Cerebral palsy research news

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Interventions and Management

1. Microstructural changes in the spinal cord of adults with cerebral palsy

No authors listed

Dev Med Child Neurol. 2023 Apr 18. doi: 10.1111/dmcn.15631. Online ahead of print.

No abstract available

PMID: 37072916

2. Spinal motoneurons respond aberrantly to serotonin in a rabbit model of cerebral palsy

E J Reedich, L T Genry, P R Steele, E Mena Avila, L Dowaliby, A Drobyshevsky, M Manuel, K A Quinlan

bioRxiv. 2023 Apr 6;2023.04.05.535691. doi: 10.1101/2023.04.05.535691. Preprint

Cerebral palsy (CP) is caused by a variety of factors that damage the developing central nervous system. Impaired motor control, including muscle stiffness and spasticity, is the hallmark of spastic CP. Rabbits that experience hypoxic-ischemic (HI) injury in utero (at 70-80% gestation) are born with muscle stiffness, hyperreflexia, and, as recently discovered, increased serotonin (5-HT) in the spinal cord. To determine whether serotonergic modulation of spinal motoneurons (MNs) contributes to motor deficits, we performed ex vivo whole cell patch clamp in neonatal rabbit spinal cord slices at postnatal day (P) 0-5. HI MNs responded to application of α-methyl 5-HT (a 5-HT 1 /5-HT 2 receptor agonist) and citalopram (a selective 5-HT reuptake inhibitor) with hyperpolarization of persistent inward currents and threshold voltage for action potentials, reduced maximum firing rate, and an altered pattern of spike frequency adaptation while control MNs did not exhibit any of these responses. To further explore the differential sensitivity of MNs to 5-HT, we performed immunohistochemistry for inhibitory 5-HT 1A receptors in lumbar spinal MNs at P5. Fewer HI MNs expressed the 5-HT 1A receptor compared to age-matched controls. This suggests many HI MNs lack a normal mechanism of central fatigue mediated by 5-HT 1A receptors. Other 5-HT receptors (including 5-HT 2) are likely responsible for the robust increase in HI MN excitability. In summary, by directly exciting MNs, the increased concentration of spinal 5-HT in HI rabbits can cause MN hyperexcitability, muscle stiffness, and spasticity characteristic of CP. Therapeutic strategies that target serotonergic neuromodulation may be beneficial to individuals with CP. Key points: After prenatal hypoxia-ischemia (HI), neonatal rabbits that show hypertonia are known to have higher levels of spinal serotoninWe tested responsivity of spinal motoneurons (MNs) in neonatal control and HI rabbits to serotonin using whole cell patch clampMNs from HI rabbits showed a more robust excitatory response to serotonin than control MNs, including hyperpolarization of the persistent inward current and threshold for action potentials, larger post-inhibitory rebound, and less spike frequency adaptation Based on immunohistochemistry of lumbar MNs, fewer HI MNs express inhibitory 5HT 1A receptors than control MNs, which could account for the more robust excitatory response of HI MNs. These results suggest that after HI injury, the increased serotonin could trigger a cascade of events leading to muscle stiffness and altered motor unit development.

PMID: 37066318

3. When to Perform Fusion Short of the Pelvis in Patients with Cerebral Palsy?: Indications and Outcomes

Daniel Badin, Keith D Baldwin, Patrick J Cahill, David A Spiegel, Suken A Shah, Burt Yaszay, Peter O Newton, Paul D Sponseller

JB JS Open Access. 2023 Apr 14;8(2):e22.00123. doi: 10.2106/JBJS.OA.22.00123. eCollection 2023 Apr-Jun.

Patients with scoliosis secondary to cerebral palsy (CP) are often treated with posterior spinal fusion (PSF) with or without pelvic fixation. We sought to establish criteria to guide the decision of whether or not to perform fusion "short of the pelvis" in this population, and to assess differences in outcomes. Methods: Using 2 prospective databases, we analyzed 87 pediatric patients who underwent PSF short of the pelvis from 2008 to 2015 to treat CP-related scoliosis and who had ≥2 years of follow-up. Preoperative radiographic and clinical variables were analyzed for associations with unsatisfactory correction (defined as pelvic obliquity of ≥10°, distal implant dislodgement, and/or reoperation for increasing deformity at 2- or 5-year follow-up). Continuous variables were dichotomized using the Youden index, and a multivariable model of predictors of unsatisfactory correction was created using backward stepwise selection. Finally, radiographic, health-related quality-of-life, and clinical outcomes of patients with fusion short of the pelvis who had neither of the 2 factors associated with unsatisfactory outcomes were compared with those of 2 matched-control groups. Results: Deformity correction was unsatisfactory in 29 of 87 patients with fusion short of the pelvis. The final model included preoperative pelvic obliquity of ≥17° (odds ratio [OR], 6.8; 95% confidence interval [CI], 2.3 to 19.7; $p < 0.01$) and dependent sitting status (OR, 3.2; 95% CI, 1.1 to 9.9; $p = 0.04$) as predictors of unsatisfactory correction. The predicted probability of unsatisfactory correction increased from 10% when neither of these factors was present to a predicated probability of 27% to 44% when 1 was present and to 72% when both were present. Among matched patients with these factors who had fusion to the pelvis, there was no association with unsatisfactory correction. Patients with independent sitting status and pelvic obliquity of <17° who had fusion short of the pelvis had significantly lower blood loss and hospital length of stay, and better 2-year health-related quality-of-life scores compared with matched controls with fusion to the pelvis. Conclusions: In patients with scoliosis secondary to CP, pelvic obliquity of <17° and independent sitting status are associated with a low risk of unsatisfactory correction and better 2-year outcomes when fusion short of the pelvis is performed. These may be used as preoperative criteria to guide the decision of whether to perform fusion short of the pelvis in patients with CP.

PMID: 37073271

4. Severe cerebral palsy: A compendium of anaesthesia challenges and impact of inter-fascial plane blocks for orthopaedic hip surgeries

Sandeep Diwan, Arkesh Madegowda, Avinash Gaikwad, Himanshu Dongre

Indian J Anaesth. 2023 Feb;67(Suppl 1):S64-S67. doi: 10.4103/ija.ija_345_22. Epub 2023 Feb 10.

No abstract available

PMID: 37065950

5. Split Transfer of the Tibialis Anterior Tendon Combined With Calcaneocuboid Fusion vs Split Transfer of the Tibialis Anterior Tendon Alone to Treat Equinovarus Foot Deformity in Children With Cerebral Palsy

Tayfun Bacaksız, İhsan Akan, Cemal Kazimoglu

Foot Ankle Int. 2023 Apr 21;10711007231165308. doi: 10.1177/10711007231165308. Online ahead of print.

Background: The study aimed to compare the outcomes of combined calcaneocuboid arthrodesis and split anterior tibialis tendon transfer (SPLATT) procedure to isolated SPLATT surgery for the treatment of the spastic equinovarus deformity in children with cerebral palsy (CCP). Methods: Forty-one ambulatory CCP with 56 equinovarus feet, with positive flexor withdrawal reflex test results, were studied. The average age was 9.1 ± 3.2 years (range 3-22). Patients were assigned into 2 groups based on the surgical procedures. Patients in group 1 underwent isolated SPLATT surgery, whereas patients in group 2 underwent the SPLATT procedure combined with calcaneocuboid arthrodesis. All feet were followed for at least 12 months after surgery. Patients were evaluated preoperatively and at the most recent follow-up visit. The hindfoot positions were assessed using Chang's criteria, the functional outcomes were assessed using Kling's criteria, and the ambulatory levels were assessed using the Gross Motor Function Classification System (GMFCS). Results: Patients were followed for an average of 30.4 ± 14 (range 14-84) months. We found no difference between the groups in Chang's scoring ($P = .550$), better clinical outcomes ($P = .034$) according to the Kling criteria in SPLATT with calcaneocuboid fusion group, and postoperative GMFCS levels better in the SPLATT with calcaneocuboid fusion group ($P = .025$). Conclusion: In this retrospective comparative study to treat children with spastic equinovarus feet, patients who had the SPLATT procedure combined with calcaneocuboid arthrodesis generally resulted in better functional outcomes compared to isolated SPLATT surgery in spastic equinovarus foot.

PMID: 37086001

6. Patient and Caregiver Reported Outcome Measures after Single-Level Selective Dorsal Rhizotomy in Pediatric and Young Adult Patients with Spastic Cerebral Palsy

Abeelan Rasadurai, Nicole Alexandra Frank, Ladina Aurea Greuter, Maria Licci, Peter Weber, Stephanie Jünemann, Raphael Guzman, Jehuda Soleman
Pediatr Neurosurg. 2023 Apr 19. doi: 10.1159/000530748. Online ahead of print.

Introduction: The aim of this cohort study is to assess the outcome of single-level selective dorsal rhizotomy (SDR) in children and young adults with spastic cerebral palsy (CP) treated at our institution, focusing on patient-reported outcome measures (PROMs) and quality of life (QoL) of patients and their caregivers. Methods: We included consecutive patients undergoing SDR from 2018 to 2020 at our institution. Subjective outcome was measured through PROMs, while functional outcome was measured through baseline characteristics, operative outcome, as well as short- and long-term follow-up. Furthermore, the effect of age at the time of surgery on patient/caregiver satisfaction was analyzed. Results: Seven patients (3 female, 43%) with a median age at surgery of 11.9 years (IQR 8.7-15.5) were included. All patients had a GMFCS score of at least IV before surgery. Five surgeries were palliative and two non-palliative. Based on PROMs, SDR showed very good QoL, and health-related outcome measures for both palliative and non-palliative patients. Patients/caregivers satisfaction was higher for the early subgroup (age ≤ 11) than the late subgroup (age > 11). Functional outcome showed reduced spasticity in both groups. Blood transfusions were never needed, while no CSF leak, infection, or permanent morbidity was seen. Conclusion: Based on PROMs, SDR leads to high satisfaction and improved QoL, especially if done at an early age. Further studies with larger cohorts are necessary to underline and confirm our observations.

PMID: 37075708

7. Early spontaneous movements and spatiotemporal gait characteristics in preterm children

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Eur J Pediatr. 2023 Apr 15. doi: 10.1007/s00431-023-04949-7. Online ahead of print.

This study aimed to analyze spatiotemporal gait characteristics of preterm children from 3 to 4 years of age according to different gestational age groups and to examine the relationship between the detailed general movements assessment and spatiotemporal gait characteristics. A total of 74 preterm children, 32 extremely preterm and very preterm (EP-VP, < 32 weeks gestational age) and 42 moderate to late preterm (MLP, 32 to < 37 weeks gestational age), were included in this prospective study, along with 38 term children. Early spontaneous movements of preterm children were assessed from videos at 9-20 weeks post-term according to the general movements assessment, which determines the Motor Optimality Score-Revised (MOS-R). The spatiotemporal gait characteristics of all children were evaluated using the GAITRite®electronic walkway at self-selected walking speeds. EP-VP children walked with shorter step lengths ($p = 0.039$), and MLP children walked with greater step length variability ($p = 0.003$) than their term peers. The MOS-R results were related to step length ($r = 0.36$, $p = 0.042$), step length variability ($r = -0.56$, $p = 0.001$), and base of support ($r = -0.37$, $p = 0.038$) in EP-VP children. The MOS-R subcategories, age-adequate movement repertoire, and postural patterns were related to some of the spatiotemporal gait characteristics, including step length, step length variability, and base of support ($p < 0.05$). Conclusion: EP-VP and MLP children might catch up to their term peers at 3 to 4 years of age in terms of most gait parameters. In addition to the MOS-R, age-adequate movement repertoire and postural patterns of preterm children without cerebral palsy in early life may be a marker of later neurodevelopmental dysfunction. What is Known: • Preterm children walk with a wider step width, a greater step length asymmetry and step time, and a shorter stride length at 18 to 22 months of age compared with term children at a self-selected speed, while these differences disappear in children 4.5-5 years old and older. What is New: • Early spontaneous movements were related to some spatiotemporal gait characteristics. • Preterm children might catch up to term children at 3-4 years of age in spatiotemporal gait characteristics while walking at a self-selected speed.

PMID: 37060442

8. Single-leg vertical jumping in young adults with spastic cerebral palsy

Meta N Eek, Jesper Augustsson, Roland Zügner, Roy Tranberg

Gait Posture. 2023 Apr 14;103:1-5. doi: 10.1016/j.gaitpost.2023.04.013. Online ahead of print.

Background: Maximum-strength tests are commonly used to detect muscle weakness in persons with cerebral palsy (CP). Tests of explosive strength (power) in the lower extremities, such as vertical jump tests, are more uncommon but might supplement maximum-strength testing by providing additional information about motor function. Research question: Is it feasible and useful to measure single-leg vertical jumping in young adults with CP? Methods: Eleven persons with spastic CP (18-30 years), able to walk without support, were compared with a reference group. Jump height and power generation in jumping were

measured using a 3D motion-analysis system and force plates. Maximum strength in plantarflexors was measured on the same occasion. Data were analysed using non-parametric statistics. Results: Jump height was significantly greater in the reference group than in the group with CP, both relative to the less-involved leg of the participants with CP ($p = .007$) and relative to their more-involved leg ($p < .001$). In the group with CP, jump height was twice as great for the less-involved leg than for the more-involved leg ($p = .008$). Power generation at the hip joint was similar between the groups but differed for the knee and ankle joints ($p = .001$-$.033$). In the reference group, most of the power was generated at the ankle joint, while the hip was the dominant power generator for the more-involved leg in the group with CP. Muscle strength in the group with CP showed a high correlation with jump height (rho = .745, $p < .001$) and power generation at the ankle (rho = .780, $p = .001$). Significance: The single-leg vertical jump test proved capable of measuring jump height and power generation in participants with CP. It also identified explosive muscle weakness both relative to a reference group and between legs. Hence the jump test may provide information additional to common tests of maximal muscle strength in persons with CP.

PMID: 37075552

9. Mental health, physical activity, and sports among children with cerebral palsy

Cory F Cribb, Mario Keko, Sarah Creveling, Haresh D Rochani, Christopher M Modlesky, Gavin Colquitt

Child Care Health Dev. 2023 Apr 19. doi: 10.1111/cch.13122. Online ahead of print.

Background: People with cerebral palsy (CP) may be at an increased risk for mental health disorders due to co-occurring physical and communication limitations associated with the condition. Participation in physical activity (PA) and sports may provide opportunities to increase socialization and improve physical function. The purpose of this study was to examine associations between participation in daily PA and sports and mental health among children with CP. Method: Participants included children with CP (n = 458) and typically developing children (TDC) (n = 40 091) 6-17 years whose parents participated in the 2016-2020 National Survey of Children's Health. Mental health disorders included anxiety, depression, behavioural disorders and attention-deficit/hyperactivity disorder (ADHD). Results: Compared with TDC, children with CP had a higher prevalence of mental health disorders (75.5% vs. 54.2%) and were more likely to receive mental health care (21.5% vs. 14.6%). Controlling for sociodemographic variables, children with CP were more likely to experience anxiety [odds ratio (OR) 2.6; 95% confidence interval (CI) = 2.1-3.3), depression (OR 1.8; 95% CI 1.3-2.4), behavioural disorders (OR 4.8; 95% CI 3.8-6.0) and ADHD (OR 2.1; 95% CI 1.6-2.6). The likelihood of these conditions decreased when children participated in sports for anxiety (OR 2.2; 95% CI 1.8-2.8), depression (OR = 1.4; 95% CI 1.0-2.0), behavioural disorders (OR 4.1; 95% CI 3.2-5.1) and ADHD (OR 1.9; 95% CI 1.5-2.5). The likelihood for anxiety (OR 2.3; 95% CI 1.8-2.8), depression (OR 1.4; 95% CI 1.0-1.9), behavioural disorders (OR 4.4; 95% CI 3.5-5.5) and ADHD (OR 1.9; 95% CI 1.5-2.4) also decreased with participation in daily PA. Conclusions: There is an overwhelming disparity in the number of children with CP who have a mental health disorder and those who receive mental health care. Increasing access to participation in sports and PA may be beneficial.

PMID: 37073535

10. Effect of Treadmill Backward Walking Training on Motor Capacity in Cerebral Palsy: A Randomized Controlled Study

Halis Doğan, Fatma Mutluay

Ann Rehabil Med. 2023 Apr 18. doi: 10.5535/arm.22154. Online ahead of print.

Objective: To evaluate treadmill backward walking training (BWT) effects on walking speed, balance, mobility, and walking endurance in children with cerebral palsy (CP). Methods: The study evaluated 41 children with CP (age, 6-18; Gross Motor Function Classification System levels I and II). They were randomly allocated into control and BWT groups. BWT was applied (two sessions/week, 15 min/session for 8-week) to BWT group after the neurodevelopmental-based physiotherapy program routinely followed by all participants while the control group did not receive BWT. 10-Meter Walk Test (10MWT), Pediatric Balance Scale (PBS), Timed Up and Go Test (TUG), and Two-Minute Walk Test (2MWT) were selected as outcome measures for assessing walking speed, balance, mobility and endurance respectively. Results: In BWG, 2MWT distance (3.5%), PBS (3.5%) increased significantly, and TUG decreased by 5.1% (all $p<0.001$) after training, 10MWT was shorter by 6.1% for BWG, corresponding to 7.4% faster walking speed ($p<0.01$). Control group assessment variations were stationary and not statistically significant. Conclusion: Backward treadmill walking training induces small but statistically significant motor capacity improvements in children with CP.

PMID: 37070285

11. A parametric 3D printed assistive device for people with cerebral palsy - assessment of outcomes and comparison with a commercial counterpart

Rune Thorsen, Denise Cugnod, Marina Ramella, Rosa Converti, Maurizio Ferrarin

Assist Technol. 2023 Apr 21. doi: 10.1080/10400435.2023.2202696. Online ahead of print.

This paper describes the results of using a parametric design platform to configure and 3D print assistive devices (AD) and how they compare with a commercial counterpart (CommAD). The configurable AD (ConfAD) was a fork/spoon holder. Five subjects with cerebral palsy participated in the study and each had a ConfAD made to fit their dominant hand. They all tested the ConfAD and the CommAD for eating in the daily routine, assisted by an occupational therapist. Functionality and satisfaction of both devices were evaluated using two standard clinical questionnaires - the Individually Prioritized Problem Assessment questionnaire (IPPA) and Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0). They outlined important issues that the participants prioritized and how they were met by the devices. In the specific cases neither the ConfAD nor the CommAD provided substantial benefits for the participants according to the evaluations, but the questionnaires provided useful information about where the designs should be improved. They show a need for highly personalized solutions which may be solved by 3D printing ADs. A configurator for generating production files starting from a parametric model of an AD may facilitate personalizing ADs, however a sufficiently large number of model versions should be present to meet individual needs. Alternatively, the clinician should be able to edit the models to accommodate said needs. Future research could use clinical evaluations to provide comparable evidence and guide development of efficient and effective frameworks for digital fabrication in terms of clinically feasible AD model sourcing.

PMID: 37083458

12. Religious Coping and Fatalism on Perception of Care Burden in Caregivers of Patients with Cerebral Palsy in Turkey: A Cross-Sectional and Correlational Study

Oguzhan Bahadir Demir, Feride Taskin Yilmaz

J Relig Health. 2023 Apr 15. doi: 10.1007/s10943-023-01814-7. Online ahead of print.

Providing care to a patient with cerebral palsy can have many negative impacts upon caregivers. This study was carried out to define caregiving burden in the caregivers of cerebral palsy patients and determine the relationships between religious coping, fatalism, and burden of care. This cross-sectional and correlational study included 132 caregivers. Data were obtained using the Religious Coping Scale, the Fatalism Scale, and the Caregiver Burden Scale. It was determined that 18.9% of the participants experienced a heavy care burden. The luck and pessimism dimensions of the Fatalism Scale were positively and weakly correlated with caregiving burden ($p < 0.01$), while there was no correlation between caregiving burden and positive or negative religious coping styles ($p > 0.05$). Perception of fatalism explained 10% of the total variance in caregiving burden ($R = 0.329$, $R2 = 0.109$, $F = 5.195$, $p = 0.002$). It is recommended that caregivers be supported by religious experts to strengthen positive religious coping styles and advisable fatalism perceptions.

PMID: 37060387

13. Primary healthcare needs and service utilisation of people with disability: a data linkage protocol

Jacinta Douglas, Di Winkler, Adam McLeod, Stacey Oliver, Karina Gardner, Jamie Supple, Christopher Pearce

BMJ Open. 2023 Apr 19;13(4):e068059. doi: 10.1136/bmjopen-2022-068059.

Introduction: General practitioners (GPs) play a crucial role in the early management and treatment of the comorbidities and complications experienced by people with disability. However, GPs experience multiple constraints, including limited time and disability-related expertise. Knowledge gaps around the health needs of people with disability as well as the frequency and extent of their engagement with GPs mean evidence to inform practice is limited. Using a linked dataset, this project aims to enhance the knowledge of the GP workforce by describing the health needs of people with disability. Methods and analysis: This project is a retrospective cohort study using general practice health records from the eastern Melbourne region in Victoria, Australia. The research uses Eastern Melbourne Primary Health Network (EMPHN)-owned de-identified primary care data from Outcome Health's POpulation Level Analysis and Reporting Tool (POLAR). The EMPHN POLAR GP health records have been linked with National Disability Insurance Scheme (NDIS) data. Data analysis will involve comparisons across disability groups and the rest of the population to explore utilisation (eg, frequency of visits), clinical and preventative care (eg, cancer screening, blood pressure readings) and health needs (eg, health conditions, medications). Initial analyses will focus on NDIS participants as a whole and NDIS participants whose condition is either an acquired brain injury, stroke, spinal cord injury, multiple sclerosis or cerebral palsy, as classified by the NDIS. Ethics and dissemination: Ethics approval was obtained from the Eastern Health Human Research Ethics Committee (E20/001/58261), and approval for the general collection, storage and transfer of data was from the Royal Australian College of General Practitioners National Research Ethics and Evaluation Committee (protocol ID: 17-088). Dissemination mechanisms will include the engagement of stakeholders through reference

groups and steering committees, as well as the production of research translation resources in parallel with peer-reviewed publications and conference presentations.

PMID: 37076156

14. Smell and taste of milk during tube feeding of preterm infants: neurodevelopmental follow-up of the randomized TASTE trial, study protocol

Friederike Beker, Ian P Hughes, Sue Jacobs, Helen G Liley, Samudragupta Bora, Gabrielle Simcock, Peter G Davis

Trials. 2023 Apr 22;24(1):290. doi: 10.1186/s13063-023-07224-0.

Background: The Taste And Smell To Enhance nutrition (TASTE) trial investigated the effects of smell and taste of milk with tube feeding compared to routine care on the growth of preterm infants. There was no difference between groups in growth (weight, head circumference, length) z-scores at discharge from the hospital. Infants in the intervention group had higher head circumference and length z-scores at 36 weeks postmenstrual age, both secondary outcomes. The objective of this follow-up study is to assess 2-year neurodevelopmental and growth outcomes after exposure of preterm infants to the smell and taste of milk with tube feeding compared to routine care. Methods: This is a neurodevelopmental follow-up study of a two-center, placebo-controlled randomized trial. Infants born before 29 weeks postmenstrual age and/or with a birth weight of less than 1250 g were randomized to smell and taste of milk with each tube feed or routine care. The current follow-up assessed the 2-year neurodevelopmental and growth outcomes of participants of the TASTE trial discharged from the hospital (n = 334). The primary outcome is survival free of any major neurodevelopmental impairment comprising any moderate/severe cerebral palsy (Gross Motor Function Classification System score II-V), Bayley Scales of Infant and Toddler Development, Third/Fourth Edition (Bayley-III/Bayley-4) motor, cognitive, or language scores < -2SD, blindness, or deafness at 2 years of age. Other outcomes include death, breastfeeding within the first year, and respiratory support, oral feeding, and anthropometric parameters at 2 years of age. The Human Research Ethics Committees of Mater Misericordiae Limited and the Royal Women's Hospital approved the TASTE trial including the neurodevelopmental follow-up described in this protocol. Discussion: For patients and their families, the neurodevelopmental outcomes of preterm infants are of utmost importance. Consequently, they should be investigated following any interventional study performed during the newborn period. Furthermore, improved weight gain and head growth in the hospital are associated with better long-term neurodevelopmental outcomes. Smelling and tasting of milk is an uncomplicated and cost-effective intervention that may improve the growth and neurodevelopmental outcomes of preterm infants. Potential limitations affecting this follow-up study, caused by the COVID-19 pandemic, are anticipated and discussed in this protocol.

PMID: 37085869

15. Systems science: An answer to dealing with the complexity of cerebral palsy?

Margaret Mayston

Editorial Dev Med Child Neurol. 2023 Apr 21. doi: 10.1111/dmcn.15629. Online ahead of print.

No abstract available

PMID: 37084034

16. Intensive Neurophysiological Rehabilitation System for children with cerebral palsy: a quasi-randomized controlled trial

A Kushnir, O Kachmar

BMC Neurol. 2023 Apr 20;23(1):157. doi: 10.1186/s12883-023-03216-4.

Background: Recent research indicates that intensive rehabilitation tends to be effective for children with cerebral palsy (CP). Intensive Neurophysiological Rehabilitation System (INRS) is a multi-component approach that combines various interventions and addresses different functional goals.. This study aimed to examine the effectiveness of the INRS treatment in children with bilateral CP. Methods: In this quasi-randomized controlled study, 48 children with spastic bilateral CP (age 5-12 years, GMFCS Levels I-IV, MACS Levels I-IV) were assigned to an experimental or control group in order they have been enrolled. The experimental group underwent INRS treatment in the tertiary care facility for about four hours daily for ten days and continued routine home treatment for four weeks. After the first evaluation, participants from the control group stayed on the waiting list for four weeks receiving home treatment and then starting the INRS treatment. Thereby, all participants were assessed three times. The primary outcome measure was a Gross Motor Function Measure 66 Item Set (GMFM). The secondary outcome measures included the Jebsen-Taylor Hand Function test, Box and Blocks test, ABILHAND-Kids Questionnaire, Self-care and Mobility domain of the Pediatric Evaluation of Disability Inventory, and the ankle dorsiflexion

passive range of motion. Results: There was a statistically significant increase in the GMFM score after the INRS treatment in both the experimental group (mean difference (MD) 2.0, $P < 0.01$) and control group (MD 1.5, $P < 0.05$), with a large size effect (partial eta squared ($\eta 2$) = 0.21 and $\eta 2$ = 0.14). The mean difference between groups during the first study period was 2.89 points ($p < 0.01$) in the GMFM score with a medium effect size ($\eta 2$ = 0.12). Statistically significant superiority of the INRS treatment over home treatment was also obtained by Jebsen-Taylor Hand Function Test and the Box and Blocks Test in both dominant and non-dominant hands. Conclusions: The study indicates that the INRS treatment can be beneficial for improving both gross motor functions and hand function in children with bilateral CP. Further longitudinal studies are required to evaluate the effects of the INRS treatment on the participation level of children with CP.

PMID: 37081406

17. "Kind of empowered": Perceptions of socio-emotional development in children driving ride-on cars

Rebecca Barchus, Chelsea Barroero, Wendy Schnare, Sarah M Dean, Heather A Feldner

Rehabil Psychol. 2023 Apr 20. doi: 10.1037/rep0000482. Online ahead of print.

Purpose/objective: Early powered mobility (PM) experiences can be essential facilitators of self-initiated mobility, socialization, and exploration for young children with disabilities. Cerebral palsy (CP) and developmental delay are two of the most common diagnoses associated with motor disability in young children with 1 in 345 children diagnosed with CP and 1 in 6 with developmental delay in the US. The purpose of this study was to explore the longitudinal experiences and caregiver perceptions of socio-emotional development in particular, in young children with disabilities during modified ride-on car (ROC) use. Research method/design: A qualitative, grounded theory approach was used. Semi-structured interviews were conducted with 15 families (children ages 1-4 with CP or developmental delay) at baseline, 6 months (as able due to COVID), and 1 year following ROC introduction. Data were coded independently by three researchers using constant comparison until data saturation occurred and themes emerged. Results: Four themes emerged from the data: "Leveling the Playing Field," "Breaking Down Barriers," "Fun and Work: ROC as Toy and Therapy Device," and "Mobility is a Pathway to Autonomy." Conclusions/Implication: Children and caregivers viewed ROCs as both fun and therapeutic, consistently identifying perceived benefits for children's socio-emotional development. This qualitative study provides a better understanding of the complexities and impact of ROCs on children and their families in the socio-emotional domain and may help facilitate clinical decision-making when introducing PM to young children with disabilities as part of a multimodal approach to early intervention. (PsycInfo Database Record (c) 2023 APA, all rights reserved).

PMID: 37079821

18. Family Perspectives on In-Home Multimodal Longitudinal Data Collection for Children Who Function Across the Developmental Spectrum

Katelynn E Boerner, Leora Pearl-Dowler, Liisa Holsti, Marie-Noelle Wharton, Harold Siden, Tim F Oberlander

J Dev Behav Pediatr. 2023 Apr 19. doi: 10.1097/DBP.0000000000001183. Online ahead of print.

Objective: Quality child health research requires multimodal, multi-informant, longitudinal tools for data collection to ensure a holistic description of real-world health, function, and well-being. Although advances have been made, the design of these tools has not typically included community input from families with children whose function spans the developmental spectrum. Methods: We conducted 24 interviews to understand how children, youth, and their families think about in-home longitudinal data collection. We used examples of smartphone-based Ecological Momentary Assessment of everyday experiences, activity monitoring with an accelerometer, and salivary stress biomarker sampling to help elicit responses. The children and youth who were included had a range of conditions and experiences, including complex pain, autism spectrum disorder, cerebral palsy, and severe neurologic impairments. Data were analyzed using reflexive thematic analysis and descriptive statistics of quantifiable results. Results: Families described (1) the importance of flexibility and customization within the data collection process, (2) the opportunity for a reciprocal relationship with the research team; families inform the research priorities and the development of the protocol and also benefit from data being fed back to them, and (3) the possibility that this research approach would increase equity by offering accessible participation opportunities for families who might otherwise not be represented. Most families expressed interest in participating in in-home research opportunities, would find most methods discussed acceptable, and cited 2 weeks of data collection as feasible. Conclusion: Families described diverse areas of complexity that necessitate thoughtful adaptations to traditional research designs. There was considerable interest from families in active engagement in this process, particularly if they could benefit from data sharing. This feedback is being incorporated into pilot demonstration projects to iteratively codesign an accessible research platform.

PMID: 37074803

19. Meaningful outcomes for children and their caregivers attending a paediatric brain centre

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Dev Med Child Neurol. 2023 Apr 18. doi: 10.1111/dmcn.15610. Online ahead of print.

Aim: To identify meaningful outcomes of children and their caregivers attending a paediatric brain centre. Method: We compiled a long list of outcomes of health and functioning of children with brain-related disorders such as cerebral palsy, spina bifida, (genetic) neurodevelopmental disorders, and acquired brain injury. We incorporated three perspectives: patients, health care professionals, and published outcome sets. An aggregated list was categorized using the International Classification of Functioning, Disability, and Health: Children and Youth version in a patient validation survey for children and parent-caregivers to prioritize outcomes. Outcomes were considered meaningful when ranked 'very important' by 70% or more of the participants. Results: We identified 104 outcomes from the three perspectives. After categorizing, 59 outcomes were included in the survey. Thirty-three surveys were completed by children (n = 4), caregivers (n = 24), and parent-caregivers together with their child (n = 5). Respondents prioritized 27 meaningful outcomes covering various aspects of health and functioning: emotional well-being, quality of life, mental and sensory functions, pain, physical health, and activities (communication, mobility, self-care, interpersonal relationships). Parent-caregiver concerns and environmental factors were newly identified outcomes. Interpretation: Children and parent-caregivers identified meaningful outcomes covering various aspects of health and functioning, including caregiver concerns and environmental factors. We propose including those in future outcome sets for children with neurodisability.

PMID: 37072934

20. Child Neurology: Cortical Malformations in Preterm Infants: Case From a Prospective Cohort

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Malformations of cortical development (MCD) are a rare group of disorders with heterogeneous clinical, neuroimaging, and genetic features. MCDs consist of disruptions in the development of the cerebral cortex secondary to genetic, metabolic, infectious or vascular etiologies. MCDs are typically classified by stage of disrupted cortical development as secondary abnormal: (1) neuronal proliferation or apoptosis, (2) neuronal migration, or (3) postmigrational cortical development. MCDs are typically detected with brain magnetic resonance imaging (MRI) when an infant or child becomes symptomatic, presenting with seizures, developmental delay, or cerebral palsy. With recent advances in neuroimaging, cortical malformations can be detected using ultrasound or MRI during the fetal period, or in the neonatal period. Interestingly, preterm infants are born at a time when many cortical developmental processes are still occurring. However, there is a paucity of literature describing the neonatal imaging findings, clinical presentation, and evolution over time of cortical malformations in preterm infants. Here, we present the neuroimaging findings from early life to term-equivalent age as well as childhood neurodevelopmental outcomes of an infant born very preterm (<32 weeks' post-menstrual age) with MCD detected incidentally on neonatal research brain MRI. These brain MRIs were performed as part of a prospective longitudinal cohort study of 160 very preterm infants; MCDs were detected incidentally in two infants.

PMID: 37072221

21. Association of Cystic Periventricular Leukomalacia and Postnatal Epilepsy in Very Preterm Infants

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Neonatology. 2023 Apr 18;1-8. doi: 10.1159/000529998. Online ahead of print.

Introduction: Cystic periventricular leukomalacia (PVL) is the most common white matter injury and a common cause of cerebral palsy in preterm infants. Postnatal epilepsy may occur after cystic PVL, but their causal relationship remains uncertain. Our aim was to validate the contribution of cystic PVL to postnatal epilepsy in very preterm infants and demonstrate their seizure characteristics. Methods: This prospective cohort study enrolled 1,342 preterm infants (birth weight <1,500 g and gestational age <32 weeks) from 2003 to 2015. Cystic PVL was diagnosed by serial cerebral ultrasound, and other comorbidities were recorded during hospitalization. Neurological developments and consequences, including epilepsy, were serially accessed until the age of 5. Results: A total of 976 preterm infants completed a 5-year neurological follow-up; 47 (4.8%) had cystic PVL. Preterm infants with cystic PVL were commonly associated with other comorbidities, including necrotizing enterocolitis stage III, neonatal seizures, and intraventricular hemorrhage during hospitalization. At age 5, 14 of the 47 (29.8%) preterm infants with cystic PVL had postnatal epilepsy. After adjusting for gender, gestational age, and three common comorbidities, cystic PVL was an independent risk factor for postnatal epilepsy (adjust OR: 16.2; 95% CI: 6.8-38.4; p < 0.001). Postnatal epilepsy after cystic PVL was commonly the generalized type (13 of 14, 92.9%), not intractable and most occurred after 1 year of age. Discussion/conclusion: Cystic PVL would independently lead to postnatal epilepsy. Preterm

infants with cystic PVL are at risk of postnatal epilepsy after age 1 in addition to cerebral palsy.

PMID: 37071988

22. Chorionicity and neurodevelopmental outcomes at 5½ years among twins born preterm: the EPIPAGE2 cohort study

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Objective: To compare the neurodevelopmental outcomes of preterm twins at 5½ years by chorionicity of pregnancy. Design: Prospective nationwide population-based EPIPAGE2 (Etude Epidémiologique sur les Petits Âges Gestationnels) cohort study. Setting: A total of 546 maternity units in France, between March and December 2011. Population: A total of 1126 twins eligible for follow-up at 5½ years. Methods: The association of chorionicity with outcomes was analysed using multivariate regression models. Main outcome measures: Survival at 5½ years with or without neurodevelopmental disabilities (comprising cerebral palsy, visual, hearing, cognitive deficiency, behavioural difficulties or developmental coordination disorders) were described and compared by chorionicity. Results: Among the 1126 twins eligible for follow-up at 5½ years, 926 (82.2%) could be evaluated: 228 monochorionic (MC) and 698 dichorionic (DC). Based on chronicity and gestational age of birth, we found no significant differences for severe neonatal morbidity. The rates of moderate/severe neurobehavioral disabilities were similar in infants from DC pregnancies versus infants from MC pregnancies (OR 1.22, 95% CI 0.65-2.28). By gestational age and without twin-twin transfusion syndrome (TTTS), no difference according to chorionicity was found for all neurodevelopmental outcome measures. Conclusions: The neurodevelopmental outcomes among preterm twins at 5½ years is similar, irrespective of chorionicity.

PMID: 37069725

23. Therapeutic advances for treating memory impairments in perinatal brain injuries with implications for cerebral palsy: A systematic review and meta-analysis of preclinical studies

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Review Exp Neurol. 2023 Apr 15;114411. doi: 10.1016/j.expneurol.2023.114411. Online ahead of print.

Cerebral palsy (CP) is a neurodevelopmental disorder caused by damage to the immature brain. CP is considered the main cause of physical disability in childhood. Studies have shown that memory function and emotional behaviour are significantly impaired in CP. Current thought is that interventions for neuromotor damaged play a prominent role, but neglects the memory acquisition problems that affect the functioning and quality of life of these children. This systematic review aims to map and analyse pre-clinical interventions used to treat memory formation problems resulting from CP. For this, a search was carried out in the Pubmed, Web of Science, Scopus and Lilacs databases. Then, eligibility, extraction date and evaluation of the methodological quality of the studies were determined. 52 studies were included in this review, and 27 were included in a meta -analysis. Assessing memory performance as a primary outcome, and structural and biochemical changes in the hippocampus as a secondary outcome. CP models were reported to be induced by hypoxia-ischemia, oxygen deprivation and liposaccharide (LPS) exposure, resulting in impairments in the formation of short-term and long-term memory in adult life. A reduction in escape latency and dwell time were observed in the target quadrant as well as an increase in the time needed for the rodents to find the platform in the Morris Water Maze (MWM). Brain injuries during the perinatal period are considered an insult that negatively impacts hippocampus maturation and causes impairment in memory formation in adult life. Some studies reported that regions of the hippocampus such as the dentate gyrus and cornu ammonis 1 were impaired in CP, noting an increase in oxidative stress enzymes and pro-inflammatory cytokines, associated with a reduction in BDNF and neurogenesis levels. These were reported to cause a reduction in the number of neurons and the volume of the hippocampus, in addition to an increase in astrogliosis and apoptosis of neurons and difficulties in forming new memories similar to those that occur in children with CP. Interventions that reduced neuroinflammation and the presence of free radicals were highlighted as a therapy for the memory disturbance present in CP. Preclinical studies registered treatments with oxygen interventions, resveratrol and erythropoietin, which were able to reduce the damage to the hippocampus and promote improvements in memory and behaviour. In the meta-analysis of selected studies, we observed favorable results, through effect size, for the use of oxygen interventions (SDM -6.83 95% CI [-7.91, -5.75], Z = 12.38, p = 0.03; I2 = 71%), erythropoietin (SDM -3.16 95% CI [-4.27, -2.05], Z = 5.58, p = 0.002; I2 = 82%) and resveratrol (SDM -2.42 95% CI [-3.19, - 1.66], Z = 6.21, p = 0.01; I2 = 77%), stimulating plastic responses in the hippocampus and facilitating the memory formation, with these presenting positive effects in general (SDM -2.84 95% CI [-3.10, -2.59], Z = 22.00; p < 0.00001; I2 = 92.9%). These studies demonstrate possible avenues of intervention for memory alterations in experimental models of early brain injuries, highlighting promising interventions that can facilitate the maturation of the hippocampus and memory formation and, consequently, minimize functional problems that arise during development.

PMID: 37068620

24. Central tegmental tract hyperintensity: follow-up outcomes from a single-center study

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Purpose: To evaluate the follow-up outcomes of symmetrical central tegmental tract hyperintensity (CTTH) and discuss possible etiological factors involved. Methods: Brain MRI scans of 7028 pediatric patients aged 0 to 18 years obtained between July 2015 and May 2020, were reviewed retrospectively for the presence of CTTH. Clinical data of the patients were retrieved from the hospital information system. Patients with follow-up MRI scans were evaluated separately. Results: A total of 5113 patients meeting the study inclusion criteria were identified in whom the prevalence of CTTH was 4.02% (n = 206). Of the patients with CTTH, 40.3% (n = 83) were girls, and the median age was 19 months (range, 1-108). The most common MRI indication was seizures (40.3%, n = 83), and among those with a definitive diagnosis, epilepsy was the most prevalent etiology (7.8%, n = 16). 40.7% (n = 84) of the patients with CTTH had follow-up MRI scans. CTTH disappeared on follow-up in 28.6% (n = 24) of the patients. The median age at CTTH disappearance was 51.5 months, and the mean (± SD) time to CTTH disappearance was 31.50 (± 19.02) months. Conclusion: CTTH is a radiological finding commonly seen in early childhood but its clinical relevance has not been fully elucidated. While CTTH may be a transient phenomenon representing the maturation process, it may also be associated with a number of clinical conditions. Using a large patient series and follow-up MRI scans, our study shed light on the possible etiological factors of CTTH and its evolution over time.

PMID: 37067564

25. Neonatal serial creatinine levels as an adjunct biomarker in timing of fetal neurologic injury

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Objective: To investigate the rise and clearance of newborn creatinine in perinatal asphyxia as an adjunct biomarker to support or refute allegations of acute intrapartum asphyxia. Study design: In this retrospective chart review, newborns > 35 weeks gestational age were evaluated from closed medicolegal cases of confirmed perinatal asphyxia and reviewed for causation. Data collected included newborn demographic data, patterns of hypoxic ischemic encephalopathy, brain magnetic resonance imaging, Apgar scores, cord and initial newborn blood gases, and serial newborn creatinine levels during the first 96 h of life. Newborn serum creatinine values were collected at 0-12, 13-24, 25-48, and 49-96 h. Newborn brain magnetic resonance imaging was used to define 3 patterns of asphyxial injury: acute profound, partial prolonged, or Both. Results: Two hundred and eleven cases of neonatal encephalopathy from multiple institutions were reviewed from 1987 to 2019 with only 76 cases having serial creatinine values during the first 96 h of life. A total of 187 creatinine values were collected. Partial prolonged and Both had significantly greater degree of metabolic acidosis in the first newborn arterial blood gas in comparison to acute profound. Acute profound and Both had significantly lower 5- and 10- minute Apgar scores in comparison to partial prolonged. Newborn creatinine values were stratified by asphyxial injury. Acute profound injury showed minimally elevated creatinine trends with rapid normalization. Partial prolonged and Both demonstrated higher creatinine trends with delayed normalization. Mean creatinine values were significantly different between the three types of asphyxial injuries within 13-24 h of life at the time when creatinine values peaked (p = 0.01).

PMID: 37065675

26. Management of pain in children and adolescents with cerebral palsy: A systematic review

No authors listed

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No abstract available

PMID: 37063078

27. Use of intraoperative topical antibiotics to reduce intrathecal baclofen pump surgical site infections: a single institution's experience over 24 years

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Objective: Patients requiring intrathecal baclofen (ITB) therapy are at high risk for surgical site infections (SSIs) given their poor functional status. After years of a nominal infection rate, there was an inexplicable increase in ITB pump infections at the authors' institution and multiple investigations offered no solution. Use of intraoperative topical antibiotics is well-documented in the orthopedic literature and was considered for ITB pump insertion. In this study, the authors investigated whether intraoperative vancomycin and tobramycin powder at the ITB pump site could reduce SSIs. Methods: Operative and infection data were collected and analyzed retrospectively to determine the efficacy of this change. Patients were stratified into three cohorts (1998-2009, 2010-2012, and 2013-2021) to better understand the trends before and after implementation of intraoperative topical antibiotics. Each cohort had similar demographics. Results: One hundred fifty-four patients underwent 272 ITB pump procedures between 1998 and 2021 (131 in 1998-2009, 49 in 2010-2012, and 92 in 2013-2021) for cerebral palsy (69.5%), spastic quadriparesis due to traumatic brain injury (7.1%), anoxic brain injury (6.5%), and other causes (16.9%). Infection rates were reduced from a high of 32% in 2010-2011 to 3.8% over the last 2.5 years ($p = 0.0094$). There were no adverse effects from the use of topical antibiotics. Conclusions: In the setting of an intractable rise in ITB pump infections, the addition of intraoperative topical antibiotics significantly reduced postoperative infections in a high-risk population. One could appreciate a significant drop each year in the rate of infections after the institution of intraoperative topical antibiotics. The reduction in SSIs significantly improved the long-term outcomes for these patients.

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