Cerebral palsy research news

Monday 24 March 2025

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Interventions and Management

1.Selective dorsal rhizotomy from indication to rehabilitation: a worldwide survey

Liza M M van Dijk, K Mariam Slot, Tom F Novacheck, Annemieke I Buizer, Nelleke G Langerak; SDR working group

Childs Nerv Syst. 2025 Mar 17;41(1):133. doi: 10.1007/s00381-025-06786-5.

Purpose: Selective dorsal rhizotomy (SDR) is a neurosurgical treatment used worldwide to reduce spasticity. The procedure has undergone many changes since its introduction in the early 1900s, and currently, different centers vary in many aspects of the procedure. We surveyed centers on different continents regarding SDR indications, surgical techniques, and postoperative rehabilitation.
Methods: Ten centers worldwide with SDR experience participated in an online survey preparing for a pre-conference workshop in 2022. The main topics were patient characteristics, the selection process, surgery, and rehabilitation.
Results: Universal suitable candidates for SDR were patients with bilateral spastic cerebral palsy, Gross Motor Function Classification System levels II or III, ages 5 to 7 years, and adequate strength, motor control, and access to postoperative rehabilitation. Centers differed in additional inclusion and exclusion criteria and the use of diagnostic tools. Both single- and multilevel approaches were used, with electrophysiological monitoring applied in all approaches. Intensive rehabilitation was recommended after surgery, followed by a less intensive program, with variations in duration, therapy frequency, modalities used, and follow-up periods.
Conclusion: This survey demonstrated many similarities in several aspects of the SDR procedure in centers performing SDR worldwide, while considerable variability was also seen. The results emphasize the need for standardized reporting of SDR procedures and outcome measures to enable international comparative studies. A Delphi procedure could be a first step to reaching a consensus on outcome measurements, which may lead to a consensus regarding the most suitable candidates, surgical techniques, and rehabilitation programs to improve functional outcomes.
PMID: 40097710

2.Efficacy of selective dorsal rhizotomy in the treatment of spasticity in children with cerebral palsy: a systematic review and meta-analysis

Iris Otero-Luis, Arturo Martinez-Rodrigo, Iván Cavero-Redondo, Nerea Moreno-Herráiz, Felipe Araya-Quintanilla, Carla Geovanna Lever-Megina, Alicia Saz-Lara

J Neurosurg Pediatr . 2025 Mar 21:1-10. doi: 10.3171/2024.11.PEDS24398. Online ahead of print.

Objective: Spasticity is one of the most prevalent neurological disorders, affecting > 90% of patients with cerebral palsy (CP). Selective dorsal rhizotomy (SDR) is a permanent neurosurgical procedure indicated for the treatment of spasticity. This study aimed to analyze the efficacy of SDR in managing spasticity in children with CP and as well as the efficacy of this therapy over time after the intervention using different scales.
Methods: A comprehensive systematic search was conducted across several databases, spanning from inception to November 5, 2023. Random-effects meta-analyses were used to calculate pooled mean differences and their corresponding confidence intervals to assess the efficacy of SDR using different scales.
Results: All the included studies involved before-after single-arm studies, with the exception of four randomized clinical trials and one quasi-experimental study. The effect of SDR on spasticity, measured with the modified Ashworth scale (MAS) and the Gross Motor Function Measure (GMFM), was significantly improved in children with lower limb spasticity. The efficacy of the treatment was significant up to 12 months posttreatment.
Conclusions: SDR has been demonstrated to be effective in treating children with CP. This efficacy is evidenced by notable improvements, as measured by both the MAS and GMFM. These improvements suggested enhanced mobility and overall quality of life.
PMID: 40117662

3.The Interactive Work of Implementing Synchronous Video-Conference Calls-A Qualitative Study Within Early Intervention for Infants With Childhood-Onset Neurodisability

Phillip Harniess, Anna Purna Basu, Deanna Gibbs, Jeff Bezemer

Health Expect . 2025 Apr;28(2):e70215. doi: 10.1111/hex.70215.

Introduction: This study explores the 'peripandemic' implementation of synchronous videoconference calls during COVID-19 for delivering physiotherapy early intervention services to families of infants with childhood-onset disability. The interactional experience of conducting early intervention through videoconference calls is under researched. We aimed to understand parents' and therapists' experiences of communication and learning within early intervention sessions for infants with cerebral palsy conducted via video conference calls.
Methods: Data were collected through interviews, video case studies and focus groups involving 15 parents and 16 therapists. We used qualitative analytical methods inspired by grounded theory and multimodality.
Results: Undertaking early intervention sessions via synchronous videoconference calls creates complexities and disrupts communication norms between parent, therapist and infant. These audio-visual constraints have implications for developing shared understanding and learning. Resolving these challenges necessitated increased interactive work within the parent-therapist partnership. The onus placed on parents to have additional logistical roles in some circumstances created strain, which diverted attention from optimal learning.
Conclusion: The post-pandemic healthcare landscape pushes for digital innovation challenging traditional therapy models. Our contribution outlines that while videoconference calls may improve efficiency, they also add cognitive load and interaction challenges, which require modification to routine in-person session designs. We provide recommendations for adaptive implementation strategies for videoconference calls that will benefit from further iterative codesign cycles.
Public and patient contribution: We partnered with parents through public and patient involvement. Parents (n = 9) who were previous NHS early intervention service users formed the Parent Advisory Group (PAG). These parent partners came from a variety of backgrounds and provided their unique perspectives to directly contribute and guide decision-making throughout the project. Their contribution influenced approach to recruitment and consent; the participant information and consent form development; topic guide development; considerations of the use of video in the project design and sense checking of analytical interpretations.
PMID: 40108845

4.Satisfactory long-term functional and radiological outcomes following hip reconstructive surgery in children with cerebral palsy

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J Pediatr Rehabil Med . 2025 Mar 20:18758894251316072. doi: 10.1177/18758894251316072. Online ahead of print.

Abstract
PurposeThis study aimed to evaluate long-term functional and radiological outcomes as well as parents' perception of change and overall satisfaction following hip reconstructive surgery in children with cerebral palsy (CP).MethodsMedical charts of children between three and 18 years of age with CP who had surgery between 1993 and 2014 by the same surgeon were reviewed. The study sample consisted of 44 children (Gross Motor Function Classification System levels I-V) aged 2-18 years representing 60 hips. Mean follow-up was 8.4 years [1.8-17.5]. A final follow-up evaluation was held to obtain post-operative anteroposterior pelvic radiographs and administer patient-reported outcomes to the caregivers.ResultsCare and Comfort Hypertonicity Questionnaire scores showed that 74-79% of caregivers reported no difficulty post-surgery in terms of child's pain or discomfort during position changes, when participating in general activities, or during sleep. The Lower Extremity Parent-Rated Change Form showed that 58-76% of caregivers reported a better status in their child's overall health, leg function, activity level, and pain post-surgery. Seventy-six percent of the caregivers indicated satisfaction with the overall changes since the surgery. For the 45 hips with both pre-operative and follow-up radiological outcomes, migration percentage improved significantly ($p < 0.001$) by 36.7%, and there was a 62.2% increase in the number of hips that were located post-operatively compared to pre-operatively. Acetabular coverage improved significantly ($p < 0.001$) from non-covered to covered in 46.7% of the hips and Shenton's line improved significantly ($p < 0.001$) from non-intact to intact in 66.7% of the hips.ConclusionHip reconstructive surgery improved long-term functional and radiological outcomes, as well as quality of life for children and caregivers, while changes were perceived as satisfactory to the families. Evaluating pain, function, and satisfaction is important to measure the impact of hip reconstructive surgery on daily life.
PMID: 40111898

5.Anthropometric-related percentile curves for muscle size and strength of lower limb muscles of typically developing children

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J Anat . 2025 Mar 17. doi: 10.1111/joa.14241. Online ahead of print.

Abstract
Muscle size and muscle strength gradually increase during childhood to meet the demands of a growing body. Therefore, the aim of this investigation was to establish anthropometric-related percentile curves for muscle size and strength in a cohort of typically developing (TD) children. Lower limb muscle size and strength were assessed in a large cross-sectional cohort of TD children with 3D freehand ultrasound (four muscles, n = 153 children with in total 156 measurements, male/female = 85/71, age range: 0.6-17.8 years) and fixed dynamometry (seven muscle groups, n = 153 children, male/female = 108/45, age range: 4.5-16.1 years), respectively. Generalized additive models for location, scale, and shape were used to estimate anthropometric-related, that is, body mass and height, TD percentile curves, and to convert absolute outcomes into unit-less z-scores. The results showed that both muscle size and strength, as well as their inter-subject variation, increased with increasing anthropometric values. The mean z-score of the TD children was approximately 0 ± 1 standard deviation (with the largest range from minimum to maximum of approximately -3 to 3) for all investigated muscle outcomes, confirming the fit of the percentile curves to the TD data. The use of the percentile curves was demonstrated through applications in children with cerebral palsy (CP) and Duchenne muscular dystrophy (DMD). The individual patients with CP and DMD exhibited negative z-scores, indicating muscle size and strength deficits in reference to TD peers. The established anthropometric-related percentile curves for muscle size and strength in a cohort of TD children allow for muscle outcomes to be expressed as unit-less z-scores, independent of body size, and relative to TD peers. This approach facilitates the interpretation of muscle size and strength outcomes, enabling the detection of abnormalities or deficits, monitoring of progression, and evaluation of treatment and intervention effectiveness in TD children, as well as in children with genetic, chronic neurological, or muscular disorders.
PMID: 40098309

6.An Analysis of Reoperations Following Proximal Femoral Varus Derotational Osteotomy in Children with Cerebral Palsy

Sam P Wimmer, Natalie L Zusman, Tishya A L Wren, Rachel Y Goldstein, Robert M Kay

JB JS Open Access . 2025 Mar 18;10(1):e23.00159. doi: 10.2106/JBJS.OA.23.00159. eCollection 2025 Jan-Mar.

Background: Hip displacement is common in children with cerebral palsy (CP). The existing literature has focused on native-hip longevity in patients with CP. This study investigated the reoperation-free rate of hips in children with CP following index proximal femoral varus derotational osteotomy (VDRO).
Methods: We conducted a retrospective cohort study of patients with CP who were <18 years of age and underwent VDRO surgery at a tertiary referral center between January 2004 and January 2022, and who were followed for at least 2 years after the index surgery. Two hundred and eighty-nine patients (518 hips) met the inclusion criteria. Any return to the operating room for a same-site procedure counted as a reoperation, apart from elective hardware removal undertaken while the patient underwent a distinctly separate procedure. Reoperation rates and odds ratios (ORs) were calculated. Analyses were carried out using logistic regression and Cox proportional hazard models.
Results: We found a 29.2% rate of reoperation (151 reoperations among 518 hips). The reoperation rate was greatest for patients functioning at Gross Motor Function Classification System (GMFCS) level V (32.2% for level V, 27.8% for level IV, and 25.5% for level II/III), although the difference did not reach significance ($p = 0.73$). Hips in patients ≥6 years of age were significantly less likely to require reoperation than in those <6 years of age (23.1% versus 46.0%; $p < 0.01$). Bilateral index procedures (OR, 3.68 [95% confidence interval (CI), 1.68 to 8.04]; $p < 0.01$) significantly increased the risk of reoperation, regardless of operative side (31.1% right versus 32.3% left; $p = 0.84$). Additionally, operations on the left hip (OR, 1.24; 95% CI, 1.04 to 1.48; $p = 0.02$) had an increased risk of reoperation compared with those on the right.
Conclusions: The frequency of reoperation in this large cohort was 29.2%, which is similar to previously published rates. An age of <6 years at the index surgery, operation on the left hip, and bilateral VDRO were the only significant risk factors for reoperation; however, there was a nonsignificant stepwise increase in the reoperation rate with increasing GMFCS level. These findings enhance a surgical team's ability to optimize counseling for families and patients with CP regarding the frequency and timing of additional hip surgery.
PMID: 40104244

7.Using Radial Shock Wave Therapy to Control Cerebral Palsy-Related Dysfunctions: A Randomized Controlled Trial

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Clinical Trial Int J Gen Med . 2025 Mar 12:18:1439-1450. doi: 10.2147/IJGM.S510383. eCollection 2025.

Background: Radial Shock wave Therapy (rSWT) is one of the recent promising modalities that can effectively improve muscle tone, ROM, and enhance functional capacity. It can be used to augment the rehabilitation effectiveness in spastic CP children. So, enhance their engagement in community and participation in social activities and decrease economic burden of rehabilitation.
Purpose: To investigate the effect of adding rSWT to standard physical therapy on muscular spasticity, ROM, gross motor function, and planter surface in spastic CP patients.
Methods: A total of 70 children (48 girls and 22 boys) with spastic CP were randomly assigned into the control group (n= 35 and average age 8.82±0.91) which received standard physical therapy and the rSWT group (n=35 and average age 9.0±1.81) which received the standard physical therapy plus 1500 rSWT shocks with 2 bar pressure and Hz frequency applied over acupuncture points. Passive ankle ROM, calf muscle tone, gross motor function (D and E categories), plantar surface area (PSA), and peak pressure values at midfoot (PPMF), and hindfoot (PPHF) were assessed at baseline, post-treatment, and three-month follow-up.
Results: Between-group comparisons demonstrated post-treatment statistically significant differences in ankle plantar flexion (APF), walking category of the GMFM (GMFM-E), PPHF, and PPMF with medium to high effect size values favoring the rSWTG ($p=0.011$, $d=0.858$; $p=0.003$, $d=1.02$; $p=0.035$, $d=0.577$; $p=0.049$, $d= 0.216$, respectively). At follow-up, all outcomes were statistically significantly different ($p<0.05$).
Conclusion: rSWT is an effective addition to the standard physical therapy care for spastic CP children in favor of spasticity, ROM, and function.
PMID: 4009890

8.Exploring the impact of dance: intersectoral quantitative and qualitative methodological challenges, lessons learned, and recommendations

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Disabil Rehabil . 2025 Mar 20:1-15. doi: 10.1080/09638288.2025.2478310. Online ahead of print.

Dance-based interventions/programs are gaining popularity; however, interventions are rarely explicitly described, including the role of dance facilitators, and their effects can be difficult to measure.
Methods: To address these issues, our intersectoral team collected quantitative and qualitative data. via a non-randomized pre-post study for six dance groups (teenagers with cerebral palsy, children with cerebral visual impairment, adults receiving outpatient physical rehabilitation, adults with Parkinson's disease, women who were formerly unsheltered, and community-dwelling older adults) outcome measures (heart rate variability-HRV, Multidimensional Outcome Expectation for Exercise Scale, Physical Activity Enjoyment Scale, Flow Sate Scale, and an in-house questionnaire) were collected with 34 participants up to five times to explore changes over time. Interviews, ethnographic observations, video recording and a qualitative thematic analysis were also conducted to describe the pedagogical strategies of one dance facilitator.
Results: HRV data were deemed unusable and other quantitative outcomes did not demonstrate statistically significant trends. Qualitative thematic analysis revealed important information about the adaptive verbal and non-verbal interactions between the facilitator and participants, linking to pleasure, effort, and body engagement.
Discussion/conclusion: Even without significant trends quantitatively, results were encouraging, and qualitative analyses were illuminating. Lessons learned and recommendations for future dance research and policymakers are included.
Plain language summary
Statistically significant quantitative improvements in well-being and targeted health-related outcome measures following 10 to 12-week dance programs were not found despite participants reporting pleasure and a desire to continue.Dance-based programs may be promising adjunctive modalities for persons with a variety of medical conditions, notably physical disabilities.Behaviors of dance facilitators are likely key to perceived benefits of dance programs.Persons facilitating dance programs for persons with specific needs should ideally have dance training as an artform, and in some cases, health professional training.
PMID: 40110635

9.Association of Enteral Feed Type with Neurodevelopmental and Neonatal Outcomes among Infants Born Preterm

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J Pediatr. 2025 Mar 13:114536. doi: 10.1016/j.jpeds.2025.114536. Online ahead of print.

Objective: To examine associations between enteral feed type with neurodevelopmental and neonatal outcomes among infants born preterm.
Study design: This was a retrospective study of enteral feeds in the first 28 postnatal days in infants born <29 weeks' gestation from 2015 through 2020 in neonatal units of the Canadian Neonatal Network and Canadian Neonatal Follow-Up Network. Feeds were examined as a compositional variable comprised of the proportion of days fed mother's milk, donor milk, mixed feeds, and nil per os (NPO), the proportions of which sum to 1. Associations between enteral feed type with neurodevelopmental outcomes at 18 to 24 months corrected age and neonatal morbidities were examined.
Results: Our cohort included 2104 infants with a mean (SD) gestational age of 26.2 (1.5) weeks (52.9% male). Compositional data analysis revealed a one-day reallocation from mother's milk to donor milk was associated with greater odds of cognitive (aOR: 1.028, 95%CI: 1.001, 1.056) and language impairment (aOR: 1.024, 95%CI: 1.002, 1.047). Replacing one day of mixed feeds, donor milk or NPO with mother's milk was associated with improved cognitive, language and motor development. A one-day reallocation of NPO to either mother's milk, mixed feeds or donor milk decreased odds of significant neurodevelopmental impairment, cerebral palsy and/or necrotizing enterocolitis.
Conclusions: Donor milk in place of mother's milk was associated with poorer cognitive and language development. Providing any human milk reduced neurodevelopmental impairment and necrotizing enterocolitis with reallocations involving mother's milk yielding the most benefit. Promoting early enteral nutrition with mother's milk should be a priority in the care of infants born preterm.
PMID: 40089177

10.Eating and drinking abilities and respiratory and oral health in children and young adults with cerebral palsy

No authors listed

Dev Med Child Neurol . 2025 Mar 18. doi: 10.1111/dmcn.16300. Online ahead of print.

No abstract available
PMID: 40100907

11.Influence of oromotor functions on motor development and feeding outcomes in children with cerebral palsy

Amira F Ibrahim, Sara Y Elsebahy, Monira I Aldhahi, Mai M Khalaf, Ahmed A Torad, Mona Mohamed Taha, Amira F El-Sheikh

Ann Med . 2025 Dec;57(1):2479587. doi: 10.1080/07853890.2025.2479587. Epub 2025 Mar 19.

Background/objective(s): Children with cerebral palsy often face feeding and swallowing issues, the most common of which include aspiration during feeding and potential pulmonary complications. This impairment can influence other areas of development, including gross motor function, fine motor skills, and oromotor functions involved in feeding and swallowing. This study aimed to investigate the relationship between the level of gross motor function, feeding level, oromotor structural dysfunction, tongue thrust, and eating performance in children with cerebral palsy (CP).
Patients/materials and methods: This cross-sectional study included a total of fifty-five children diagnosed with spastic diplegic cerebral palsy, with a mean age of 4.84 years and a mean weight of 12.46 kg. Participants' ages ranged from 2 to 14 years. All patients underwent evaluations to determine their level of gross motor function using the Gross Motor Function Classification System (GMFCS), feeding level assessed using the Functional Oral Intake Scale, assessment of oromotor structural dysfunction using the Orofacial Motor Functional Assessment Scale, tongue thrust using the Tongue Thrust Rating Scale, and feeding performance using the Oral Motor Assessment Scale.
Results: Correlational analysis revealed that children with better gross motor function tended to exhibit improved feeding levels, orofacial motor function, and feeding performance ($p < 0.05$); however, no significant relationship was observed between gross motor function and tongue thrust. Regression models showed moderate positive correlations for age, weight, and height, with respective R2 values of 0.21, 0.23, and 0.28, indicating some influence on outcomes, but with much unexplained variability.
Conclusions: Gross motor function significantly influences feeding and orofacial motor function. These findings suggest that individuals with higher feeding levels tend to have better overall orofacial motor function and feeding performance. Understanding these relationships can inform interventions aimed at improving feeding outcomes and the overall quality of life of children with CP.
PMID: 40105092

12.Long-term outcomes of intraventricular baclofen therapy for medically refractory generalized secondary dystonia

Joyce Koueik, Tenzing Lhamo, Emily Meyer, Susan Hubanks, Brandon G Rocque, A Leland Albright

J Neurosurg Pediatr . 2025 Mar 21:1-6. doi: 10.3171/2024.12.PEDS24418. Online ahead of print.

Objective: Intrathecal baclofen (ITB) is commonly used to treat secondary generalized dystonia. Intraventricular baclofen (IVB) has been shown to be a safe alternative treatment with low complications. The objective of this study was to report the long-term effects of IVB.
Methods: This retrospective analysis included patients who underwent IVB therapy from April 2005 to June 2024. The decision to use IVB and the surgical technique have been previously described. Data collection included sex, race, etiology of dystonia, Gross Motor Functional Classification System scores, Barry-Albright Dystonia Scale (BADS) scores, Ashworth Scale scores, medical and surgical management of dystonia, follow-up duration, and complications. Patients whose IVB pump was removed within 1 year and those with less than 1 year of follow-up were excluded.
Results: Thirty-six patients with IVB were identified, and 27 patients (median age 12.9 years) were ultimately included. The most common cause of secondary dystonia was cerebral palsy in 21 patients (78%), followed by metabolic and neurodegenerative disorders in 4 (14%), infection in 1 (4%), and severe traumatic brain injury (TBI) in 1 (4%). The follow-up duration ranged from 1.2 to 16.7 years, with a median of 7.7 years and mean of 8.4 years. The baclofen dosage was twice as high in patients with metabolic and neurodegenerative disorders compared with those with cerebral palsy, TBI, and infection, with median dosages of 1455 µg/day and 725 µg/day, respectively. Both posttreatment BADS and Ashworth Scale scores showed statistically significant improvement. Complications included infection that necessitated pump removal in 1 patient (4%), wound dehiscence that was treated with wound revision and antibiotics in 1 patient (4%), and hydrocephalus that required CSF diversion in 4 patients (15%). In 2 patients, IVB therapy was ineffective at controlling dystonia and, thus, was discontinued after 1.3 and 2.7 years. One patient asked for the pump to be removed after 1.2 years due to "does not like the physical pump itself." Four patients (15%) developed hydrocephalus, which required CSF diversion via a ventriculoperitoneal shunt in 3 patients and a lumboperitoneal shunt in 1 patient, with no further shunt or IVB complications.
Conclusions: IVB is well tolerated in patients with generalized secondary dystonia refractory to conventional medical therapy, ITB, and deep brain stimulation. Positive long-term outcomes were reported in this cohort, with significant improvement in dystonia and overall complication rates similar to those reported with ITB.
PMID: 40117664

13.Evaluating the impact of school-based rebound therapy on chest health in children and young people with neurodisability and respiratory issues: a series of single case studies

Rachel Knight Lozano, Harriet Shannon, Kayleigh Bell, Julia Melluish, Christopher Morris, Rachel Rapson, Jonathan Marsden

Disabil Rehabil . 2025 Mar 22:1-12. doi: 10.1080/09638288.2025.2479080. Online ahead of print.

Purpose: To evaluate feasibility and impact of an individualised rebound therapy programme on chest health in children with complex neurodisability.
Methods and materials: A single-case ABA design was conducted over 18 weeks with five children aged 5-15 years with complex neurodisability. Intervention involved twice weekly rebound therapy for six consecutive weeks in school. Summary outcomes included parent/carer-reported chest health, quality-of-life and clinician-observed motor ability. Serial weekly outcomes included chest health observations, usual care changes, adherence and adverse events. Parents completed a semi-structured interview after follow-up. Quantitative data were analysed descriptively and qualitative data were analysed using thematic analysis.
Results: Within-case and across-case findings indicated improvement in motor ability following rebound therapy intervention. Additional trends of improvement were noted in parent/carer-reported chest health and quality-of-life, but these changes were not specific to the intervention phase. Improvements in motor ability, chest health and quality-of-life indicators were verified through qualitative interview data.
Conclusion: Co-design successfully informed an inclusive, feasible intervention study for children with complex neurodisability. However, overall improvement in parent/carer-reported chest health, quality-of-life and observed motor ability were not limited to the intervention phase. Measurement tools lacked published thresholds to determine if changes were clinically significant.
Plain language summary
Rebound therapy is a feasible school-based intervention to promote rehabilitation through physical activity participation in children with complex neurodisability.Selected outcome measures require further psychometric testing to evaluate the impact of this rehabilitation approach effectively.Chest health education, monitoring and communication alongside rebound therapy may positively influence outcomes of rehabilitation, such as quality of life.Co-design and safety monitoring is necessary to address challenges of implementing rehabilitation research in children with complex neurodisability.
PMID: 40119636

14.Deep learning-based classification of hemiplegia and diplegia in cerebral palsy using postural control analysis

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Sci Rep . 2025 Mar 14;15(1):8811. doi: 10.1038/s41598-025-93166-3.

Abstract
Cerebral palsy (CP) is a neurological condition that affects mobility and motor control, presenting significant challenges for accurate diagnosis, particularly in cases of hemiplegia and diplegia. This study proposes a method of classification utilizing Recurrent Neural Networks (RNNs) to analyze time series force data obtained via an AMTI platform. The proposed research focuses on optimizing these models through advanced techniques such as automatic parameter optimization and data augmentation, improving the accuracy and reliability in classifying these conditions. The results demonstrate the effectiveness of the proposed models in capturing complex temporal dynamics, with the Bidirectional Gated Recurrent Unit (BiGRU) and Long Short-Term Memory (LSTM) model achieving the highest performance, reaching an accuracy of 76.43%. These results outperform traditional approaches and offer a valuable tool for implementation in clinical settings. Moreover, significant differences in postural stability were observed among patients under different visual conditions, underscoring the importance of tailoring therapeutic interventions to each patient's specific needs.
PMID: 40087338

15.Towards Automatic Assessment of Atypical Early Motor Development?

Ori Ossmy, Georgina Donati, Aman Kaur, Saber Sotoodeh, Gillian Forrester

Review Brain Res Bull . 2025 Mar 18:111311. doi: 10.1016/j.brainresbull.2025.111311. Online ahead of print.

Abstract
Atypical motor development is an early indicator for several neurodevelopmental conditions, including cerebral palsy and Rett Syndrome, prompting early diagnosis and intervention. While not currently part of the diagnostic criteria for other conditions like Autism Spectrum Disorder, the frequent retrospective diagnosis of motor impairments alongside these conditions highlights the necessity of a deeper understanding of the relationship between motor and cognitive development. Traditional clinical assessments, while considered the gold standard, rely on movement characteristics discernible to the trained eye of professionals. The emergence of automated technologies, including computer-vision and wearable sensors, promises more objective and scalable detections. However, these methods are not without challenges, including concerns over data quality, generalizability, interpretability, and ethics. By reviewing recent advances, we highlight the potential and the challenges of integrating automated detections into research and clinical practice. While we agree that these technologies can revolutionize pediatric care, we believe their use must be tempered with caution and supported by clinical expertise to ensure effective outcomes.
PMID: 40112955

16.Communication challenges and use of communication apps among individuals with cerebral palsy

Eva Chang, Yi-Ran Chen

Disabil Rehabil Assist Technol . 2025 Mar 20:1-7. doi: 10.1080/17483107.2025.2481425. Online ahead of print.

Purpose: Verbal communication is the most immediate way of expressing oneself and the fastest way to make a first impression on others. However, for individuals with cerebral palsy (CP), which is generally accompanied by speech impediments, verbal communication can present a major hurdle to social interactions.
Materials and methods: In this study, 10 individuals with CP (four men and six women) and speech impediments were surveyed using questionnaires and semistructured interviews to explore the following four points: (1) communication difficulties in life, (2) communication methods and related problems, (3) application of existing AAC methods, and (4) predicaments using existing communication technologies.
Results: The study found that individuals with CP and speech impediments speak slowly and generally choose to avoid conversations or engage passively, relying on written words, simplified phrases, and physical gestures to compensate for their language impediments. Family education and educational attainment influence their communication strategies.
Conclusion: Following advancements in technology, individuals with CP have become more reliant on text communications via phone apps such as Line and Facebook Messenger, and use text and stickers to express themselves. Despite the many problems with the usability of assistive devices and tech products for individuals with CP, reducing the number of operational steps and time constraints can improve the convenience of these products for individuals with CP.
Plain language summary
Following advancements in technology, individuals with CP have become more reliant on text communications via phone apps such as Line and Messenger, and use text and stickers to express themselves.Despite the many problems with the usability of assistive devices and tech products for individuals with CP, reducing the number of operational steps and time constraints can improve the convenience of these products for individuals with CP.Family education and educational attainment influence individuals with CP communication strategies.
PMID: 40111936

17.Korean Cerebral Palsy Registry (KCPR): study rationale and protocol of a multicentre prospective cohort study

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Multicenter Study BMJ Open . 2025 Mar 15;15(3):e093857. doi: 10.1136/bmjopen-2024-093857.

Introduction: Cerebral palsy (CP) is a leading cause of motor developmental disability in children. Generating epidemiological data on CP could enable early diagnosis, intervention and translational research. We aim to establish a Korean network and online data repository for CP called the Korean Cerebral Palsy Registry (KCPR).
Methods and analysis: The KCPR is a nationwide, multicentre, prospective cohort study designed to conduct a 20-year longitudinal follow-up of children with CP. Institution-based surveillance involving 42 institutions across the country will be used for the registration of children with CP aged less than 7 years to participate in KCPR. The data collection form of the KCPR will comprise diagnostic information, risk factors, extent of disability, genetic data, quality of life, socioeconomic status, functional levels according to life cycle stages and patterns of healthcare utilisation, including rehabilitation. The primary goal of KCPR is to establish a national data repository for CP in Korea, providing a platform for continuous monitoring and analysis of CP cases. Based on its role as a registry, KCPR will support various research projects to enhance the understanding and management of CP. The specific objectives of research projects using KCPR data include: (1) identifying the pathological characteristics of CP and their associated medical, social, economic and psychological needs; (2) using data from prospective tracking of CP children's function and quality of life to develop integrated service plans and policies and (3) conducting intervention cohort studies to establish guidelines for standardised rehabilitative medical services.
Ethics and dissemination: The study protocol was approved by the ethics committees of all 42 participating hospitals. Findings from this study will be disseminated in peer-reviewed publications.
PMID: 40090683

18.STORCH Brazil: multicenter cohort study protocol to investigate neurodevelopmental paths and functioning in infants exposed to STORCH in Brazil

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Multicenter Study BMC Pediatr . 2025 Mar 19;25(1):217. doi: 10.1186/s12887-025-05548-1.

Background: The acronym STORCH encompasses gestational infections that can lead to congenital syndromes or adverse neurological outcomes in children. In Brazil and worldwide, there has been an alarming increase in confirmed cases of STORCH in recent years. However, no study has examined the impact of STORCH on infants' neurodevelopmental outcomes in a large, multi-center cohort, recruiting a substantial number of participants, with analysis across a broad set of variables and ages and based on the International Classification of Functioning, Disability and Health (ICF) model.
Objective: To examine the association between the exposure to classic STORCH (syphilis, toxoplasmosis, rubella, cytomegalovirus infection, and herpes simplex) on components of functioning in infants from 3 to 24 months old in Brazil.
Methods: We propose a multi-center prospective cohort study that includes data collection in at least one city from each geographical region of Brazil. A proposed total sample size of 296 infants will be included at 3 months (12-15 weeks post term). They will be equitably divided into: (a) an exposed group (n = 148), consisting of those diagnosed with any congenital STORCH infection or whose mothers experienced prenatal STORCH infection; (b) an unexposed group (n = 148). Assessments are carried out longitudinally at 3, 6, 9, 12, 18, and 24 months of age. Assessment tools include Prechtl's General Movements Assessment, Hammersmith Infant Neurological Examination, Alberta Infant Motor Scale; Bayley Scales of Infant and Toddler Development; Survey of Well-being of Young Children; Autism Observational Scale for Infants; Modified Checklist for Autism in Toddlers; Child Behavior Checklist; and Young Children's Participation and Environment Measure. Descriptive analyses, including the calculation of relative risk, and logistic regressions will be conducted to examine the association between gestational exposure to STORCH agents and infants' responses/outcomes.
Discussion: The STORCH Brazil study will investigate the impact of STORCH exposure on functioning, including neurodevelopmental trajectories, in infants during their first two years, aligning with the ICF framework. This will enhance understanding of the characteristics and needs of STORCH-exposed infants, aiding therapists in making informed clinical decisions. The results might support public policies tailored to this population. Findings will be disseminated to ensure knowledge translation.
PMID: 40108576

19.Health and education outcomes from adolescence to adulthood for young people with neurodisability and their peers: protocol for a population-based cohort study using linked hospital and education data from England

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BMJ Open . 2025 Mar 18;15(3):e100276. doi: 10.1136/bmjopen-2025-100276.

Introduction: Children and young people with neurodisability (conditions affecting the brain or nervous system, creating functional impairment, eg, autism, learning disabilities, epilepsy, cerebral palsy or attention-deficit/hyperactivity disorder) have more complex health and educational needs than their peers, contributing to higher healthcare use and special educational needs (SEN) provision. To guide policy and improve services, evidence is needed on how health and education support and outcomes change with age for adolescents with and without neurodisability.
Methods and analysis: Using the Education and Child Health Insights from Linked Data (ECHILD) database, which links health and education data across England, we will follow adolescents from the start of secondary school (Year 7) into early adulthood. We will classify children with and without neurodisability recorded in hospital and education records before Year 7, compare their sociodemographic characteristics and describe trends in health and educational outcomes throughout secondary school. We will estimate rates of planned and unplanned healthcare contacts by year of age (11-22 years old), and we will examine changes in trends before, during and after transition to adult healthcare. We will also estimate the proportion of adolescents with school-recorded SEN provision and rates of school absences and exclusions by year of age (11-15 years old) for the two groups. We will explore variation in outcomes by neurodisability subgroup and sociodemographic characteristics and contextualise the findings using existing interview and survey data from children, young people and parents/carers generated in the Health Outcomes of young People throughout Education (HOPE) research programme.
Ethics and dissemination: Ethics approval for analyses of the ECHILD database has been granted previously (20/EE/0180). Findings will be shared with academics, policymakers and stakeholders, and published in open-access journals. Code and metadata will be shared in the ECHILD GitHub repository.
PMID: 40107698

20.Determinants of Gross Motor Function in Children With Ambulatory Spastic Cerebral Palsy: A Cross-Sectional Study in Turkey

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J Paediatr Child Health . 2025 Mar 18. doi: 10.1111/jpc.70034. Online ahead of print.

Aim: This study aims to explore the determinants of gross motor function in ambulatory children with spastic cerebral palsy (CP).
Methods: Sixty-eight children diagnosed with spastic CP type were included in the study. Sociodemographic and clinical information of children with CP and their families was recorded. Children's gross motor function level was classified using the Gross Motor Function Classification System; gross motor function was assessed using the Gross Motor Function Measure-66 (GMFM-66); and parental quality of life was assessed using the Paediatric Quality of Life Scale Family Effects Module (PedsQL-FIM).
Results: No significant differences were observed in gross motor function or parental quality of life between hemiparetic and diparetic CP groups. However, children residing in urban areas showed significantly higher gross motor function and parental quality of life compared to those in rural areas ($p < 0.05$). Moderate correlations were found between gross motor function and physical functioning as well as place of residence ($p < 0.05$). Multiple regression indicated that physical functioning and urban residence were significant predictors of gross motor function, accounting for 37.9% of the variance in the GMFM-66 score.
Conclusion: This study shows that the quality of life of parents of children and residence in the urban area are independent predictors of gross motor function in children with CP. These findings highlight the importance of considering family well-being and environmental factors when developing interventions to improve gross motor function outcomes in children with CP.
Trial registration: NCT06439446.
PMID: 40099358

21.Insights on the Shared Genetic Landscape of Neurodevelopmental and Movement Disorders

Elisabetta Indelicato, Michael Zech, Anna Eberl, Sylvia Boesch

Review Curr Neurol Neurosci Rep . 2025 Mar 17;25(1):24. doi: 10.1007/s11910-025-01414-w.

Purpose of review: Large-scale studies using hypothesis-free exome sequencing have revealed the strong heritability of neurodevelopmental disorders (NDDs) and their molecular overlap with later-onset, progressive, movement disorders phenotypes. In this review, we focus on the shared genetic landscape of NDDs and movement disorders.
Recent findings: Cumulative research has shown that up to 30% of cases labelled as "cerebral palsy" have a monogenic etiology. Causal pathogenic variants are particularly enriched in genes previously associated with adult-onset progressive movement disorders, such as spastic paraplegias, dystonias, and cerebellar ataxias. Biological pathways that have emerged as common culprits are transcriptional regulation, neuritogenesis, and synaptic function. Defects in the same genes can cause neurological dysfunction both during early development and later in life. We highlight the implications of the increasing number of NDD gene etiologies for genetic testing in movement disorders. Finally, we discuss gaps and opportunities in the translation of this knowledge to the bedside.
PMID: 40095113

22.N-acetylserotonin derivative ameliorates hypoxic-ischemic brain damage by promoting PINK1/Parkin-dependent mitophagy to inhibit NLRP3 inflammasome-induced pyroptosis

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Int Immunopharmacol . 2025 Mar 18:153:114469. doi: 10.1016/j.intimp.2025.114469. Online ahead of print.

Abstract
Neonatal hypoxic-ischemic brain damage is the main cause of hypoxic-ischemic encephalopathy and cerebral palsy, whose clinical treatment is still limited to therapeutic hypothermia with limited efficacy. N-[2-(5-hydroxy-1H-indol-3-yl) ethyl]-2-oxopiperidine-3-carboxamide (HIOC), a derivative of N-acetylserotonin, has shown neuroprotective properties. This study was conducted to evaluate the neuroprotective and molecular mechanisms of HIOC. We established an in vitro model using Oxygen -glucose deprivation/reoxygenation (OGD/R) in HT22 cells, alongside an in vivo model via the modified Rice-Vannucci method. The results showed that HIOC reduced OGD/R-induced HT22 cell pyroptosis and inhibited NOD-like receptor pyrin domain- containing protein 3 (NLRP3) inflammasome activation. With the addition of the mitophagy inhibitor 3-MA, we demonstrated that HIOC promoted PTEN-induced putative kinase 1 (PINK1)/Parkin-mediated mitophagy to reduce HT22 cell pyroptosis. Mechanistically, HIOC stimulated mitophagy to remove damaged mitochondria. The clearance of injured mitochondria reduced reactive oxygen species generation, which consequently inhibited NLRP3 inflammasome expression. In vivo, HIOC remarkably lessened cerebral blood flow, infarct volume, neuronal injury by activating mitophagy. HIOC activated mitophagy to produce antipyroptosis effects. Together, our finding demonstrated that HIOC improves brain injury by promoting PINK1/Parkin-dependent mitophagy to inhibit NLRP3 inflammasome activation and pyroptosis, suggesting its potential for hypoxic-ischemic brain damage treatment.
PMID: 40106901

23.Proximal Deletions of 14q32.2 Result in Severe Neurodevelopmental Outcomes, Congenital Anomalies, and Dysmorphic Features

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Am J Med Genet A . 2025 Mar 20:e64042. doi: 10.1002/ajmg.a.64042. Online ahead of print.

Abstract
Deletions of chromosome 14q32.2 often involve the imprinted region of chromosome 14, giving rise to paternal or maternal UPD(14)-like phenotypes. A few individuals with deletions that spare the imprinted region have been reported, with significant variability in deletion size and gene involvement. Four patients with proximal deletions of 14q32.2 were gathered from the primary authors' clinic or through the DECIPHER database. Informed consent for inclusion in this study was obtained from all participants. A retrospective chart review was performed, and medical history records were compiled and analyzed. We report four patients with similar deletions of 14q32.2, three of whom do not involve the imprinted region. These deletions overlapped for 13 different genes, three of which are associated with autosomal dominant conditions: BCL11B, CCNK, and YY1. All four patients presented with prenatal and/or postnatal growth restriction, feeding problems, congenital urogenital anomalies, hypotonia, severe intellectual and developmental disability, and similar dysmorphic features. We propose that deletions involving BCL11B, CCNK, and YY1 result in a discrete clinical entity entailing a severe neurodevelopmental phenotype, characteristic facial features, and congenital anomalies. We propose the nomenclature of proximal 14q32.2 deletion syndrome.
PMID: 40110997

24.Families' Strategies for Navigating Care for Their Child With Cerebral Palsy: A Qualitative Study

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Health Expect . 2025 Apr;28(2):e70197. Doi: 10.1111/hex.70197.

Introduction: Families of children with medical complexities, like cerebral palsy (CP), often interact with multiple service providers across healthcare, education, social services, and family support sectors. To navigate these services, families shoulder various responsibilities, such as managing appointments, understanding different service systems, and advocating for their child's needs. However, our understanding of how families navigate these services remains limited. Therefore, this study explores families' strategies for navigating services for their child with cerebral palsy.
Methods: Data were gathered through interviews with six families who each have a child diagnosed with CP aged between 8 and 12 years old. These interviews involved both children and parents and were conducted in three consecutive semi-structured sessions with each family. Additionally, observations were conducted during multidisciplinary coordination meetings held at the children's schools, involving parents and service providers.
Results: To navigate services, parents applied strategies to (1) become experts on both their child's diagnosis, challenges, care needs and on the services available; (2) act as proactive participants in their child's care; and (3) manage day-to-day care. In doing so, families contributed to the provision of family-centred services according to their care needs.
Conclusion: Families make use of several different strategies to navigate the services. By applying these strategies, they effectively express their care needs and facilitate tailored services, thus contributing towards a family-centred approach. This highlights the importance of supporting the strategies used by families when collaborating with the services.
Patient or public contribution: Families actively participated in shaping the study by engaging in a series of interviews, discussing topics important to them, and reviewing the information provided. This approach ensures that their experiences and needs are accurately captured and addressed. Additionally, families shared their thoughts on how services could be improved to better meet their care needs.
PMID: 40087998

Prevention and Cure

25.Antenatal Low Dose Magnesium Sulphate for Foetal Neuroprotection in Preterm Birth Versus Control: A Comparative Prospective Cohort Study in Tertiary Care Centre in India

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J Obstet Gynaecol India . 2025 Feb;75(1):46-52. doi: 10.1007/s13224-023-01902-4. Epub 2023 Dec 2.

Introduction: Preterm infants are at great risk of neurological impairments. This study aimed to evaluate what is the difference in short- and long-term neonatal outcome comparing magnesium sulphate in small dose (4 g) versus controls.
Methods: Prospective cohort study was conducted in the Department of Obstetrics and Gynaecology over a period of 4 years. Group A comprised of the study group (intravenous 4 g magnesium sulphate was given over 20 min). Group B consisted of control group who did not receive magnesium sulphate.
Results: The study population comprised of 116 pregnant women who received intravenous bolus of 4 grams $MgSO_4$ while the control group comprised of 95 pregnant women who did not receive $MgSO_4$. Fewer neonates in the $MgSO_4$ group required intubation at birth (32% vs. 52%) or chest compression (4% vs. 6%); however, the difference was not statistically significantly ($p = 0.175$ and $p = 0.329$). Neonatal brain ultrasound done in first month showed a significant reduction intraventricular haemorrhage of severe grade 3-4 IVH in the $MgSO_4$ group ($p = 0.016$). $MgSO_4$ administration was associated with a decrease in neonatal mortality before discharge ($p = 0.039$). Follow-up at 3 years showed a significant reduction in delayed milestones, visual impairment, Bayley score < 85 ($p = 0.015$). $MgSO_4$ treatment antenatally was associated with lower risk of Cerebral Palsy (2.6% vs. 23.2%, $p < 0.001$).
Conclusion: The benefits from single smaller dose magnesium sulphate 4 gram prove its potential to be used for foetal neuroprotection in any healthcare setting without any maternal concerns.
PMID: 40092384