.59%) as opposed to its application to anterior teeth (50.98%). Parents generally agreed/ strongly agreed to the use of SF to reduce infection and pain (82%); to avoid treatment under GA (26.70%); and to avoid an injection (78%). 64% of parents indicated their agreement in using SF because it has a reduced cost when compared to a conventional restoration. Majority of parents were in agreement to use SF even if it contains Fluoride (84%) and Silver (78%). Conclusion: The use of SF, as treatment option for caries, was well accepted by South African parents of CSHCN. Shared decision making should be applied when considering SF as treatment option for CSHCN.

PMID: [38033463](#)

21. A comparison of cohorts of children with cerebral palsy from a population register and hospital admission data: A data linkage study

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Paediatr Perinat Epidemiol. 2023 Nov 30. doi: 10.1111/ppe.13024. Online ahead of print.

Background: Administrative health data, such as hospital admission data, are often used in research to identify children/young people with cerebral palsy (CP). Objectives: To compare sociodemographic, clinical details and mortality of children/young people identified as having CP in either a CP population registry or hospital admission data. Methods: We identified two cohorts of children/young people (birth years 2001-2010, age at study end or death 2 months to 19 years 6 months) with a diagnosis of CP from either (i) the New South Wales (NSW)/Australian Capital Territory (ACT) CP Register or (ii) NSW hospital admission data (2001-2020). Using record linkage, these data sources were linked to each other and NSW Death, Perinatal, and Disability datasets. We determined the sensitivity and positive predictive value (PPV) of CP diagnosis in hospital admission data compared with the NSW/ACT CP Register (gold standard). We then compared the sociodemographic and clinical characteristics and mortality of the two cohorts available through record linkage using standardised mean difference (SMD). Results: There were 1598 children/young people with CP in the NSW/ACT CP Register and 732-2439 children/young people with CP in hospital admission data, depending on the case definition used. The sensitivity of hospital admission data for diagnosis of CP ranged from 0.40-0.74 and PPV 0.47-0.73. Compared with children/young people with CP identified in the NSW/ACT CP Register, a greater proportion of those identified in hospital admission data (one or more admissions with G80 case definition) were older, lived in major cities, had comorbidities including epilepsy, gastrostomy use, intellectual disability and autism, and died during the study period (SMD > 0.1). Conclusions: Sociodemographic and clinical characteristics differ between cohorts of children/young people with CP identified using a CP register or hospital admission data. Those identified in hospital admission data have higher rates of comorbidities and death, suggesting some may have progressive conditions and not CP. These differences should be considered when planning and interpreting research using various data sources.

PMID: [38035765](#)

22. Prediction of movement difficulties at 5 years from parent report at 2 years in children born extremely preterm

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Dev Med Child Neurol. 2023 Sep;65(9):1215-1225. doi: 10.1111/dmcn.15518. Epub 2023 Feb 22.

Aim: To assess the predictive validity of parent-reported gross motor impairment (GMI) at age 2 years to detect significant movement difficulties at age 5 years in children born extremely preterm. Method: Data were from 556 children (270 males, 286

females) born at less than 28 weeks' gestation in 2011 to 2012 in 10 European countries. Parent report of moderate/severe GMI was defined as walking unsteadily or unable to walk unassisted at 2 years corrected age. Examiners assessed significant movement difficulties (score \leq 5th centile on the Movement Assessment Battery for Children, Second Edition) and diagnoses of cerebral palsy (CP) were collected by parent report at 5 years chronological age. Results: At 2 years, 66 (11.9%) children had moderate/severe GMI. At 5 years, 212 (38.1%) had significant movement difficulties. Parent reports of GMI at age 2 years accurately classified CP at age 5 years in 91.0% to 93.2% of children. Classification of moderate/severe GMI at age 2 years had high specificity (96.2%; 95% confidence interval 93.6-98.0) and positive predictive value (80.3%; 68.7-89.1) for significant movement difficulties at age 5 years. However, 74.5% of children with significant movement difficulties at 5 years were not identified with moderate/severe GMI at age 2 years, resulting in low sensitivity (25.1%; 19.4-31.5). Interpretation: This questionnaire may be used to identify children born extremely preterm who at age 2 years have a diagnosis of CP or movement difficulties that are likely to have a significant impact on their functional outcomes at age 5 years.

PMID: [38038478](#)

23. Assessment Scales in Cerebral Palsy: A Comprehensive Review of Tools and Applications

Chaitanya Kumar Javvaji, Jayant D Vagha, Revat J Meshram, Amar Taksande

Review Cureus. 2023 Oct 30;15(10):e47939. doi: 10.7759/cureus.47939. eCollection 2023 Oct.

Cerebral palsy (CP) is a complex neurological condition characterized by motor dysfunction affecting millions worldwide. This comprehensive review delves into the critical role of assessment in managing CP. Beginning with exploring its definition and background, we elucidate the diverse objectives of CP assessment, ranging from diagnosis and goal setting to research and epidemiology. We examine standard assessment scales and tools, discuss the challenges inherent in CP assessment, and highlight emerging trends, including integrating technology, personalized medicine, and neuroimaging. The applications of CP assessment in clinical diagnosis, treatment planning, research, and education are underscored. Recommendations for the future encompass standardization, interdisciplinary collaboration, research priorities, and professional training. In conclusion, we emphasize the importance of assessment as a compass guiding the care of individuals with CP, issuing a call to action for improved assessment practices to shape a brighter future for those affected by this condition.

PMID: [38034189](#)

24. Association between bronchopulmonary dysplasia and death or neurodevelopmental impairment at 3 years in preterm infants without severe brain injury

Wenli Li, Yong Wang, Juan Song, Chen Zhang, Yiran Xu, Falin Xu, Xiaoyang Wang, Changlian Zhu

Front Neurol. 2023 Nov 15;14:1292372. doi: 10.3389/fneur.2023.1292372. eCollection 2023.

Objective: We investigated the association between bronchopulmonary dysplasia (BPD) and 3 years death or neurodevelopmental impairment (NDI) in very preterm infants without severe brain injury. Method: Our prospective cohort study recruited preterm infants who were born prior to 32 weeks of gestational age and survived in the neonatal intensive care unit until 36 weeks of corrected age. Upon reaching 3 years of age, each infant was assessed for death or NDI such as cerebral palsy, cognitive deficit, hearing loss, and blindness. Correlations between BPD and death or NDI were determined using multiple logistic regression analyses adjusted for confounding factors. Result: A total of 1,417 infants without severe brain injury who survived until 36 weeks of corrected age were initially enrolled in the study. Over the study period, 201 infants were lost to follow-up and 5 infants were excluded. Our final dataset, therefore, included 1,211 infants, of which 17 died after 36 weeks of corrected age and 1,194 were followed up to 3 years of age. Among these infants, 337 (27.8%) developed BPD. Interestingly, by 3 years of age, BPD was demonstrated to be independently associated with death or NDI, with an adjusted odds ratio of 1.935 (95% confidence interval: 1.292-2.899, $p = 0.001$), in preterm infants without severe neonatal brain injury. Conclusion: Our findings indicate that BPD is strongly associated with death or NDI in preterm infants without severe neonatal brain injury at 3 years of age. Further research is needed to understand the mechanisms linking the development of BPD with death or NDI and whether appropriate treatment of BPD may ameliorate or prevent the development of neurological complications.

PMID: [38033771](#)

25. Early heart rate variability changes during acute fetal inflammatory response syndrome: An experimental study in a fetal sheep model

Geoffroy Chevalier, Charles Garabedian, Jean David Pekar, Anne Wojtanowski, Delphine Le Hesran, Louis Edouard Galan, Dyuti Sharma, Laurent Storme, Veronique Houfflin-Debarge, Julien De Jonckheere, Louise Ghesquière

PLoS One. 2023 Nov 30;18(11):e0293926. doi: 10.1371/journal.pone.0293926. eCollection 2023.

Introduction: Fetal infection during labor with fetal inflammatory response syndrome (FIRS) is associated with neurodevelopmental disabilities, cerebral palsy, neonatal sepsis, and mortality. Current methods to diagnose FIRS are inadequate. Thus, the study aim was to explore whether fetal heart rate variability (HRV) analysis can be used to detect FIRS. **Material and methods:** In chronically instrumented near-term fetal sheep, lipopolysaccharide (LPS) was injected intravenously to model FIRS. A control group received saline solution injection. Hemodynamic, blood gas analysis, interleukin-6 (IL-6), and 14 HRV indices were recorded for 6 h. In both groups, comparisons were made between the stability phase and the 6 h following injection (H1-H6, respectively) and between LPS and control groups. **Results:** Fifteen lambs were instrumented. In the LPS group (n = 8), IL-6 increased significantly after LPS injection ($p < 0.001$), confirming the FIRS model. Fetal heart rate increased significantly after H5 ($p < 0.01$). In our FIRS model without shock or cardiovascular decompensation, five HRV measures changed significantly after H2 until H4 in comparison to baseline. Moreover, significant differences between LPS and control groups were observed in HRV measures between H2 and H4. These changes appear to be mediated by an increase of global variability and a loss of signal complexity. **Conclusion:** As significant HRV changes were detected before FHR increase, these indices may be valuable for early detection of acute FIRS.

PMID: [38032884](#)

26. Neonatal hypoxic-ischemic encephalopathy after acute carbon monoxide intoxication during pregnancy. A case report and brief review of the literature

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Case Reports Front Pediatr. 2023 Nov 3;11:1264855. doi: 10.3389/fped.2023.1264855. eCollection 2023.

Carbon monoxide (CO) poisoning during pregnancy is a rare occurrence, associated with high maternal and fetal mortality rates. As CO can cross the placenta, leading to intrauterine hypoxia, CO intoxication can result in neurological sequelae and neurologic complications in fetuses who survive. We report a case of a preterm newborn acutely exposed to CO in-utero and delivered by emergent cesarean section at the 31st week of gestation due to the severe burns suffered by the mother following an indoor boiler explosion. As CO has serious adverse effects both on the mother and fetus, it is important to recognize and treat poisoning in a timely manner. Despite maternal blood CO levels, CO intoxication at critical stage of central nervous system development can lead to hypoxic-ischemic lesions, thus interdisciplinary care and follow up for these patients are mandatory.

PMID: [38027275](#)

27. Pseudomonas aeruginosa in children with cerebral palsy: a prospective study

Katrien Romaen, Isabelle Van Ussel, Carolin Van Rossem, Sandra Kenis, Bertien Ceulemans, Kim Van Hoorenbeeck, Stijn Verhulst

Front Pediatr. 2023 Nov 6;11:1267345. doi: 10.3389/fped.2023.1267345. eCollection 2023.

Introduction: Children with cerebral palsy (CP) often present with chronic respiratory symptoms. *Pseudomonas aeruginosa* (PA), is a known pathogen associated with more severe respiratory disease. Preventive actions to eradicate this bacterium and to improve the respiratory condition of children with CP could be very valuable. Therefore, we assessed the prevalence of PA and its association with respiratory disease. **Methods:** Throat swabs were taken in children with CP, aged 0-18 years. Data from patient records were extracted from the electronic medical records. Follow-up of respiratory symptoms was done by the Liverpool respiratory symptom questionnaire (LRSQ) after 3 months. **Results:** A throat swab and a completed LRSQ after 3 months were received from 79 children with CP. Twenty-eight patients (35.4%) were found to have at least one positive respiratory culture. Only 4 patients (5.1%) were contaminated with PA. Gram negative bacteria were isolated in 21.5% of the positive throat swabs, *S. aureus* was found in 13.9%. Most pathogens were found in patients with higher GMFCS score (GMFCS IV and V). Results of the LRSQ showed that 52.1% of these patients reported having 1 cold in the past 3 months. **Discussion:** The prevalence of PA in our population of children with CP is low, gram-negative bacteria were most commonly found. The respiratory consequences of being colonized with these bacteria were limited. These results may have been affected by the COVID-19 pandemic. Further research is recommended.

PMID: [38027271](#)

28. Neurodevelopmental Outcomes in Preterm Babies: A 12-Month Observational Study

Shresth Jain, Putun Patel, Nimisha Pandya, Dhruva Dave, Trupti Deshpande

Cureus. 2023 Oct 27;15(10):e47775. doi: 10.7759/cureus.47775. eCollection 2023 Oct.

Background Preterm births are a significant concern worldwide due to their association with both short- and long-term morbidity. Modern neonatal intensive care techniques have improved the survival of infants born at the brink of viability. However, there remain significant challenges concerning their neurodevelopment. A considerable proportion of very low birth weight infants exhibit significant motor deficits such as cerebral palsy or cognitive, behavioral, or attention disabilities. The consequences of these impairments, particularly given their life-long nature, can be severe for the affected individuals, families, and public health resources. Consequently, timely neurodevelopmental assessment is critical in recognizing delayed development and selecting infants for neurodevelopmental stimulation. This study aimed to estimate the neurodevelopment of preterm infants, identify influencing factors, detect at-risk groups, and refer/recommend early intervention when developmental delays are observed. Methodology This prospective, observational, hospital-based study done in the department of pediatrics, Gujarat Medical Education and Research Society (GMERS) Medical College and Hospital, Gotri, Vadodara, Gujrat, India included inborn and outborn preterm neonates admitted to the Neonatal Intensive Care Unit (NICU) or the Sick Newborn Care Unit from their first day of life. The study period was from October 2020 to January 2021, and only neonates with an uncomplicated clinical course were included. Newborns were enrolled in a high-risk clinic, and follow-up appointments were scheduled at three, six, nine, and 12 months of corrected gestational age (CGA). We used the Baroda Developmental Screening Tool (BDST) to calculate the developmental quotient (DQ) at each appointment. This assessment involved parental interviews, observation of developmental milestones, and simple test demonstrations. The gathered DQ data at different ages were analyzed and compared across groups. Results Of 100 preterms enrolled, 62 preterms were followed up until 12 months of CGA. Thirteen patients out of the 62 (approximately one-fifth) preterm neonates exhibited developmental delays at one year of CGA, most of whom were early preterm infants. Twenty-six patients (approximately two-fifths) were delayed at three months of CGA, and thus 13 patients (half) showed catch-up growth and development. There was no statistically significant difference between the neurodevelopment of female and male infants. However, infants born to mothers with better socioeconomic status and higher education showed improved neurodevelopment. Conclusions Our study findings suggest that preterm infants discharged from the NICU exhibit poor neurodevelopmental outcomes, especially those born early preterm. This pattern indicates an inverse relationship between neurodevelopmental delay and the maturity of the neonate. Maternal education and socioeconomic status positively impacted the neurodevelopment of preterm NICU graduates. Thus, regular follow-up (at least once every three months), early detection by a screening scale like the BDST and intervention significantly improved neurodevelopmental outcomes.

PMID: [38022026](#)

29. Morphological and functional cardiac alterations in children with congenital Zika syndrome and severe neurological deficits

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PLoS Negl Trop Dis. 2023 Nov 29;17(11):e0011762. doi: 10.1371/journal.pntd.0011762. Online ahead of print.

Introduction: Zika virus infection during pregnancy causes fetal microcephaly and brain damage. Congenital Zika syndrome (CZS) is characterized by systemic involvement with diffuse muscle impairment, a high frequency of arthrogryposis, and microphthalmia. Cardiac impairment in CZS has rarely been evaluated. Our study assessed morphology and biventricular cardiac function in children with CZS and advanced neurological dysfunction. Methods: This cross-sectional study was conducted on 52 children with CZS (Zika group; ZG) and 25 healthy children (control group; CG) in Paraíba, Brazil. Clinical evaluation, electrocardiogram (EKG), and transthoracic echocardiogram (TTE) were performed on all children. Additionally, troponin I and natriuretic peptide type B (BNP) levels, the degree of cerebral palsy, and neuroimaging findings were assessed in the ZG group. Results: The median age of the study population was 5 years in both groups, and 40.4% (ZG) and 60% (CG) were female. The most prevalent electrocardiographic alteration was sinus arrhythmia in both the ZG (n = 9, 17.3%) and CG (n = 4, 16%). The morphological parameters adjusted for Z score were as follows: left ventricular (LV) end-diastolic diameter in ZG: -2.36 [-5.10, 2.63] vs. CG: -1.07 [-3.43, 0.61], $p < 0.001$); ascending aorta (ZG: -0.09 [-2.08, 1.60] vs. CG: 0.43 [-1.47, 2.2], $p = 0.021$); basal diameter of the right ventricle (RV) (ZG: -2.34 [-4.90, 0.97] vs. CG: -0.96 [-2.21, 0.40], $p < 0.01$); and pulmonary artery dimension (ZG: -2.13 [-5.99, 0.98] vs. CG: -0.24 [-2.53, 0.59], $p < 0.01$). The ejection fractions (%) were 65.7 and 65.6 in the ZG and CG, respectively ($p = 0.968$). The left atrium volume indices (mL/m²) in the ZG and CG were 13.15 [6.80, 18.00] and 18.80 [5.90, 25.30] ($p < 0.01$), respectively, and the right atrium volume indices (mL/m²) were 10.10 [4.90, 15.30] and 15.80 [4.10, 24.80] ($p < 0.01$). The functional findings adjusted for Z score were as follows: lateral systolic excursion of the mitral annular plane (MAPSE) (ZG: 0.36 [-2.79, 4.71] vs. CG: 1.79 [-0.93, 4.5], $p = 0.001$); tricuspid annular plane systolic excursion (TAPSE) (ZG: -2.43 [-5.47, 5.09] vs. CG: 0.07 [-1.98, 3.64], $p < 0.001$); and the S' of the RV (ZG: 1.20 [3.35, 2.90] vs. CG: -0.20 [-2.15, 1.50], $p = 0.0121$). No differences in biventricular strain measurements were observed between the groups. Troponin I and BNP levels were normal in the ZG. Grade V cerebral palsy and subcortical calcification were found in 88.6% and 97.22% of children in the ZG group, respectively. Conclusion: A reduction in cardiac dimensions and functional changes were found in CZS patients, based on the TAPSE, S' of the RV, and MAPSE, suggesting the importance of cardiac evaluation and follow-up in this group of patients.

PMID: [38019886](#)

30. The relation between neuroimaging and visual impairment in children and adolescents with cerebral palsy: A systematic review

Monica Crotti, Sarah Genoe, Nofar Ben Itzhak, Lisa Mailleux, Els Ortibus

Review Brain Dev. 2023 Nov 27:S0387-7604(23)00172-9. doi: 10.1016/j.braindev.2023.11.002. Online ahead of print.

Objective: The structure-function relation between magnetic resonance imaging (MRI) and visual impairment (VI) in children with cerebral palsy (CP) has not been fully unravelled. The present systematic review aims to summarize the relation between brain lesions on MRI and VI in children and adolescents with CP. Methods: PubMed, Embase, Web of Science Core Collection, and Cochrane Database were systematically searched according to the PRISMA checklist. A total of 45 articles met the inclusion criteria. Results: White matter lesions were most frequently associated with VI. Only 25 studies described lesions within specific structures, mainly in the optic radiations. Only four studies reported on the thalamus. 8.4% of children with CP showed no brain abnormalities on MRI. Diffusion-weighted MRI studies showed that decreased structural connectivity in the optic radiations, superior longitudinal fasciculus, posterior limb of the internal capsule, and occipital lobe is associated with more severe VI. Conclusions: All types of brain lesions lead to visual dysfunctions, arguing for a comprehensive visual assessment in all children with CP. Whereas white matter damage is a well-known contributor, the exact contribution of specific visual structures requires further investigation, to enable early prediction, detection, and intervention.

PMID: [38016876](#)

31. Periosteal Turnover Flap for Coverage and Salvage of Exposed Deep Brain Stimulation Device

Semih Baghaki, Can E Yalcin, Leo C Mazlum

Case Reports J Craniofac Surg. 2023 Nov-Dec;34(8):e794-e796. doi: 10.1097/SCS.0000000000009683. Epub 2023 Aug 25.

Implanted deep brain stimulation (DBS) devices are crucial in the treatment of movement disorders. Hardware extrusion is among the most frequent complications of the implantation process and requires reconstruction with well-vascularized tissues. The authors present a case of periosteal turnover flap for coverage of an exposed DBS device. An 11-year-old female patient with spastic cerebral palsy presented with an exposed DBS device located in the right parietal area. The exposed device was covered by a proximally based periosteal flap. Postoperative evaluations at months 1, 2, 3, and 8 revealed no signs of infection or dehiscence. This brief clinical study shows that reconstruction with periosteal turnover flaps is both an easy and excellent choice for secondary closure of exposed DBS devices.

PMID: [38011272](#)

32. 'Focal Seizures in Dystonic Cerebral Palsy (DCP): Rare or common or both?

Jean-Pierre Lin

Editorial Eur J Paediatr Neurol. 2023 Nov 22:S1090-3798(23)00172-1. doi: 10.1016/j.ejpn.2023.11.010. Online ahead of print.

No abstract available

PMID: [38007305](#)

33. Functional connectivity of sensorimotor network is enhanced in spastic diplegic cerebral palsy: A multimodal study using fMRI and MEG

Jaakko Vallinoja, Timo Nurmi, Julia Jaatela, Vincent Wens, Mathieu Bourguignon, Helena Mäenpää, Harri Piitulainen

Clin Neurophysiol. 2023 Nov 7:157:4-14. doi: 10.1016/j.clinph.2023.10.014. Online ahead of print.

Objective: To assess the effects to functional connectivity (FC) caused by lesions related to spastic diplegic cerebral palsy (CP) in children and adolescents using multiple imaging modalities. Methods: We used resting state magnetoencephalography (MEG) envelope signals in alpha, beta and gamma ranges and resting state functional magnetic resonance imaging (fMRI) signals to quantify FC between selected sensorimotor regions of interest (ROIs) in 11 adolescents with spastic diplegic cerebral palsy and 24 typically developing controls. Motor performance of the hands was quantified with gross motor, fine motor and kinesthesia tests. Results: In fMRI, participants with CP showed enhanced FC within posterior parietal regions; in MEG, they showed enhanced interhemispheric FC between sensorimotor regions and posterior parietal regions both in alpha and lower beta bands. There was a correlation between the kinesthesia score and fronto-parietal connectivity in the control population.

Conclusions: CP is associated with enhanced FC in sensorimotor network. This difference is not correlated with hand coordination performance. The effect of the lesion is likely not fully captured by temporal correlation of ROI signals. Significance: Brain lesions can show as increased temporal correlation of activity between remote brain areas. We suggest this effect is likely separate from typical physiological correlates of functional connectivity.

PMID: [38006621](#)

34. Parent ratings of children's daily functioning in a mixed clinical sample

Jacobus Donders, Jonah Reibsome, Kate Wilson

Appl Neuropsychol Child. 2023 Nov 25:1-8. doi: 10.1080/21622965.2023.2284812. Online ahead of print.

Parent questionnaires pertaining to executive and emotional/behavioral functioning are routinely included in neuropsychological evaluations to complement face-to-face cognitive tests. We evaluated in a clinical sample of 198 6-16 year-old children the degree of overlap and divergence between two common parent rating scales: the Behavior Assessment System for Children-Third Edition (BASC-3) and the Behavior Rating Inventory of Executive Function-Second Edition (BRIEF-2). This sample was 66% male, 70% white, and included both neurological diagnoses (e.g., 33% traumatic brain injury, 12% cerebral palsy) and neurodevelopmental ones (e.g., 10% attention-deficit/hyperactivity disorder). Inter-correlations between composite indices from the respective instruments were moderate (.41-.77). They disagreed about the presence or absence of impairment in 26% of the cases. Cluster analysis revealed four subtypes: Cluster 1 had mild externalizing and executive concerns, Cluster 2 had global emotional/behavioral and executive concerns, Cluster 3 had normal functioning, and Cluster 4 had mild internalizing and executive concerns. Clusters 2 and 3 differed in age and parental education, whereas Clusters 1 and 4 differed in Full Scale IQ. We conclude that BASC-3 and BRIEF-2 provide complementary information about a child's functioning that can inform treatment of neurobehavioral dysfunction. Elevations as well as patterns of the respective profiles on these instruments may help direct such treatment (e.g., cognitive rehabilitation, behavioral management and/or psychotherapy).

PMID: [38006394](#)