Cerebral palsy research news

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Interventions and Management

1. Cost-Effectiveness of an Intensive Upper Limb Rehabilitation Therapy for Children With Unilateral Cerebral Palsy: An Economic Evaluation of a Randomized Controlled Trial

Michael C David, Hideki Higashi

J Health Econ Outcomes Res. 2024 Apr 11;11(1):103-111. doi: 10.36469/001c.94460. eCollection 2024.

Background: Unilateral cerebral palsy is a major cause of childhood disability and a substantial economic burden. Intensive group-based therapy, consisting of hybrid constraint-induced movement and bimanual therapies, has been shown to be effective in improving specific quality-of-life domains in children with this disability. Our objective in this study was to assess if this intervention was cost-effective compared with standard care. Methods: An open-label, parallel, randomized controlled trial with an embedded economic evaluation of the intervention was conducted. A total of 47 children were randomized to either the intervention group (n = 27) or the standard care (n = 20) group. The effectiveness of the intervention was assessed using the Cerebral Palsy Quality of Life (Child) questionnaire across several domains. Nonparametric bootstrapping was used to quantify uncertainty intervals (UIs) for incremental cost-effectiveness ratios. Results: The incremental cost-effectiveness ratios for the intervention were $273 (95% UI: $107 to $945) for Pain and Impact of Disability, $1071 (95% UI: -$5718 to $4606) for Family Health and $1732 (95% UI: -$6448 to $8775) for Access to Services. For the 4 remaining domains, the intervention was dominated by standard care. At a willingness-to-pay threshold of $1000, only for the Pain and Impact of Disability domain was the intervention likely to have a probability of being cost-effective exceeding 0.75. Conclusions: Other than the Pain and Impact of Disability domain, there was insufficient evidence demonstrating the intervention to be cost-effective over a 13-week time horizon.

PMID: 38779334

2. Non-invasive spinal cord electrical stimulation for arm and hand function in chronic tetraplegia: a safety and efficacy trial

Chet Moritz, Edelle C Field-Fote, Candace Tefertiller, Ilse van Nes, Randy Trumbower, Sukhvinder Kalsi-Ryan, Mariel Purcell, Thomas W J Janssen, Andrei Krassioukov, Leslie R Morse, Kristin D Zhao, James Guest, Ralph J Marino, Lynda M Murray, Jill M Wecht, Markus Rieger, Jared Pradarelli, Amanda Turner, Jessica D'Amico, Jordan W Squair, Gregoire Courtine

Clinical Trial Nat Med. 2024 May;30(5):1276-1283. doi: 10.1038/s41591-024-02940-9. Epub 2024 May 20.

Cervical spinal cord injury (SCI) leads to permanent impairment of arm and hand functions. Here we conducted a prospective, single-arm, multicenter, open-label, non-significant risk trial that evaluated the safety and efficacy of ARCEX Therapy to improve arm and hand functions in people with chronic SCI. ARCEX Therapy involves the delivery of externally applied electrical stimulation over the cervical spinal cord during structured rehabilitation. The primary endpoints were safety and efficacy as measured by whether the majority of participants exhibited significant improvement in both strength and functional performance in response to ARCEX Therapy compared to the end of an equivalent period of rehabilitation alone. Sixty participants completed the protocol. No serious adverse events related to ARCEX Therapy were reported, and the

primary effectiveness endpoint was met. Seventy-two percent of participants demonstrated improvements greater than the minimally important difference criteria for both strength and functional domains. Secondary endpoint analysis revealed significant improvements in fingertip pinch force, hand prehension and strength, upper extremity motor and sensory abilities and self-reported increases in quality of life. These results demonstrate the safety and efficacy of ARCEX Therapy to improve hand and arm functions in people living with cervical SCI. ClinicalTrials.gov identifier: NCT04697472 .

PMID: 38769431

3. Does intrathecal baclofen therapy decrease the progression of hip displacement in young patients with cerebral palsy?

No authors listed

Dev Med Child Neurol. 2024 May 17. doi: 10.1111/dmcn.15962. Online ahead of print.

No abstract available

PMID: 38760989

4. Robot-assisted gait training improves walking and cerebral connectivity in children with unilateral cerebral palsy

Laura Julien, Guillemette Moreau-Pernet, Emmanuelle Rochette, Jean-Jacques Lemaire, Bénédicte Pontier, Sacha Bourrand, Bruno Pereira, Carine Chassain, Anna Sontheimer, Catherine Sarret

Pediatr Res. 2024 May 20. doi: 10.1038/s41390-024-03240-1. Online ahead of print.

Background: Robot-assisted gait training (RAGT) is promising to help walking rehabilitation in cerebral palsy, but training-induced neuroplastic effects have little been investigated. Methods: Forty unilateral cerebral palsy children aged 4-18 years were randomly allocated in a monocentric study to ten 20-minute RAGT sessions with the G-EO system, five days a week (n = 20) or to a control group (who continued conventional care with six 30-minute physiotherapy sessions, three days a week) (n = 20), two weeks running, from September 2020 to December 2021. Clinical and MRI outcomes were compared before and one month after therapy. The primary outcome was gait speed. Secondary outcomes were a 6-minute walking test distance, Gross Motor Function Measure-88 (GMFM-88) dimensions D and E, Patient Global Impression of Improvement, resting-state functional connectivity within the sensorimotor network, and structural connectivity in the corticospinal tracts. Results: Gait speed and the 6-minute walking test distance improved more after RAGT. Resting-state functional connectivity increased after RAGT but decreased in controls between superior and lateral healthy or lateral injured sensorimotor networks. GMFM-88 and structural connectivity in corticospinal tracts were unchanged. Impression of improvement in children was better after RAGT. Conclusion: Short-term benefit of repetitive RAGT on walking abilities and functional cerebral connectivity was found in unilateral cerebral palsy children. Impact statement: Short-term repetitive robot-assisted gait training improves gait speed and walking resistance and increases cerebral functional connectivity in unilateral cerebral palsy. GMFM dimensions D and E were unchanged after short-term repetitive robot-assisted gait training in unilateral cerebral palsy.

PMID: 38769400

5. Wearing an ultrasound probe during walking does not influence lower limb joint kinematics in adolescents with cerebral palsy and typically developing peers

Francesco Cenni, Nathalie Alexander, Iida Laatikainen-Raussi, Maria Sukanen, Taija Finni

Gait Posture. 2024 May 17:112:134-139. doi: 10.1016/j.gaitpost.2024.05.017. Online ahead of print.

Background: Enhancing traditional three-dimensional gait analysis with a portable ultrasound device at the lower-limb muscle-tendon level enables direct measurement of muscle and tendon lengths during walking. However, it is important to consider that the size of the ultrasound probe and its attachment on the lower limb may potentially influence gait pattern. Research question: What is the effect of wearing an ultrasound probe at the lower limb in adolescents with cerebral palsy and typically developing peers? Methods: Eleven individuals with cerebral palsy and nine age-matched typically developing peers walking barefoot at their self-selected speed were analyzed. Data collection occurred under three conditions: the reference condition (GAIT), and two conditions involving placement of the ultrasound probe over the distal medial gastrocnemius-Achilles tendon junction (MTJ) and over the medial gastrocnemius mid-belly to capture fascicles (FAS). Data processing included calculating differences between conditions using root mean square error (RMSE) for joint kinematics and comparing them to the overall mean difference. Additionally, Spearman correlations were calculated to examine the relationship between kinematic RMSEs and walking speed. Results: No significant differences in stance phase duration or walking speed were observed among the three conditions. Average RMSEs were below 5° for all parameters and condition comparisons in both groups. In both the TD and CP groups, RMSE values during the swing phase were higher than those during the stance phase for all joints. No significant correlations were found between height or body mass and swing phase RMSEs. In the CP group, there was a

significant correlation between joint kinematics RMSEs and differences in walking speed at the hip, knee and ankle joints when comparing the MTJ condition with the GAIT condition. Significance: This study confirms joint kinematics alterations are smaller than 5° due to wearing to the leg an ultrasound probe during walking.

PMID: 38772125

6. Clinical study on the safety and feasibility of AiWalker-K for lower limbs exercise rehabilitation in children with cerebral palsy

Yi Zhang, Zhichong Hui, Weihang Qi, Jiamei Zhang, Mingmei Wang, Dengna Zhu

Randomized Controlled Trial PLoS One. 2024 May 22;19(5):e0303517. doi: 10.1371/journal.pone.0303517. eCollection 2024.

Background: Robotic-assisted gait training (RAGT) devices are effective for children with cerebral palsy (CP). Many RAGT devices have been created and put into clinical rehabilitation treatment. Therefore, we aimed to investigate the safety and feasibility of a new RAGT for children with CP. Methods: This study is a cross-over design with 23 subjects randomly divided into two groups. The occurrence of adverse events and changes in heart rate and blood pressure were recorded during each AiWalker-K training. Additionally, Gross Motor Function Measure-88 (GMFM-88), Pediatric Balance Scale (PBS), 6 Minutes Walking Test (6MWT), Physiological Cost Index, and Edinburgh Visual Gait Score (EVGS) were used to assess treatment, period, carry-over, and follow-up effects in this study. Results: Adverse events included joint pain, skin pain, and injury. Heart rate and blood pressure were higher with the AiWalker-K compared to the rest ($P < 0.05$), but remained within safe ranges. After combined treatment with AiWalker-K and routine rehabilitation treatment, significant improvements in 6MWT, GMFM-88 D and E, PBS, and EVGS were observed compared to routine rehabilitation treatment alone ($P < 0.05$). Conclusions: Under the guidance of experienced medical personnel, AiWalker-K can be used for rehabilitation in children with CP.

PMID: 38776339

7. The applicability of markerless motion capture for clinical gait analysis in children with cerebral palsy

Koen Wishaupt, Wouter Schallig, Marleen H van Dorst, Annemieke I Buizer, Marjolein M van der Krogt

Sci Rep. 2024 May 24;14(1):11910. doi: 10.1038/s41598-024-62119-7.

The aim of this comparative, cross-sectional study was to determine whether markerless motion capture can track deviating gait patterns in children with cerebral palsy (CP) to a similar extent as marker-based motion capturing. Clinical gait analysis (CGA) was performed for 30 children with spastic CP and 15 typically developing (TD) children. Marker data were processed with the Human Body Model and video files with Theia3D markerless software, to calculate joint angles for both systems. Statistical parametric mapping paired t-tests were used to compare the trunk, pelvis, hip, knee and ankle joint angles, for both TD and CP, as well as for the deviation from the norm in the CP group. Individual differences were quantified using mean absolute differences. Markerless motion capture was able to track frontal plane angles and sagittal plane knee and ankle angles well, but individual deviations in pelvic tilt and transverse hip rotation as present in CP were not captured by the system. Markerless motion capture is a promising new method for CGA in children with CP, but requires improvement to better capture several clinically relevant deviations especially in pelvic tilt and transverse hip rotation.

PMID: 38789587

8. A Comparison of the Immediate Effects of Verbal and Virtual Reality Feedback on Gait in Children with Cerebral Palsy

Tine De Mulder, Heleen Adams, Tijl Dewit, Guy Molenaers, Anja Van Campenhout, Kaat Desloovere

Children (Basel). 2024 Apr 27;11(5):524. doi: 10.3390/children11050524.

Different types of feedback are used during gait training in children with cerebral palsy (CP), including verbal (VB) and virtual reality (VR) feedback. Previous studies on VR feedback showed positive effects on the targeted gait parameter. However, both positive and negative side effects on other parameters were seen as well. The literature on the effect of VB feedback is lacking and, to our knowledge, both feedback methods have not yet been compared. In this monocentric study with a single-session intervention protocol, children with CP completed a training session on the Gait Real-Time Analysis Interactive Lab (GRAIL) and received both VB and VR feedback on hip extension, in randomized order. Outcome parameters were continuous gait curves of sagittal kinematics and hip kinetics, specific features of hip angle and moment, sagittal gait variable scores and gait profile scores. Improvement of the targeted gait parameter was seen both after VB and VR feedback, with a small advantage for VR over VB feedback. Furthermore, positive side effects on knee and ankle sagittal kinematics were seen. However, the overall gait profile score did not improve, most likely due to negative compensatory strategies. In conclusion, children with CP can adapt gait in response to both VB and VR feedback, with VR feedback producing a slightly better effect. Due to secondary

effects on parameters other than the targeted parameter, the overall gait did not improve.

PMID: 38790520

9. Ankle fracture open reduction and internal fixation in patients with cerebral palsy

Meera M Dhodapkar, Ally Yang, Will Jiang, Scott J Halperin, David B Frumberg, Jonathan N Grauer

Dev Med Child Neurol. 2024 May 21. doi: 10.1111/dmcn.15958. Online ahead of print.

Aim: To examine patients with cerebral palsy (CP) undergoing open reduction and internal fixation (ORIF) for ankle fractures. Method: This was a retrospective study of adult patients undergoing ankle fracture ORIF for closed, isolated ankle fractures identified in between 2010 and 2021 in the Q1 PearlDiver M151 database. Patients with CP were identified with International Classification of Diseases (ICD)-9 and ICD-10 codes, and were matched to those without 1:10 on age, sex, and Elixhauser comorbidity index (ECI). Ninety-day adverse events were assessed with multivariable logistic regression. Results: A total of 148 993 patients with isolated ankle fracture ORIF were identified, of whom 407 (0.27%) had CP. After matching, 3863 without CP were compared to 389 with CP. Patients with CP were at increased odds of: 90-day urinary tract infection (odds ratios [OR] 6.26), pneumonia (OR 3.50), minor adverse events (OR 3.46), sepsis (OR 3.30), any adverse events (OR 3.04), emergency department visits (OR 2.28), serious adverse events (OR 1.77), and prolonged length of stay more than 4 days (OR 22.44) ($p < 0.001$ for all). Interpretation: Patients with CP undergoing ORIF for isolated, closed ankle fractures are at increased odds of several 90-day adverse events and prolonged length of stay compared to matched patients without CP.

PMID: 38773804

10. Adverse events after different forms of botulinum neurotoxin A injections in children with cerebral palsy: An 8-year retrospective study

No authors listed

Dev Med Child Neurol. 2024 May 21. doi: 10.1111/dmcn.15980. Online ahead of print.

No abstract available

PMID: 38773794

11. Short-Term Effects of Vestibular Training on Gross Motor Function in Children and Youth with Cerebral Palsy: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

María Coello-Villalón, Purificación López-Muñoz, Rocío Palomo-Carrión, Álvaro Hidalgo-Robles, Javier Merino-Andrés

Review Phys Occup Ther Pediatr. 2024 May 19:1-11. doi: 10.1080/01942638.2024.2350385. Online ahead of print.

Aims: To review the literature on the effects of vestibular training on motor function and balance in children and youth with cerebral palsy. Methods: Eight databases (MEDLINE-PubMed, PEDro, Cochrane Library, OTSeeker, Web of Science, Scopus Database, CINAHL and SPORTDiscus.) were searched up to May 15th, 2023. Studies comparing vestibular training with other types of interventions. The DerSimonian and Laird method was employed using random effects models to calculate the pooled estimate of the effect size with confidence intervals of 95%. The risk of bias was assessed with the Cochrane Collaboration's tool and the Grading of Recommendations Assessment, Development and Evaluation approach was used to judge the certainty of the evidence for all outcomes. Results: Eight studies were included comprising 226 participants with cerebral palsy. The meta-analyses demonstrated significant standardized mean differences in favor of vestibular training program compared to other technique(s) for Gross Motor Function Measure (-0.471; 95% confidence intervals: -0.919 to -0.023) and balance (-0.546; 95% confidence intervals: -0.916 to -0.176). Conclusions: Vestibular training has potential benefits in the short-term as a therapeutic approach for improving gross motor function and the balance in children and youth with cerebral palsy, but further research is needed.

PMID: 38764313

12. Stimulus zones of Vojta method and trunk control in children with spastic-type cerebral palsy: A quasi-experimental pilot study

Sun-Young Ha, Yun-Hee Sung

J Bodyw Mov Ther. 2024 Apr:38:150-154. doi: 10.1016/j.jbmt.2024.01.020. Epub 2024 Jan 15.

Background: Vojta method improves motor function by inducing a response by pressing the stimulus zones. Purpose: To determine the effect of the stimulus zones on trunk muscle thickness, trunk control, trunk angle, and gross motor function in children with spastic-type cerebral palsy. Methods: A quasi-experimental pilot study was conducted with 19 children with spastic-type cerebral palsy divided into two groups: Vojta method group (n = 10) and general physical therapy group (n = 9). Each group underwent a 6-week intervention, and assessments were conducted to evaluate abdominal muscle thickness, trunk control, trunk angle, and gross motor function. Results: In the Vojta method group, the change rate in the thickness of the internal oblique and transversus abdominis increased significantly within the group ($P < 0.05$) and the difference (post-pre) of the transversus abdominis was higher ($P < 0.05$). The trunk angle increased significantly within the group when thoracic 7 and 11, lumbar 3, and sacrum 1 were supported ($P < 0.05$). There was a significant difference in trunk angle difference (post-pre) between groups when thoracic 11 and sacrum 1 were supported ($P < 0.05$). Segmental assessment of trunk control and gross motor function measure-88 scores were significantly increased within the group in all groups ($P < 0.05$). Conclusion: The stimulus zones of the Vojta method could improve trunk control in children with spastic-type cerebral palsy through intra-abdominal pressure and anti-gravity movement.

PMID: 38763554

13. Measuring grip strength in adolescents and adults with cerebral palsy in a clinic setting: Feasibility, reliability, and clinical associations

No authors listed

Dev Med Child Neurol. 2024 May 23. doi: 10.1111/dmcn.15984. Online ahead of print.

No abstract available

PMID: 38779863

14. Superior cerebellar peduncle deep brain stimulation for cerebral palsy

Suzhen Lin, Ningfei Li, Yimei Shu, Tao Wang, Peng Huang, Yixin Pan, Bomin Sun, Chencheng Zhang, Dianyou Li, Yiwen Wu

J Neurosurg. 2024 May 24:1-11. doi: 10.3171/2024.2.JNS232471. Online ahead of print.

Objective: Patients with coexisting spastic cerebral palsy (CP) and dystonia have limited treatment options. In this study, the authors aimed to evaluate the efficacy of deep brain stimulation (DBS) targeting the superior cerebellar peduncles (SCPs) in adults with CP. Methods: Five patients with CP and medically refractory dystonia and spasticity underwent SCP DBS. Assessments included the Burke-Fahn-Marsden Dystonia Rating Scale (BFMDRS), modified Ashworth scale (mAS), and tests of cognition, mental status, and quality of life preoperatively and at 3, 6, and 12 months postoperatively (in both DBS ON and OFF states, double blinded). Active contacts and fiber bundles were examined. Results: Four patients completed follow-up. The BFMDRS motor score decreased from 74 to 52 at 12 months postoperatively (30%, $p = 0.008$). The mean mAS score indicated significant spasticity reduction (from 2.9 ± 0.9 to 1.9 ± 0.6 after 12 months, $p = 0.0454$). Quality of life improved ($p < 0.01$), while cognition remained unaffected. Active contacts were found within the dentato-rubro-thalamic tract, with variable efficiency in decussating and nondecussating portions. Conclusions: In this pilot trial, SCP DBS showed promise as a well-tolerated treatment for CP, improving dystonic symptoms, spasticity, quality of life, and functional capacities. However, caution is needed when interpreting the results given the small sample size and heterogeneous motor outcomes.

PMID: 38788237

15. Emotional State Measurement Trial (EMOPROEXE): A Protocol for Promoting Exercise in Adults and Children with Cerebral Palsy

Isabel M Gómez-González, Juan A Castro-García, Manuel Merino-Monge, Gemma Sánchez-Antón, Foad Hamidi, Alejandro Mendoza-Sagrera, Alberto J Molina-Cantero

J Pers Med. 2024 May 14;14(5):521. doi: 10.3390/jpm14050521.

Background: The protocol described in this paper is part of a research project coordinated between three Spanish universities, where a technology aimed at improving the quality of life of people with cerebral palsy will be developed. Part of the proposed technology will consist of an interface and a series of applications to increase motivation for daily physical activity. The basis of these developments is the measurement of the emotional state of the subjects. Methods: The experimental protocol is designed with two research objectives, on the one hand to identify the emotional state through physiological signals, and on the other to determine whether music can be a motivating factor to promote physical activity. It is specifically designed for subjects with cerebral palsy, taking into account the special characteristics of this population. These are people with whom it is difficult

to use questionnaires to have a basis to contrast with the measured physiological signals, so measurements must be taken in carefully chosen daily-life situations. Discussion: We hope our findings show which physiological parameters are the most robust to measure the emotional state and how to design rehabilitation and physical activity promotion routines that are motivating, in addition to being able to avoid risk factors during the performance of these routines. Trial registration: NCT05621057.

PMID: 38793103

16. Effectiveness of kinesiotape and sham kinesiotape application in children with cerebral palsy with dysphagia: A randomized controlled study

Mazlum Serdar Akaltun, Ebru Umay, Ozlem Altindag, Ozgur Zeliha Karaahmet

Turk J Phys Med Rehabil. 2023 Jun 7;69(4):434-443. doi: 10.5606/tftrd.2023.11066. eCollection 2023 Dec.

Objectives: This study aimed to investigate the short- and long-term effects of kinesiotaping (KT) on dysphagia in children with cerebral palsy (CP). Patients and methods: One hundred one CP patients (59 males, 42 females; mean age: 49.3±18.8 years; range, 2 to 6 years) with dysphagia referred between October 2017 and January 2020 were enrolled in the randomized controlled study. Children who met the study criteria were randomly assigned to the kinesiotape group (n=54) or the sham group (n=47). Specific swallowing evaluations were performed on all patients before the therapy. The KT or sham application protocole combined with conventional rehabilitaion therapy was conducted for six weeks. Evaluation parameters were repeated at 6 and 18 weeks. The evaluated parameters were compared within and between groups. Results: Drooling, weak tongue movement, chewing difficulty, coughing/choking and retching/vomiting during/after feeding, functional oral intake score, and meal time were found to be significantly improved at six weeks in the kinesiotape group compared to the sham group, and the clinical improvements were present at 18 weeks ($p<0.05$). There was no statistically significant difference in any parameter in the sham group at 6 and 18 weeks compared to the pretreatment ($p>0.05$). Conclusion: The addition of KT to a home exercise program is an effective method for dysphagia in CP.

PMID: 38766591

17. Successful Hemispherotomy in a Patient With 22q11.2 Deletion Syndrome Who Had Developmental and Epileptic Encephalopathy With Spike-and-Wave Activation During Sleep

Naoki Yamada, Ichiro Kuki, Takehiro Uda, Shin Okazaki

Case Reports Cureus. 2024 Apr 16;16(4):e58424. doi: 10.7759/cureus.58424. eCollection 2024 Apr.

We report a case of developmental and epileptic encephalopathy with spike-and-wave activation during sleep with 22q11.2 deletion syndrome in a patient who had undergone hemispherotomy and achieved developmental improvement. A four-year-old male child with paralysis on the left side of his body since birth had a mild developmental delay. An MRI of the brain revealed polymicrogyria diffusely throughout the right hemisphere. He was diagnosed with the 22q11.2 deletion syndrome at one year of age. Focal impaired awareness seizure in the right hemisphere origin and focal to bilateral tonic-clonic seizure appeared by two years of age. At three years of age, myoclonic seizures occurred, which induced frequent falls. Simultaneously, developmental and epileptic encephalopathy with spike-and-wave activation during sleep were observed. At four years and seven months of age, the patient underwent a right hemispherotomy. Epileptic seizures and spike-and-wave activation during sleep disappeared, and cognitive improvement was observed one year after surgery. In spite of chromosomal abnormalities being present, drug-resistant epilepsy with localized regions on MRI should be evaluated to determine surgical options to improve cognitive function and development.

PMID: 38765340

18. The quality of sleep and digestion in cerebral palsy depends not only on the level of functional independence

Walter Michael Strobl, Carla Alexandra Scorza, Fulvio Alexandre Scorza, Josef Finsterer

Rev Assoc Med Bras (1992). 2024 May 20;70(5):e20231637. doi: 10.1590/1806-9282.20231637. eCollection 2024.

No abstract available

PMID: 38775514

19. Approach to obtaining a swallow study in a five-year-old with a disability and significant procedural anxiety: A case report

Tyler Estes, Aaron Gaul, Allison Thornton, Laura Hobart-Porter

J Pediatr Rehabil Med. 2024 May 24. doi: 10.3233/PRM-230063. Online ahead of print.

Case description: A five-year-old male with spastic quadriplegia cerebral palsy and an expressive communication disorder presented because the family desired liberalization of diet. The diet consisted of pureed solids and no liquids due to deficits identified on bedside swallow evaluation; further dysphagia assessment had not been obtained due to significant procedural anxiety. Comprehensive approaches were taken involving premedication with buspirone, desensitization, distraction, and positive reinforcement. The fluoroscopic swallow study was successfully completed, and the patient's diet was upgraded to include moderately thickened liquids. Discussion: Procedural anxiety management in special populations is not well-researched. The lack of definitive recommendations regarding these issues increases the difficulty of managing these patients. This case highlights one successful approach to addressing individual needs using widely-available pharmacologic and environmental techniques. Additionally, this case reinforces the need to identify underlying causes for procedural anxiety and involve an interdisciplinary team. Conclusions: Attempts should be made to identify factors driving procedural anxiety. After discussing with the patient and family, relevant information should be relayed to staff with an open-ended invitation to propose ideas. While not all hospitals have equivalent resources, concerns related to unfamiliarity, underlying anxiety, and locus of control can be addressed with limited resource utilization, as demonstrated in this case.

PMID: 38788098

20. A bilingual speech neuroprosthesis driven by cortical articulatory representations shared between languages

Alexander B Silva, Jessie R Liu, Sean L Metzger, Ilina Bhaya-Grossman, Maximilian E Dougherty, Margaret P Seaton, Kaylo T Littlejohn, Adelyn Tu-Chan, Karunesh Ganguly, David A Moses, Edward F Chang

Nat Biomed Eng. 2024 May 20. doi: 10.1038/s41551-024-01207-5. Online ahead of print.

Advancements in decoding speech from brain activity have focused on decoding a single language. Hence, the extent to which bilingual speech production relies on unique or shared cortical activity across languages has remained unclear. Here, we leveraged electrocorticography, along with deep-learning and statistical natural-language models of English and Spanish, to record and decode activity from speech-motor cortex of a Spanish-English bilingual with vocal-tract and limb paralysis into sentences in either language. This was achieved without requiring the participant to manually specify the target language. Decoding models relied on shared vocal-tract articulatory representations across languages, which allowed us to build a syllable classifier that generalized across a shared set of English and Spanish syllables. Transfer learning expedited training of the bilingual decoder by enabling neural data recorded in one language to improve decoding in the other language. Overall, our findings suggest shared cortical articulatory representations that persist after paralysis and enable the decoding of multiple languages without the need to train separate language-specific decoders.

PMID: 38769157

21. Histopathological findings of anterior lens capsule in pediatric cataract

Ferhad Özer, İrem İnanç, Pınar B Kızıltunç, Hüban Atilla, Belgin Can

Indian J Ophthalmol. 2024 May 20. doi: 10.4103/IJO.IJO_2957_23. Online ahead of print.

Purpose: To investigate the histopathological findings of the anterior lens capsule in pediatric patients who had surgery for cataracts. Methods: This study is a prospective interventional study. Anterior capsule tissue samples that were obtained by the anterior capsulotomy method during phacoemulsification surgery were fixed and examined under a transmission electron microscope. Results: Twenty-two eyes of 19 patients who were diagnosed with congenital and juvenile cataracts were included in this study. Five patients had associated systemic diseases, including hydrocephalus, cerebral palsy, prematurity, juvenile myelomonocytic leukemia, and Down's syndrome. Electron microscopic evaluation demonstrated single-layered epithelium under the capsule, degenerated organelles with round-oval and prismatic-oval nuclei, and degenerated mitochondria and heterochromatin-rich nuclei. In the case with cerebral palsy, collagen fibrils of the connective tissue and fibroblast-like cells were observed replacing the epithelium that should be underneath the capsule in both eyes, and there was a disorganized distribution of collagen fibrils and vacuole structures in the cytoplasm of fibroblast-like cells. Conclusion: Similar histopathological findings were found in pediatric cataracts with or without systemic disease except in one cerebral palsy case. The absence of lens epithelium may have been a result of degeneration in this patient, and this can be attributed to the presence of systemic inflammation and gliosis in cerebral palsy. The absence of lens epithelium can play a role in the development of dense subcapsular fibrosis and cataract formation.

PMID: 38767535

22. Use of virtual reality in children in a broad range of medical settings: a systematic narrative review of recent meta-analyses

Emily Antonovics, Grammatina Boitsios, Thomas Saliba

Clin Exp Pediatr. 2024 May 21. doi: 10.3345/cep.2023.00388. Online ahead of print.

Virtual reality (VR) is an emerging method that can be used in many scenarios involving children. VR has been increasingly studied as it has become cheaper, more widely available, and of better quality. In this review of current meta-analyses on the use of VR in children in the medical setting, we examined its role in 5 broad settings where it is used to alleviate pain and anxiety as well as in therapeutic scenarios. The study scope was purposefully broad to highlight a wide range of cases. We searched the ScienceDirect, SpringerLink, Cochrane Library, PubMed, and PMC databases for meta-analyses using VR in pediatric populations in medical settings. The National Institutes of Health quality assessment tool and Quality of Reporting of Meta-analyses statement checklist were used to verify study quality. Six hundred fifty-three articles were retrieved; after the application of the inclusion and exclusion criteria, 11 remained. These meta-analyses included cerebral palsy (4 meta-analyses), attention deficit/hyperactivity disorder (2 meta-analyses), burn care (1 meta-analysis), preoperative anxiety (2 meta-analyses), and needle-involving procedures (2 meta-analyses). The meta-analyses showed broadly positive results, with VR being useful in the areas in which it was applied. This study had several limitations. The meta-analyses consistently highlighted a high level of heterogeneity, making it challenging to draw clear conclusions. Most meta-analyses across all fields yielded encouraging results. However, further studies are required to confirm these findings. Guidelines must be established for future experiments to provide a standard and uniform procedure for reducing the heterogeneity of experimental methods.

PMID: 38772412

23. Anti-artifacts techniques for neural recording front-ends in closed-loop brain-machine interface ICs

Weijian Chen, Xu Liu, Peiyuan Wan, Zhijie Chen, Yi Chen

Review Front Neurosci. 2024 May 9:18:1393206. doi: 10.3389/fnins.2024.1393206. eCollection 2024.

In recent years, thanks to the development of integrated circuits, clinical medicine has witnessed significant advancements, enabling more efficient and intelligent treatment approaches. Particularly in the field of neuromedical, the utilization of brain-machine interfaces (BMI) has revolutionized the treatment of neurological diseases such as amyotrophic lateral sclerosis, cerebral palsy, stroke, or spinal cord injury. The BMI acquires neural signals via recording circuits and analyze them to regulate neural stimulator circuits for effective neurological treatment. However, traditional BMI designs, which are often isolated, have given way to closed-loop brain-machine interfaces (CL-BMI) as a contemporary development trend. CL-BMI offers increased integration and accelerated response speed, marking a significant leap forward in neuromedicine. Nonetheless, this advancement comes with its challenges, notably the stimulation artifacts (SA) problem inherent to the structural characteristics of CL-BMI, which poses significant challenges on the neural recording front-ends (NRFE) site. This paper aims to provide a comprehensive overview of technologies addressing artifacts in the NRFE site within CL-BMI. Topics covered will include: (1) understanding and assessing artifacts; (2) exploring the impact of artifacts on traditional neural recording front-ends; (3) reviewing recent technological advancements aimed at addressing artifact-related issues; (4) summarizing and classifying the aforementioned technologies, along with an analysis of future trends.

PMID: 38784093

24. A self-supervised spatio-temporal attention network for video-based 3D infant pose estimation

Wang Yin, Linxi Chen, Xinrui Huang, Chunling Huang, Zhaohong Wang, Yang Bian, You Wan, Yuan Zhou, Tongyan Han, Ming Yi

Med Image Anal. 2024 May 18:96:103208. doi: 10.1016/j.media.2024.103208. Online ahead of print.

General movement and pose assessment of infants is crucial for the early detection of cerebral palsy (CP). Nevertheless, most human pose estimation methods, in 2D or 3D, focus on adults due to the lack of large datasets and pose annotations on infants. To solve these problems, here we present a model known as YOLO-infantPose, which has been fine-tuned, for infant pose estimation in 2D. We further propose a self-supervised model called STAPose3D for 3D infant pose estimation based on videos. We employ multi-view video data during the training process as a strategy to address the challenge posed by the absence of 3D pose annotations. STAPose3D combines temporal convolution, temporal attention, and graph attention to jointly learn spatio-temporal features of infant pose. Our methods are summarized into two stages: applying YOLO-infantPose on input videos, followed by lifting these 2D poses along with respective confidences for every joint to 3D. The employment of the best-performing 2D detector in the first stage significantly improves the precision of 3D pose estimation. We reveal that fine-tuned YOLO-infantPose outperforms other models tested on our clinical dataset as well as two public datasets MINI-RGBD and YouTube-Infant dataset. Results from our infant movement video dataset demonstrate that STAPose3D effectively comprehends the spatio-temporal features among different views and significantly improves the performance of 3D infant pose

estimation in videos. Finally, we explore the clinical application of our method for general movement assessment (GMA) in a clinical dataset annotated as normal writhing movements or abnormal monotonic movements according to the GMA standards. We show that the 3D pose estimation results produced by our STAPose3D model significantly boost the GMA prediction performance than 2D pose estimation. Our code is available at github.com/wwYinYin/STAPose3D.

PMID: 38788327

25. Efficacy of a Soft Robotic Exoskeleton to Improve Lower Limb Motor Function in Children with Spastic Cerebral Palsy: A Single-Blinded Randomized Controlled Trial

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Brain Sci. 2024 Apr 25;14(5):425. doi: 10.3390/brainsci14050425.

Purpose: Soft robotic exoskeletons (SREs) are portable, lightweight assistive technology with therapeutic potential for improving lower limb motor function in children with cerebral palsy. To understand the effects of long-term SRE-assisted walking training on children with spastic cerebral palsy (SCP), we designed a study aiming to elucidate the effects of SRE-assisted walking training on lower limb motor function in this population. Methods: In this randomized, single-blinded (outcome assessor) controlled trial, forty children diagnosed with SCP were randomized into the routine rehabilitation (RR) group (N = 20) and the SRE group (N = 20) for comparison. The RR group received routine rehabilitation training, and the SRE group received routine rehabilitation training combined with SRE-assisted overground walking training. Assessments (without SRE) were conducted pre- and post-intervention (8 weeks after the intervention). The primary outcome measures included the 10 m walk test (10MWT) and the 6 min walk test (6MWT). Secondary outcome measures comprised the gross motor function measure-88, pediatric balance scale modified Ashworth scale, and physiological cost index. Results: Both groups showed significant improvements ($p < 0.01$) across all outcome measures after the 8-week intervention. Between-group comparisons using ANCOVA revealed that the SRE group demonstrated greater improvement in walking speed from the 10MWT (+6.78 m/min, 95% CI [5.74-7.83]; $p < 0.001$) and walking distance during the 6MWT (+34.42 m, 95% CI [28.84-39.99]; $p < 0.001$). The SRE group showed greater improvement in all secondary outcome measures ($p < 0.001$). Conclusions: The study findings suggested that the integration of SRE-assisted overground walking training with routine rehabilitation more effectively enhances lower limb motor function in children with SCP compared to routine rehabilitation alone.

PMID: 38790405

26. The Role of Immersive Virtual Reality Interventions in Pediatric Cerebral Palsy: A Systematic Review across Motor and Cognitive Domains

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Review Brain Sci. 2024 May 12;14(5):490. doi: 10.3390/brainsci14050490.

Background: In recent years, new technologies have been applied in cerebral palsy. Among these, immersive virtual reality is one with promising motor and cognitive effects along with the reduced costs of its application. The level of immersion of the subject in the illusional world gives the feeling of being a real part of the virtual environment. This study aims to investigate the safety and the efficacy of immersive virtual reality in children affected by cerebral palsy. Methods: PubMed, Embase, Cochrane Database of Systematic Reviews, RehabData, and Web of Science were screened up to February 2023 to identify eligible clinical studies. Results: Out of 788, we included 15 studies involving CP patients. There was high heterogeneity in the outcomes considered, and the results showed non-inferiority to conventional therapy and initial additional benefits in comparison with conventional rehabilitation. Conclusions: Immersive virtual reality emerges as a pivotal technological tool in rehabilitation, seamlessly integrating with conventional therapy within CP rehabilitation programs. Indeed, it not only enhances motivation but significantly increases children's functional capacity and abilities.

PMID: 38790468

27. Foot and lower leg pain in children and adults with cerebral palsy: a population-based register study on 5,122 individuals

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BMC Musculoskelet Disord. 2024 May 18;25(1):391. doi: 10.1186/s12891-024-07486-y.

Background: Pain is common in individuals with cerebral palsy (CP) and the most reported pain site is the foot/lower leg. We analyzed the prevalence of pain in the foot/lower leg and the associations with age, sex, gross motor function, and clinical findings in individuals with CP. Method: This was a cross-sectional register-study, based on data reported to the Swedish

Cerebral Palsy Follow-up Program (CPUP). All participants in CPUP, four years-of-age or older, were included. Pearson chi-square tests and logistic regression were used to analyze the prevalence and degree of pain in the foot/lower leg. Results: In total, 5,122 individuals were included from the CPUP database: 58% were males and 66% were under 18 years-of-age. Overall, 1,077 (21%) reported pain in the foot/lower leg. The odds ratios (ORs) of pain were higher in females (OR 1.31, 95% confidence interval (CI) 1.13-1.53), individuals who could ambulate (Gross Motor Function Classification System Level I (OR 1.84, CI 1.32-2.57) and II (OR 2.01, CI 1.46-2.79) compared to level V), and in individuals with decreased range of motion of the ankle (dorsiflexion 1-10 degrees (OR 1.43, CI 1.13-1.83) and ≤ 0 degrees (OR 1.46, CI 1.10-1.93) compared to ≥ 20 degrees). With increasing age the OR of pain increased (OR 1.02, CI 1.01-1.03) as well as the reported pain intensity ($p < 0.001$). Conclusions: Pain in the foot and lower leg appears to be a significant problem in individuals with CP, particularly in those who walk. As with pain in general in this population, both pain intensity and frequency increase with age. The odds of pain in the foot and lower leg were increased in individuals with limited dorsiflexion of the ankle. Given the cross-sectional design causality cannot be inferred and it is unknown if pain causes decreased range of motion of the ankle or if decreased range of motion causes pain. Further research is needed on causal pathways and importantly on prevention.

PMID: 38762469

28. Selective dorsal rhizotomy for spastic cerebral palsy: report of 18 cases performed in the North of Vietnam

Nguyen Duc Lien, Nguyen Van Linh, Nguyen Thi Cam Van, Le Thi Giang, Donald T King, Anna Tarren, Nguyen Dinh Dat, Brandon G Rocque

World Neurosurg. 2024 May 16:S1878-8750(24)00819-2. doi: 10.1016/j.wneu.2024.05.055. Online ahead of print.

Objective: The purpose of this report is to describe a case series of children undergoing selective dorsal rhizotomy (SDR) for treatment of spastic cerebral palsy in Vietnam. Also described is an international cooperation model to facilitate the development of a new, multi-disciplinary team for evaluation and treatment of these children. Methods: Details of international collaboration are described, including in-person travel and virtual interactions. All cases of children under 18 undergoing SDR for treatment of spastic cerebral palsy at a single center in Hanoi, Vietnam are described, including pre-operative evaluation of spasticity and gait as well as results at 6 and 12 months. Results are summarized using descriptive statistics. Results: Since the beginning of cooperation in training and transferring SDR techniques by experts from the United States, in the period from June 2016 to December 2022, 18 SDR surgeries were performed in Hanoi. Age ranged from 2-14 years; 13 were male and 5 were female. Overall, approximately 60% of nerve rootlets were cut. Modified Ashworth scores at 6- and 12-months post-surgery in the hip, knee, and ankle joints showed improvement from pre-operative values. There were two recorded complications: intracranial hypotension causing subdural hemorrhage and a case of skin infection at the incision site. Conclusion: The ongoing international cooperation between Vietnamese and American physicians has helped improve the surgical treatment of spasticity in children with cerebral palsy in Hanoi, providing children with a surgical treatment option with successful outcomes.

PMID: 38762026

29. Early Detection and Intervention for Children with High Risk of Cerebral Palsy: A Survey of Physical Therapists and Occupational Therapists in Brazil

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Phys Occup Ther Pediatr. 2024 May 19:1-15. doi: 10.1080/01942638.2024.2353124. Online ahead of print.

Aims: The purpose of this study was to assess the current clinical practice of physiotherapists and occupational therapists on early detection and early intervention for children with cerebral palsy (CP) in Brazil. Methods: This was a cross-sectional study. A purpose-developed electronic survey was disseminated across the country to physiotherapists and occupational therapists working with young children with or at risk of CP. Results: A total of 205 anonymous respondents were included. Most participants (64.4%) agree that the diagnosis of CP can be made before 6 months of age. General Movements Assessment (26.8%) and Hammersmith Infant Neurological Examination (37.1%) were used infrequently. Infants at risk for CP receive therapy twice a week or more by 58.5% of therapists, 93.2% identified parents' goals as the most important factor in customizing the early intervention program. The most frequent intervention strategies for this age group were active stimulation of the child (n = 182), family training (n = 161), strategies to optimize the environment (n = 143), and neurodevelopmental treatment/Bobath (n = 99). Conclusions: Currently, pediatric physiotherapists and occupational therapists in Brazil do not fully incorporate best practice tools for early identification of children with CP, nor sufficient best evidence-based interventions.

PMID: 38764324

30. 'We did everything by phone': a qualitative study of mothers' experience of smartphone-aided screening of cerebral palsy in Kathmandu, Nepal

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BMC Pediatr. 2024 May 22;24(1):357. doi: 10.1186/s12887-024-04829-5.

Background: International guidelines recommend early intervention to all children at risk of cerebral palsy, but targeted screening programs are often lacking in low- and middle-income settings with the highest burden of disease. Smartphone applications have the potential to improve access to early diagnostics by empowering parents to film their children at home followed by centralized evaluation of videos with General Movements Assessment. We explored mothers' perceptions about participating in a smartphone aided cerebral palsy screening program in Kathmandu, Nepal. Methods: This is an explorative qualitative study that used focus group discussions (n = 2) and individual interviews (n = 4) with mothers of term-born infants surviving birth asphyxia or neonatal seizures. Parents used the NeuroMotion™ smartphone app to film their children at home and the videos were analysed using Precthl's General Movements Assessment. Sekhon et al.'s framework on the acceptability of health care interventions guided the design of the group discussions and interviews, and the deductive qualitative content analysis. Results: Mothers were interested in engaging with the programme and expressed hope it would benefit their children. Most felt using the app was intuitive. They were, however, unclear about the way the analysis was performed. Support from the research team was often needed to overcome an initial lack of self-confidence in using the technology, and to reduce anxiety related to the follow-up. The intervention was overall perceived as recommendable but should be supplemented by a face-to-face consultation. Conclusion: Smartphone aided remote screening of cerebral palsy is acceptable in a lower middle-income population but requires additional technical support.

PMID: 38778316

31. Caregiver Knowledge, Attitude, and Behavior toward Care of Children with Cerebral Palsy: A Saudi Arabian Perspective

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Healthcare (Basel). 2024 May 10;12(10):982. doi: 10.3390/healthcare12100982.

The care of children with cerebral palsy (CP) requires a complex system of care that is not only dependent on health care resources, but is also strongly influenced by social and cultural attributes. Hence, it is important to explore the understanding and practices of caregivers within a regional perspective. This study was conducted to investigate the knowledge, attitude, and behavior (KAB) of parents with children diagnosed with CP in Saudi Arabia. A cross sectional survey was conducted on the caregivers of children with CP admitted for inpatient rehabilitation between October 2023 to January 2024. A total of 216 caregivers participated in this survey. About 82.9% of caregivers were the mothers of CP children, half (50.5%) were ≤36 years old, 53.7% were highly educated, and 89.2% lived in urban areas. More than half of the participants (57.7%) owned their homes. Regarding children, spastic quadriplegia was the most common type (46.3% of cases). Overall, the participants recorded good values for all variables for KAB. The mean value for attitude was higher (2.67 ± 0.20) when compared to behavior (2.49 ± 0.36) and knowledge (2.46 ± 0.25). Participants who had children with spastic quadriplegia CP reported lower behavior scores than their peers. Strategies with a special emphasis on improving the behaviors of caregivers for children with quadriplegia need to be adapted. Similarly, the living situations of families need to be taken into consideration given its significant association with the attitude of caregivers. A considerable lack of knowledge in handling emergency situations by caregivers signifies a gap in care, which could have potentially life-threatening consequences.

PMID: 38786393

32. Postnatal Growth Assessment and Prediction of Neurodevelopment and Long-Term Growth in Very Low Birth Weight Infants: A Nationwide Cohort Study in Korea

Min Soo Kim, Ji Won Koh, Jeongmin Shin, Sae Yun Kim

J Clin Med. 2024 May 16;13(10):2930. doi: 10.3390/jcm13102930.

Background/Objectives: Extrauterine growth restriction (EUGR) is associated with high mortality and an increased incidence of poor neurodevelopmental outcomes in preterm infants. In this study, we aimed to compare the Intergrowth-21ST (IG-21ST) and Fenton charts in predicting long-term neurodevelopmental and anthropometric outcomes of very low birth weight (VLBW) infants. Methods: Data were collected from 2649 VLBW infants registered in the Korean Neonatal Network born between 240/7 and 316/7 weeks of gestational age from January 2013 to December 2017. Follow-up assessments were conducted at 18-24 months of age, corrected for prematurity. Multiple logistic regression analysis was performed to evaluate the association between EUGR and long-term outcomes. Results: Among the 2649 VLBW infants, 60.0% (1606/2649) and 36.9% (977/2649)

were diagnosed as having EUGR defined by the Fenton chart (EUGRF) and by the IG-21ST chart (EUGRIG), respectively. The EUGRIG group exhibited a higher proportion of infants with cerebral palsy, neurodevelopmental impairment (NDI), and growth failure. In multiple logistic regression analysis, adjusted for risk factors for long-term outcome, the EUGRIG group showed higher risk of cerebral palsy (adjusted odds ratio [aOR], 1.66; 95% confidence interval [CI], 1.04-2.65), NDI (aOR, 2.09; 95% CI, 1.71-2.55), and growth failure (aOR, 1.57; 95% CI, 1.16-2.13). Infants with EUGRF tended to develop NDI (aOR, 1.29; 95%CI, 1.03-1.63) and experience growth failure (aOR, 2.44; 95% CI, 1.77-3.40). Conclusions: The IG-21ST chart demonstrated a more effective prediction of long-term neurodevelopmental outcomes, whereas the Fenton chart may be more suitable for predicting growth failure at 18-24 months.

PMID: 38792471

33. Identifying Opportunities for Early Detection of Cerebral Palsy

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Children (Basel). 2024 Apr 25;11(5):515. doi: 10.3390/children11050515.

This study aimed to evaluate assessment and referral practices for the early detection and diagnosis of children at risk for or with cerebral palsy (CP) by health care and education providers in Maryland and Delaware. A secondary aim was to identify barriers for using early detection tools and identify opportunities for change to support early diagnosis and improve care. Seventy-two participants answered ≥ 50% of the survey questions. Most were occupational or physical therapists (86%) working in early intervention (61%). Eighty-eight percent indicated awareness that CP can be diagnosed by 12 months. Though 86% stated they typically suspect a diagnosis of CP between 0 and 12 months, only 19% reported that their patients received a CP diagnosis < 12 months. The Developmental Assessment of Young Children (73%) and the Peabody Developmental Motor Scales-2 (59%) were used most. Many respondents indicated never using magnetic resonance imaging (70%), the General Movements Assessment (87%), or the Hammersmith Infant Neurological Exam (69%). Participants identified clinical signs and symptoms prompting a referral for the diagnostic assessment of CP, most commonly stiffness in legs (95%), excessive head lag (93%), and persistent fisting (92%). Policy and organizational change, clinician education, and training are needed to support the implementation of CP early detection guidelines.

PMID: 38790510

34. Neonatal resveratrol treatment in cerebral palsy model recovers neurodevelopment impairments by restoring the skeletal muscle morphology and decreases microglial activation in the cerebellum

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Exp Neurol. 2024 May 23:378:114835. doi: 10.1016/j.expneurol.2024.114835. Online ahead of print.

Cerebral Palsy (CP) is the main motor disorder in childhood resulting from damage to the developing brain. Treatment perspectives are required to reverse the primary damage caused by the early insult and consequently to recover motor skills. Resveratrol has been shown to act as neuroprotection with benefits to skeletal muscle. This study aimed to investigate the effects of neonatal resveratrol treatment on neurodevelopment, skeletal muscle morphology, and cerebellar damage in CP model. Wistar rat pups were allocated to four experimental groups (n = 15/group) according CP model and treatment: Control+Saline (CS), Control+Resveratrol (CR), CP + Saline (CPS), and CP + Resveratrol (CPR). CP model associated anoxia and sensorimotor restriction. CP group showed delay in the disappearance of the palmar grasp reflex ($p < 0.0001$) and delay in the appearance of reflexes of negative geotaxis ($p = 0.01$), and free-fall righting ($p < 0.0001$), reduced locomotor activity and motor coordination ($p < 0.05$) than CS group. These motor skills impairments were associated with a reduction in muscle weight ($p < 0.001$) and area and perimeter of soleus end extensor digitorum longus muscle fibers ($p < 0.0001$), changes in muscle fibers typing pattern ($p < 0.05$), and the cerebellum showed signs of neuroinflammation due to elevated density and percentage of activated microglia in the CPS group compared to CS group ($p < 0.05$). CP animals treated with resveratrol showed anticipation of the appearance of negative geotaxis and free-fall righting reflexes ($p < 0.01$), increased locomotor activity ($p < 0.05$), recovery muscle fiber types pattern ($p < 0.05$), and reversal of the increase in density and the percentage of activated microglia in the cerebellum ($p < 0.01$). Thus, we conclude that neonatal treatment with resveratrol can contribute to the recovery of the delay neurodevelopment resulting from experimental CP due to its action in restoring the skeletal muscle morphology and reducing neuroinflammation from cerebellum.

PMID: 38789024

35. Update in Pediatric Neurocritical Care: What a Neurologist Caring for Critically Ill Children Needs to Know

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Semin Neurol. 2024 May 24. doi: 10.1055/s-0044-1787047. Online ahead of print.

Currently nearly one-quarter of admissions to pediatric intensive care units (PICUs) worldwide are for neurocritical care diagnoses that are associated with significant morbidity and mortality. Pediatric neurocritical care is a rapidly evolving field with unique challenges due to not only age-related responses to primary neurologic insults and their treatments but also the rarity of pediatric neurocritical care conditions at any given institution. The structure of pediatric neurocritical care services therefore is most commonly a collaborative model where critical care medicine physicians coordinate care and are supported by a multidisciplinary team of pediatric subspecialists, including neurologists. While pediatric neurocritical care lies at the intersection between critical care and the neurosciences, this narrative review focuses on the most common clinical scenarios encountered by pediatric neurologists as consultants in the PICU and synthesizes the recent evidence, best practices, and ongoing research in these cases. We provide an in-depth review of (1) the evaluation and management of abnormal movements (seizures/status epilepticus and status dystonicus); (2) acute weakness and paralysis (focusing on pediatric stroke and select pediatric neuroimmune conditions); (3) neuromonitoring modalities using a pathophysiology-driven approach; (4) neuroprotective strategies for which there is evidence (e.g., pediatric severe traumatic brain injury, post-cardiac arrest care, and ischemic stroke and hemorrhagic stroke); and (5) best practices for neuroprognostication in pediatric traumatic brain injury, cardiac arrest, and disorders of consciousness, with highlights of the 2023 updates on Brain Death/Death by Neurological Criteria. Our review of the current state of pediatric neurocritical care from the viewpoint of what a pediatric neurologist in the PICU needs to know is intended to improve knowledge for providers at the bedside with the goal of better patient care and outcomes.

PMID: 38788765

36. Helicobacter pylori Infection in Children With Cerebral Palsy: A Cross-Sectional Study

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Pediatr Neurol. 2024 May 3:156:170-177. doi: 10.1016/j.pediatrneurol.2024.04.024. Online ahead of print.

Background: Children with cerebral palsy (CP) frequently have associated disorders and complications, including gastrointestinal problems. Helicobacter pylori is a common infection worldwide, frequently associated with gastrointestinal manifestations. Methods: To estimate the prevalence of H. pylori infection in children with CP, a cross-sectional study over an eight-month period was performed in the pediatric neurology outpatient clinic of Tanta University Hospital. The study included 100 patients with CP aged two to 17 years. All patients were tested for H. pylori antigen in stool by enzyme-linked immunosorbent assay. Results: The mean age of studied children with CP was 7.03 ± 4.1 years; there were 57 males and 43 females. Spastic quadriplegic CP was the most common type of CP (34%). Forty-five children with CP were positive for H. pylori antigen in stool. Intellectual disability (ID), low sociodemographic scoring system, semisolid diet, and Eating and Drinking Ability Classification System (EDACS) levels 4 and 5 were significant predictors of H. pylori infection (odds ratio of 1.86, 2.63, 12, and 1.77, respectively, $P < 0.05$). Vomiting, abdominal pain, and gastrointestinal tract bleeding were significantly more frequent in H. pylori-infected children with CP than noninfected children with CP (P value < 0.05) CONCLUSION: H. pylori is a relatively common infection among children with CP. The main risk factors for H. pylori infection were low socioeconomic level, ID, semisolid diet, and EDACS levels 4 and 5.

PMID: 38788279

37. Human Cytomegalovirus Infection and Neurocognitive and Neuropsychiatric Health

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Review Pathogens. 2024 May 16;13(5):417. doi: 10.3390/pathogens13050417.

A common infection, human cytomegalovirus (HCMV) has been associated with a variety of human diseases, including cardiovascular disease and possibly certain cancers. HCMV has also been associated with cognitive, psychiatric, and neurological conditions. Children with congenital or early-life HCMV are at risk for microcephaly, cerebral palsy, and sensorineural hearing loss, although in many cases sensorineural loss may resolve. In addition, HCMV can be associated with neurodevelopmental impairment, which may improve with time. In young, middle-aged, and older adults, HCMV has been adversely associated with cognitive function in some but not in all studies. Research has linked HCMV to Alzheimer's and vascular dementia, but again not all findings consistently support these associations. In addition, HCMV has been associated with depressive disorder, bipolar disorder, anxiety, and autism-spectrum disorder, although the available findings are likewise inconsistent. Given associations between HCMV and a variety of neurocognitive and neuropsychiatric disorders, additional research investigating reasons for the considerable inconsistencies in the currently available findings is needed. Additional meta-analyses and more longitudinal studies are needed as well. Research into the effects of antiviral medication on cognitive and neurological outcomes and continued efforts in vaccine development have potential to lower the neurocognitive, neuropsychiatric, and neurological burden of HCMV infection.

PMID: 38787269

38. Meta-analysis of the efficacy of Jingjin acupuncture therapy in the treatment of spastic cerebral palsy

Xingyu Kang, Ying Huang, Yi Zheng, Qian Zhang, Rui Gong, Jinlang Tan, Le Ma, Siyu Chen, Xueyan Lv, Shuai Shi

Front Neurol. 2024 May 9:15:1358732. doi: 10.3389/fneur.2024.1358732. eCollection 2024.

Background: This study aimed to systematically evaluate the clinical efficacy of Jingjin (muscle region of the meridian, sinew/tendon/fascia) acupuncture therapy for the treatment of spastic cerebral palsy. Methods: Computer searches of the Cochrane Library, Web of Science, PubMed, Embase, Chinese Biomedical Literature (CBM) Database, Wanfang database, Wipu (VIP) database, and China National Knowledge Infrastructure (CNKI) database for published randomized controlled trial (RCT) studies on Jingjin acupuncture treatment of cerebral palsy from the beginning of the database construction until 30 November 2023 were performed, and the quality of the papers was assessed through independent data extraction by two individuals and then meta-analyzed using RevMan5.4 software. A total of 20 RCTs involving 1,453 patients were included. Results: The overall effective rate of Jingjin acupuncture therapy was better than that of conventional therapy, with a combined odds ratio (OR) of 4.70 and a 95% confidence interval (CI) of [3.05, 7.24]. The Modified Ashworth Spasticity (MAS) Scale, Gross Motor Function Measure (GMFM), Fine Motor Function Measure (FMFM), and Comprehensive Spasticity Scale (CSS) scores are superior to conventional therapy. Conclusion: Jingjin acupuncture therapy is effective in treating spastic cerebral palsy and has better overall efficacy than conventional therapy. Due to the low quality of some of the literature in this study type, more high-quality, well-designed clinical studies are needed to validate it.

PMID: 38784910

39. The use of two or more courses of low-dose systemic dexamethasone to extubate ventilator-dependent preterm neonates may be associated with a higher prevalence of cerebral palsy at two years of corrected age

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Early Hum Dev. 2024 May 20:194:106050. doi: 10.1016/j.earlhumdev.2024.106050. Online ahead of print.

Background: Our objective was to determine whether the use of two or more courses of low-dose systemic dexamethasone for extubation of ventilator-dependent preterm infants after the first week of life, as proposed in the DART study, is associated with greater neurodevelopmental harm at two years of corrected age, compared to a single course. Methods: Retrospective review at seven level III neonatal intensive care units. Preterm infants who underwent only one course of systemic dexamethasone for extubation were grouped into DART-1; those who underwent two or more courses were grouped into DART-2. Data and outcomes of infants in DART-2 were compared with those in DART-1. Results: 150 preterm infants were studied: 104 in DART-1 and 46 in DART-2. Patients in DART-2 had a lower gestational age (25 vs. 26 weeks, p = 0.031) and greater morbidity. The average dexamethasone cumulative dose for patients in DART-1 was 0.819 mg/kg, vs. 1.697 mg/kg for patients in DART-2. A total of 14 patients died. The neuromotor and neurosensory assessments at two years of corrected age revealed in the DART-2 survivors, after the multivariate analysis, a higher prevalence of cerebral palsy with functional motor class 2 (OR = 6.837; 95%CI: 1.054-44.337; p = 0.044) and ophthalmological problems requiring the use of glasses (OR = 4.157; 95%CI: 1.026-16.837; p = 0.046). Conclusions: In this cohort, the use of more than one course of systemic dexamethasone in low doses for extubation of ventilator-dependent premature infants after the first week of life was associated, at two years of corrected age, with a higher prevalence of cerebral palsy with functional motor class 2 and ophthalmological problems requiring the use of glasses.

PMID: 38781715

40. Pharmacological and neurosurgical management of cerebral palsy and dystonia: Clinical practice guideline update

No authors listed

Dev Med Child Neurol. 2024 May 23. doi: 10.1111/dmcn.15979. Online ahead of print.

No abstract available

PMID: 38779827

41. Assessing the Role of Asthma on the Relationship between Neurodevelopmental Disabilities and Adverse Birth Outcomes

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Background: Investigating asthma as an effect modifier between adverse birth outcomes and neurodevelopmental disabilities (NDDs) across different races is crucial for tailored interventions and understanding variable susceptibility among diverse populations. Methods: Data were collected through the National Survey of Children's Health. This cross-sectional study included 131,774 children aged 0 to 17 years. Study exposures comprised adverse birth outcomes including preterm birth and low birth weight. Weighted prevalence estimates and odds ratios with 95% confidence intervals (CIs) among children with and without adverse birth outcomes were calculated for NDDs including attention-deficit/hyperactivity disorder, autism spectrum disorder, cerebral palsy, seizure, and several others including behavior problems. Adjusted odds ratios were stratified by asthma status and separate interactions were assessed for each outcome. Results: Of 131,774 participants, 10,227 were born low birth weight (9.12%; 95% CI: 8.77% to 9.49%), 14,058 were born preterm (11.35%; 95% CI: 10.94% to 11.76%), and 16,166 participants had asthma (11.97%; 95% CI: 11.58% to 12.37%). There were 68,100 males (51.11%), 63,674 females (48.89%), 102,061 non-Hispanic Whites (NHW) (66.92%), 8,672 non-Hispanic Blacks (NHB) (13.97%), and 21,041 participants (19.11%) categorized as other. NHB children with adverse birth outcomes had higher prevalence of several NDDs compared to NHW children. Conclusions: Asthma was not shown to be an effect modifier of the association between adverse birth outcomes and NDDs. Nevertheless, these results suggest that NDDs are more prevalent within US children with adverse birth outcomes, with higher rates among NHB compared to NHW children. These findings support screening for NDDs in pediatric health care settings among patients with adverse birth outcomes, particularly among those from ethnic minority backgrounds.

PMID: 38776595

42. Health care resource use in preschool children with cerebral palsy

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Aim: To estimate the burden of disease and evaluate which factors affect health care resource use (HCRU) in young children with cerebral palsy (CP). Method: Data were collected as part of a prospective, longitudinal cohort study of children with CP born in Queensland, Australia between 2006 and 2009. HCRU questionnaires were administered at six time points. Data on resource use, socio-demographics, and disease severity were collected. Costs were sourced from Medicare, the Australian National Hospital Cost Data Collection, and market prices. A generalized linear model was used to identify factors influencing CP-related costs. Results: A total of 794 questionnaires were completed by 222 participants (mean = 3.6 per participant). Physiotherapy (94%, n = 208) was the most widely accessed allied health care therapy; almost half of the participants (45%; 354 of 794) reported one or more hospital admissions. From the health care funder perspective, a child with CP costs on average A$24 950 per annum (A$12 475 per 6 months). Higher costs were associated with increased motor impairment (Gross Motor Function Classification System, $p < 0.001$) and increased comorbidities ($p = 0.012$). Interpretation: HCRU in preschool children with CP can be analysed according to disease severity. Both increased motor impairments and increased comorbidities were associated with higher health care costs.

PMID: 38773730

43. Epidemiological predictors of quality of life and the role of early markers in children with cerebral palsy: A multi-centric cross-sectional study

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Background: More than 100 million children in the world have at least one type of disability. Among disabled children, approximately 25% of chronic disabilities are of neurological origin. Cerebral Palsy is the leading cause of chronic disability in children, making them not only physically and mentally handicapped but also socially aloof. Methods: This study was conducted among 200 eligible participants from three centers with Child Guidance or Cerebral Palsy clinics in the outpatient department. All the participants were included in the analysis of the epidemiological profile and the role of early markers. Of these, 70 participants were assessed for quality of life according to the age criteria of a pre-tested Cerebral Palsy Quality of Life questionnaire (CP-QOL). Results: Mean ± S.D. age in years was 3.7 ± 2.8. Birth history included 182 (39%) neonatal etiopathology, followed by 173 (38%) perinatal, and 106 (23%) antenatal causes. Mean ± S.D. birth weight was 2.3 ± 1.2 kg. The positive predictors of various domains of Quality of Life were an absence of any associated sensory, neurological,

communication, or psychological disorder or disability. While, the negative predictors were decreasing functional capacity, involvement of number of limbs in increasing order, high therapeutic requirements, and dependency. Conclusion: The association between early diagnosis of cerebral palsy and improved functional capacity, involvement of a lesser number of limbs, better quality of life, and absence of associated disabilities is established from the findings of our study.

PMID: 38772791

44. Facilitators and barriers to learning faced by female students with disability in higher education

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This study was aimed to investigate the learning experiences' facilitators and barriers that is encountered by the physically disabled female students during their higher education. Twenty semi-structured interviews were conducted with female students with physical disabilities aged between 19 and 33 years. Interviews were transcribed, confirmed, and analyzed after being recorded. The average age of the sample was 22.15 ± 3.48 years and one-fourth of the participants' disability was due to cerebral palsy and 35% participants used wheelchairs. All the factors promoted inclusive education and equal opportunities for both disabled and nondisabled students. This study reveals that in order to improve the learning experiences of students with disabilities (SwD) and to give them more opportunities for success, it is important to consider all the barriers discussed in this study. It can be concluded that high effort is required to transform the higher educational institutions to be more accommodating for students with disabilities.

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45. Omega-3 fatty acid diglyceride emulsions as a novel injectable acute therapeutic in neonatal hypoxic-ischemic brain injury

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Hypoxic-ischemic encephalopathy (HIE), resulting from a lack of blood flow and oxygen before or during newborn delivery, is a leading cause of cerebral palsy and neurological disability in children. Therapeutic hypothermia (TH), the current standard of care in HIE, is only beneficial in 1 of 7-8 cases. Therefore, there is a critical need for more efficient treatments. We have previously reported that omega-3 (n-3) fatty acids (FA) carried by triglyceride (TG) lipid emulsions provide neuroprotection after experimental hypoxic-ischemic (HI) injury in neonatal mice. Herein, we propose a novel acute therapeutic approach using an n-3 diglyceride (DG) lipid emulsions. Importantly, n-3 DG preparations had much smaller particle size compared to commercially available or lab-made n-3 TG emulsions. We showed that n-3 DG molecules have the advantage of incorporating at substantially higher levels than n-3 TG into an in vitro model of phospholipid membranes. We also observed that n-3 DG after parenteral administration in neonatal mice reaches the bloodstream more rapidly than n-3 TG. Using neonatal HI brain injury models in mice and rats, we found that n-3 DG emulsions provide superior neuroprotection than n-3 TG emulsions or TH in decreasing brain infarct size. Additionally, we found that n-3 DGs attenuate microgliosis and astrogliosis. Thus, n-3 DG emulsions are a superior, promising, and novel therapy for treating HIE.

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46. Cerebral palsy: A neurodevelopmental disorder with motor disability

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