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Cerebral palsy research news

Monday 5 June 2023

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Interventions and Management

1. Investigation of brain mechanisms underlying upper limb function in bilateral cerebral palsy using EEG

Victoria Hinchberger, Si Hyun Kang, Julia Kline, Christopher J Stanley, Thomas C Bulea, Diane L Damiano

Clin Neurophysiol. 2023 May 4;151:116-127. doi: 10.1016/j.clinph.2023.04.006. Online ahead of print.

Objective: Few studies focus on upper limbs in bilateral cerebral palsy (CP) despite potential bimanual deficits. Electroencephalography (EEG) was utilized to investigate brain mechanisms underlying upper limb tasks in bilateral CP and typical development (TD) and relationships to function. Methods: 26 (14 CP; 12 TD) completed the Box and Blocks Test and transport task with paper, sponge or mixed blocks, while recording EEG and motion data. Results: Group effects for path time, path length and Box and Blocks Test revealed bimanual deficits. Four sensorimotor-related EEG clusters were identified. Group effects were found in premotor and dominant motor clusters with greater beta event-related desynchronization (ERD) in CP. Hand and hand by group effects were found in the dominant motor cluster, showing greater ERD with the more affected hand in CP. Condition effects were prominent in the posterior parietal cluster with higher ERD reflecting greater difficulty in force modulation. Conclusions: Higher brain activation associated with greater bimanual deficits is similar to our lower limb findings but contrasts studies in TD or unilateral CP linking higher ERD to greater proficiency. Significance: Bilateral CP shows overreliance on the dominant hemisphere with the less functional hand and higher brain activity presumably related to excessive intracortical connectivity.

PMID: 37245498

2. The utility of selective partial neurectomy of the musculocutaneous nerve in children with bilateral spastic elbow

Antonio Heredia-Gutierrez, María Eugenia Carbarin-Carbarin, Samuel Torres-Garcia, Vicente Gonzalez-Carranza, Fernando Chico-Ponce de Leon

Childs Nerv Syst. 2023 Jun 2. doi: 10.1007/s00381-023-06009-9. Online ahead of print.

Purpose: This study aims to determine the utility of selective partial neurectomy of the musculocutaneous nerve (MCN) in pediatric patients with bilateral spastic elbow. Methods: A prospective, cross-sectional, case series study was performed in nine pediatric patients (four females and five males) with bilateral spastic elbow, all with a 11.4-year-old average age, where 18 selective partial neurectomies of the MCN were carried out. They were evaluated with goniometry of both spastic elbows at resting position and active amplitude, and staging spasticity employing the Modified Ashworth Scale (MAS) in the preoperative and postoperative period. The results are reported 1 year after surgery. Results: The etiology of the spasticity was secondary to cerebral palsy in eight patients (88.8%) and in one patient (11.11%) secondary to traumatic brain injury. A clinical improvement was observed in goniometry comparing the preoperative and postoperative resting position, a mean preoperative of 44.38 degrees (SD ± 7.61) versus 98.05 degrees (SD ± 24.44), respectively, and preoperative active amplitude a mean of 86.55 degrees (SD ± 15.97) versus the mean postoperative of 47.33 (SD ± 17.86). A relevant decrease on the MAS after surgical intervention was observed, resulting from an average preoperative state according to MAS of 3.78 (SD ± 0.42) to a postoperative state according to MAS of 1.44 (SD ± 0.51), these changes being statistically significant ($p \leq 0.001$). No postoperative complications were observed. Conclusions: Selective partial neurectomy of the MCN has shown good results in

patients with bilateral spastic elbow in whom antispastic drugs and physical therapy have failed, and has prove permanent effects.

PMID: 37266682

3. Is functional electrical stimulation effective in improving walking in adults with lower limb impairment due to an upper motor neuron lesion? An umbrella review

Georgia Andreopoulou, Giulia Busselli, Tamsyn Street, Cathy Bulley, Reza Safari, Marietta L van der Linden, Jane Burridge

Review Artif Organs. 2023 Jun 1. doi: 10.1111/aor.14563. Online ahead of print.

Purpose: To conduct an umbrella review of systematic reviews on functional electrical stimulation (FES) to improve walking in adults with an upper motor neuron lesion. Methods: Five electronic databases were searched, focusing on the effect of FES on walking. The methodological quality of reviews was evaluated using AMSTAR2 and certainty of evidence was established through the GRADE approach. Results: The methodological quality of the 24 eligible reviews (stroke, n = 16; spinal cord injury (SCI), n = 5; multiple sclerosis (MS); n = 2; mixed population, n = 1) ranged from critically low to high. Stroke reviews concluded that FES improved walking speed through an orthotic (immediate) effect and had a therapeutic benefit (i.e., over time) compared to usual care (low certainty evidence). There was low-to-moderate certainty evidence that FES was no better or worse than an Ankle Foot Orthosis regarding walking speed post 6 months. MS reviews concluded that FES had an orthotic but no therapeutic effect on walking. SCI reviews concluded that FES with or without treadmill training improved speed but combined with an orthosis was no better than orthosis alone. FES may improve quality of life and reduce falls in MS and stroke populations. Conclusion: FES has orthotic and therapeutic benefits. Certainty of evidence was low-to-moderate, mostly due to high risk of bias, low sample sizes, and wide variation in outcome measures. Future trials must be of higher quality, use agreed outcome measures, including measures other than walking speed, and examine the effects of FES for adults with cerebral palsy, traumatic and acquired brain injury, and Parkinson's disease.

PMID: 37259954

4. Brain-spine interface allows paralysed man to walk using his thoughts

Dyani Lewis

Nature. 2023 Jun;618(7963):18. doi: 10.1038/d41586-023-01728-0.

No abstract available

PMID: 37225819

5. Effect of intrathoracic oscillations on pulmonary functions in children with cerebral palsy

Alaa M El-Moatasem, Mai E Abbass

J Taibah Univ Med Sci. 2023 May 16;18(6):1254-1260. doi: 10.1016/j.jtumed.2023.05.003. eCollection 2023 Dec.

Objectives: This study was aimed at investigating the effects of intrathoracic oscillations on pulmonary function in children with spastic quadriplegic cerebral palsy. Methods: This study comprised 24 boys and girls 6-8 years of age with spastic quadriplegic cerebral palsy. According to the modified Ashworth scale, the degree of spasticity was 2 to 2+. The children were able to sit independently and follow instructions. The children were randomly divided into a study group and control group. A spirometer was used to examine each child before and after 6 weeks. Children in the control group received traditional chest physiotherapy (postural drainage and percussion), whereas children in the study group underwent quake device training. For 6 weeks, both groups received four sessions per week. After treatment, the results were collected. Paired t-test and independent-samples t-test were applied to compare the means for each group. p-values <0.05 were considered significant. Results: The post -treatment results of forced expiratory volume at 1 s, peak expiratory flow, forced vital capacity, and the ratio of forced expiratory volume at 1 s to forced vital capacity demonstrated significant differences favoring the study group over the control group ($p < 0.001$, $p < 0.001$, $p = 0.002$, and $p = 0.023$, respectively). Conclusion: Intrathoracic oscillations may improve pulmonary function in children with quadriplegic cerebral palsy.

PMID: 37250813

6. The changing face of reported status dystonicus - A systematic review

Daniel E Lumsden, Laura Cif, Alessandro Capuano, Nicholas M Allen

Review Parkinsonism Relat Disord. 2023 May 18;105438. doi: 10.1016/j.parkreldis.2023.105438. Online ahead of print.

Background: Status Dystonicus (SD) represents the most severe end of the spectrum of dystonia. We aimed to explore whether reported features of cases of SD have changed over time. Methods: A systematic review of cases of SD reported from 2017 to 2023 and comparison of features to data extracted from 2 previous literature reviews (epochs 2012-2017 and pre-2012). Results: From 53 papers, a total 206 SD episodes in 168 patients were identified from 2017 to 2023. Combining data from all 3 epochs, a total of 339 SD episodes were reported from 277 patients. SD episodes occurred mostly in children, with a trigger identified in 63.4% of episodes, most commonly infection/inflammation. Most reported underlying aetiologies were genetic (e.g. 49.5% between 2017 and 2023), including new associated aetiologies in each epoch. Deep Brain Stimulation (DBS)-related SD increased over time. Neurosurgical interventions were more frequently reported in later epochs. Across the epochs, return to or improvement post SD episode, compared to baseline was reported above 70%. Reported mortality was 4.9% most recently, compared to 11.4% and 7.9%, previously. Conclusions: SD episodes reported have more than doubled in the last 5 years. Reports of medication change-induced SD have become less frequent, whilst episodes of DBS-related SD have become more frequent. More dystonia aetiologies, including novel aetiologies have been reported in recent cohorts, reflecting advances in genetic diagnosis. Neurosurgical interventions are increasingly reported in the management of SD episodes, including novel use of intraventricular baclofen. Overall outcomes from SD remain largely unchanged over time. No prospective epidemiological studies of SD were identified.

PMID: 37268557

7. Identification of risk factors for reconstructive hip surgery after intrathecal baclofen therapy in children with cerebral palsy

Ali Asma, Jason J Howard, Armağan Can Ulusaloglu, Kenneth J Rogers, Freeman Miller, M Wade Shrader

Acta Orthop Traumatol Turc. 2023 Jun 1. doi: 10.5152/j.aott.2023.22017. Online ahead of print.

Objective: This study aimed to determine the risk factors for reconstructive hip surgery after intrathecal baclofen pump application in children with cerebral palsy. Methods: Inclusion criteria were children with hypertonic (spastic or mixed spastic/dystonic motor type) cerebral palsy, intrathecal baclofen implantation <8 years of age, no reconstructive osteotomies prior to or concomitant with intrathecal baclofen implantation and at least a 5-year follow-up. Exclusion criteria included reconstructive osteotomies prior to or concurrent with intrathecal baclofen implantation, lack of at least 1 hip surveillance radiograph before intrathecal baclofen, lack of a 5-year follow-up, or having selective dorsal rhizotomy. In addition, patients with bony surgery plus last follow-up migration percentage ≥50% were labeled as required reconstruction hips. Results: We identified 34 patients (68 hips). The mean follow-up was 9.2 ± 2.8 years. The mean age for intrathecal baclofen application was 6.4 ± 1.2 years. Seven patients were Gross Motor Function Classification System IV, and 27 were V. Eighteen patients (52.9%) with 31 hips (45.6%) were requiring reconstruction at the final follow-up. In multivariate analysis, male sex (odds ratio 12.8, P=.012), pre-intrathecal baclofen migration percentage (odds ratio 1.1, P=0.003), age at intrathecal baclofen implantation (odds ratio 0.24, P=.002), and delta migration percentage (odds ratio 1.1, P=.002) were significant risk factors for requiring reconstruction. Patients with intrathecal baclofen <6.2 years of age had a significantly higher rate of requiring reconstruction. A pre-intrathecal baclofen migration percentage >31% had a greater risk of progression to requiring reconstruction (P=.001). Delta migration percentage higher than 15% was significantly associated with progression to requiring reconstruction (P=.043). Conclusion: The risk of requiring reconstruction osteotomies after intrathecal baclofen was significantly increased in males, those younger (±migration percentage >31%) at the time of intrathecal baclofen implantation and those with an increased rate of migration percentage progression after intrathecal baclofen implantation.

PMID: 37260383

8. Acupuncture in the Treatment of Abnormal Muscle Tone in Children with Cerebral Palsy: A Meta-Analysis

Ya Yuanjie, Xue Jianyi, Xu Jinyan, Huang Mao, Yan Siyang, Yin Zhenjin

Review Behav Neurol. 2023 Mar 21;2023:4662788. doi: 10.1155/2023/4662788. eCollection 2023.

Objective: To analyse the clinical efficacy of acupuncture and routine treatment in improving dystonia in children with cerebral palsy. Method: The randomized controlled trials published from the establishment of the databases to August 2022 on acupuncture in the treatment of dystonia in children with cerebral palsy were collected and comprehensively searched in China national knowledge infrastructure (CNKI), weipu (VIP), Wanfang, SinoMed, PubMed, Excerpta medica database (EMBASE), and Cochrane Library. The literature was selected according to the established standards, the quality of the included studies was evaluated, the heterogeneity of the included studies was evaluated with the I2 test, and the appropriate model was selected for analysis. Sensitivity analysis was used to evaluate the reliability of the results, and a funnel plot was used to evaluate the publication bias. Results: Fifteen studies were included in the meta-analysis. The control group was treated with routine treatment and acupuncture combined with routine treatment. The outcome index showed that the effect in the treatment group was better: Modified Ashworth Scale score: -0.52, 95% confidence interval (CI) (-0.62 to -0.41), $p < 0.01$. The treatment group showed reduced muscle tension to a greater extent (integral eletromyographic (iEMG) score: standard mean square deviation =

-2.97, 95% CI (-4.87 to -1.06), p < 0.01). The effective rate in the control group was 74.2% and that in the treatment group was 91.5%, odds ratio = 3.70, 95% CI (2.02-6.78), p < 0.01. The funnel plot showed publication bias. Conclusion: Acupuncture combined with routine training could improve muscle tension abnormalities and improve the efficiency of clinical treatment.
PMID: 37252107

9. Development of the Gross Motor Function Family Report (GMF-FR) for Children with Cerebral Palsy

Paula S C Chagas, Peter Rosenbaum, F Virginia Wright, Lesley Pritchard, Marilyn Wright, Aline Martins Toledo, Ana Cristina R Camargos, Egmar Longo, Hércules R Leite

Physiother Can. 2023 Feb 8;75(1):83-91. doi: 10.3138/ptc-2021-0006. eCollection 2023 Winter.

Purpose: To describe the initial steps in the development of a family-completed, modified version of the Gross Motor Function Measure (GMFM-88) to report gross motor function of young people with cerebral palsy in their natural environments. Methods: Development of the Gross Motor Function - Family Report (GMF-FR) was based on expert opinion involving 13 experienced clinicians and researchers, in four steps: (1) item identification to target items that reflect functional gross motor performance; (2) item selection; (3) critical analysis of the items; and (4) item and scoring modification. Results: Several modifications to existing items and scoring were made, including wording changes to optimize ease of families' understanding, the addition of photographs to illustrate all items, changes to the items to enable use of furniture instead of specialized equipment, and modifications to scoring criteria to ensure a focus on functional motor skills. Ultimately, 30 items were selected, and specific testing/scoring instructions were created for each item. Conclusions: GMF-FR is a new family-report tool, based on the GMFM-88. When validated, it can be used as a telehealth outcome measure to capture family-reported functional motor skill performance in home and community environments.

PMID: 37250728

10. Ankle-foot orthoses among children with cerebral palsy: a cross-sectional population-based register study of 8,928 children living in Northern Europe

Jessica Stockman, Guðbjörg Eggertsdótti, Mark S Gaston, Ira Jeglinsky-Kankainen, Sandra Julsen Hollung, Kirsten Nordbye-Nielsen, Philip von Rosen, Ann I Alriksson-Schmidt

BMC Musculoskelet Disord. 2023 Jun 2;24(1):443. doi: 10.1186/s12891-023-06554-z.

Background: Cerebral palsy (CP) is an umbrella term where an injury to the immature brain affects muscle tone and motor control, posture, and at times, the ability to walk and stand. Orthoses can be used to improve or maintain function. Ankle-foot orthoses (AFOs) are the most frequently used orthoses in children with CP. However, how commonly AFOs are used by children and adolescents with CP is still unknown. The aims of this study were to investigate and describe the use of AFOs in children with CP in Sweden, Norway, Finland, Iceland, Scotland, and Denmark, and compare AFO use between countries and by gross motor function classification system (GMFCS) level, CP subtype, sex, and age. Method: Aggregated data on 8,928 participants in the national follow-up programs for CP for the respective countries were used. Finland does not have a national follow-up program for individuals with CP and therefore a study cohort was used instead. Use of AFOs were presented as percentages. Logistic regression models were used to compare the use of AFOs among countries adjusted for age, CP subtype, GMFCS level, and sex. Results: The proportion of AFO use was highest in Scotland (57%; CI 54-59%) and lowest in Denmark (35%; CI 33-38%). After adjusting for GMFCS level, children in Denmark, Finland, and Iceland had statistically significantly lower odds of using AFOs whereas children in Norway and Scotland reported statistically significantly higher usage than Sweden. Conclusion: In this study, the use of AFOs in children with CP in countries with relatively similar healthcare systems, differed between countries, age, GMFCS level, and CP subtype. This indicates a lack of consensus as to which individuals benefit from using AFOs. Our findings present an important baseline for the future research and development of practical guidelines in terms of who stands to benefit from using AFOs.

PMID: 37268928

11. Dynamic electromyography findings of the lower leg muscles during walking in spastic cerebral palsy children with hindfoot valgus

Xuesen Wang, Xiaohu Fu, Wei Li, Qining Wang, Kuan Zhang, Songhua Yan

Clin Biomech (Bristol, Avon). 2023 Jun;106:106008. doi: 10.1016/j.clinbiomech.2023.106008. Epub 2023 May 20.

Background: Hindfoot valgus is one of the most prevalent foot deformities in cerebral palsy children. Investigating the muscle activation patterns of cerebral palsy children with hindfoot valgus is crucial to understand their abnormal gait different from typically developing children. Methods: Electromyography data of 20 cerebral palsy children with hindfoot valgus and 20 typically developing children were recorded for tibialis anterior, peroneal longus, and gastrocnemius medialis. The activation onset and offset times, normalized peak electromyography amplitude, average electromyography amplitude and integral

electromyography amplitude for 20 completed cycles were averaged for data analysis. The co-activation index and activation percentage of peroneal longus were used to evaluate the co-activation level for tibialis anterior and peroneal longus muscles. Findings: Compared with typically developing children, the activation onset of tibialis anterior and the activation offset of tibialis anterior, peroneal longus, and gastrocnemius medialis were significantly delayed in cerebral palsy children; moreover, the muscle activation durations of tibialis anterior, peroneal longus, and gastrocnemius medialis were significantly longer, and the normalized average electromyography amplitude of tibialis anterior, peroneal longus and gastrocnemius medialis, and the normalized integral electromyography amplitude of tibialis anterior were significantly lower in cerebral palsy children. Furthermore, for cerebral palsy children, the co-activation index was greater, and the peroneal longus muscles activation percentage was lower in the stance phase and greater in the swing phase than that of typically developing children. Interpretation: The lower leg muscle activation patterns in cerebral palsy children were found to be abnormal.

PMID: 37257273

12. The IndieTrainer system: a clinical trial protocol exploring use of a powered wheelchair training intervention for children with cerebral palsy

Lisa K Kenyon, John Farris, Lindsey Veety, Daniel K Zondervan

Disabil Rehabil Assist Technol. 2023 May 31;1-11. doi: 10.1080/17483107.2023.2218436. Online ahead of print.

Objective: The IndieTrainer system, comprised of both a mobility device and gamified training modules, was developed to aid powered wheelchair (PWC) skills acquisition in children with cerebral palsy (CP). The aims of this small-scale study are to: explore use of the IndieTrainer system to improve PWC skills in children who have CP and document parental/caregiver perceptions of, and satisfaction with, the IndieTrainer system. Method: This small-scale study is an open-label single-arm clinical trial involving a three-week PWC training intervention consisting of two 60-minute training sessions per week. A single session retention trial will be held four weeks after the completion of the intervention period. All research activities will take place in-person in a laboratory-based setting located within a university. Twenty-five child-parent/caregiver dyads will participate in the study. Each child participant will be 3 to 21 years of age and have a diagnosis of CP or other similar condition. The Assessment of Learning Powered mobility use will be the primary outcome measure. Secondary outcome measures will include the Wheelchair Skills Checklist, the Canadian Occupational Performance Measure, the Customer Satisfaction Questionnaire-8, and a qualitative interview. Data analyses will involve one-way repeated measures ANOVAs followed by paired samples t-tests with Bonferroni adjustments. Impact: The IndieTrainer system allows children to explore and use power mobility in their own manual wheelchair and was designed to meet the needs of power mobility learners across the continuum of learning. It is the first PWC training system to optimize learning for early learners who do not yet understand cause and effect concepts. IMPLICATIONS FOR REHABILITATION The IndieTrainer system is designed to meet the needs of power mobility learners across the continuum of learning. This protocol outlines a novel means of providing progressive power mobility training. The IndieTrainer was designed to expand power mobility access to children with cerebral palsy, a previously underserved population.

PMID: 37256733

13. The Impact of Functional Strength Training on Muscle Strength and Mobility in Children with Spastic Cerebral Palsy - A Systematic Review and Meta-Analysis

Kirthana Shilesh, Suruliraj Karthikbabu, Pratiksha Tilak Rao

Review Dev Neurorehabil. 2023 May 30;1-16. doi: 10.1080/17518423.2023.2218905. Online ahead of print.

Objective: To review the effects of functional strength training (FST) on muscle strength and mobility in children with spastic cerebral palsy (CP). Methods: Eight databases were screened through March 2022 for studies assessing the impact of FST on strength, mobility, balance, and endurance in children with spastic CP. Study quality was assessed using the Downs and Black checklist and Cochrane Risk of Bias tools, followed by a meta-analysis. Results: Twelve intervention studies of moderate-to-high-level evidence were selected. The interventions included open and closed chain exercises using free weights or body weight, administered approximately thrice a week for 12 weeks. The FST was found to have a moderate-to-large, statistically significant, positive effect on muscle strength (quadriceps, hamstrings, and plantar flexors) and mobility (GMFM D and E), with only four studies showing maintenance of gains during follow-up assessment. Conclusion: FST has a positive effect on muscle strength and mobility in children with spastic CP, but evidence of sustained effects following FST is limited.

PMID: 37254274

14. Presence and grade of undertreatment of pain in children with cerebral palsy

Tamo Sultan, Christian Wong

Scand J Pain. 2023 Jun 2. doi: 10.1515/sjpain-2022-0124. Online ahead of print.

Objectives: To investigate if chronic pain in children with cerebral palsy is undertreated with the current pharmacological/non-pharmacological interventions using a pain management index. Methods: Parents of 120 children with cerebral palsy between the ages of 2-19 years from our region in Denmark answered a questionnaire about whether their child had everyday pain. When answering in pain, we inquired about pain status and pharmacological/non-pharmacological pain coping interventions. Everyday pain was viewed as chronic pain with acute exacerbations. Pain experienced was divided into worst pain (highest moments of pain intensity) and least pain (lowest moments of pain intensity). To describe and evaluate the effectiveness of pain interventions used, a pain management index was utilized. Everyday pain was assessed using a logistical regression by adjusting for age, sex, and gross motor function classification system level. Results: 59/115 (0.51) of parents answering the questionnaire reported everyday pain. Of those, the median age was 10 years. For pain alleviation, massage was reported by parents as being used by 29/59 (0.49) children and paracetamol by 21/59 (0.36). Pain affected daily life in 44/59 (0.75). By our evaluation 44/59 (0.75) were inadequately treated for their pain. Our evaluation also revealed that 19/59 (0.32) of children in pain had inadequately treated pain combined with an undesirable intensity of least pain. Conclusions: Half of the children with cerebral palsy experienced chronic pain according to our pain questionnaire answered by parents. Among these children three-quarters were insufficiently treated for their pain. In the same group, one-third were impacted by pain felt at both its highest and lowest moments of intensity. Massage therapy and paracetamol were the most frequently utilized pain-alleviating interventions. In our cohort, pain was undertreated and likely underdiagnose (Protocol number H-17008823).

PMID: 37267482

15. Visual impairment due to retinopathy of prematurity and concomitant disabilities in the Netherlands

Kasia Trzcionkowska, Jacqueline U M Termot, Maria M van Genderen, Meindert J de Vries, Arlette J van Sorge, Nicoline E Schalij-Delfos

Early Hum Dev. 2023 May 29;182:105793. doi: 10.1016/j.earlhumdev.2023.105793. Online ahead of print.

Aim: Determine incidence of visual impairment due to retinopathy of prematurity (ROP) and concomitant disabilities between 2009 and 2018 in the Netherlands and compare data to four former similar studies. Secondly, monitor if infants were missed for ROP-screening since the adoption of stricter, risk factor guided criteria (2013). Methods: Retrospective inventory on anonymous data of infants diagnosed with ROP from Dutch visual impairment-institutes. Data including: best corrected visual acuity, ROP-treatment and concomitant disabilities: bronchopulmonary dysplasia, behavioral abnormalities, epilepsy, hearing deficit, developmental delay, cerebral palsy and cerebral visual impairment. During the study period, lower age limit for neonatal life support (2010) and higher oxygen saturation targets (2014) were implemented. Results: Records of 53 infants were analyzed. Visual impairment incidence due to ROP was 2.02 per 100.000 live births (2000-2009: 1.84, p = 0.643). Compared to earlier periods (1975-2000), a significant decrease was observed. The incidence of concomitant disabilities remained stable. Mean gestational age (GA) continued to decrease to 26.6 ± 1.9 weeks (2000-2009: 27.4 ± 2.0 weeks, p = 0.047). All patients met the screening inclusion criteria. Conclusion: The incidence of visual impairment due to ROP and concomitant disabilities between 2009 and 2018 has not increased, despite lower GA and higher oxygen saturation targets. None of the infants were missed for ROP screening following introduction of more restricted screening inclusion criteria.

PMID: 37263155

16. The Parental Stress Scale: Validity and Reliability of Gujarati Translated Version in Parents of Children with Cerebral Palsy

Vivek Ramanandi, Aparna Bachkaniwala, Aksh Chahal, Sakshi Vats, Mansi Jain, Abhishek Sharma, Nidhi Sharma, Kanika

J Lifestyle Med. 2023 Feb 28;13(1):59-65. doi: 10.15280/jlm.2023.13.1.59.

Background: The parental Stress Scale (PSS) is an 18 item self-report scale that indicates positive (e.g., emotional benefits, personal development) and negative (demands on resources, restrictions) themes of parenthood. This study was aimed to study the reliability and validity of the Gujarati version of PSS (PSS-G) by a study performed among parents of children with Cerebral Palsy (CP). Methods: In total, 152 parents of children with CP were assessed for evaluation of stress using the Gujarati version of PSS and the English version of the Parenting Stress Index- Short form. Concurrent validity was evaluated using Pearson's correlations, internal consistency was evaluated using Cronbach's alpha, and test-retest reliability was evaluated using the intraclass correlation coefficient value. Results: The scales of the PSS-G revealed high internal consistency (i.e., Cronbach's $\alpha = 0.923$) and the intraclass correlation coefficient value for test-retest reliability of 0.987. Moreover, Pearson's correlation coefficient also supports the concurrent validity of PSS-G for parents of children with CP. Conclusion: The PSS-G is a valid and reliable outcome measure to evaluate parental stress in parents of children with CP. As the robust psychometric properties of PSS-G is already established, research can be performed to extend its utility and routine use in clinical and public health settings.

PMID: 37250277

17. Growth patterns in children and adolescents with cerebral palsy from Argentina and Germany

Maria de Las Mercedes Ruiz Brunner, Eduardo Cuestas, Rüdiger von Kries, Jordan Brooks, Charlotte Wright, Florian Heinen, Andreas Sebastian Schroeder

Sci Rep. 2023 Jun 2;13(1):8947. doi: 10.1038/s41598-023-34634-6.

To analyze growth patterns of children with CP between countries; to examine differences in growth; and to assess the fit of growth charts. Cross-sectional study in children with CP from 2 to 19 years old, 399 from Argentina and 400 from Germany. Growth measures were converted into z-scores and compared to WHO reference and US CP growth charts. Generalized Linear Model was used to analyze the growth expressed as mean z-scores. 799 children. Mean age 9 years (± 4). Compared to the WHO reference, the decrease in Height z-scores (HAZ) with age in Argentina (- 0.144/year) was double that in Germany (- 0.073/year). For children in GMFCS IV-V, BMI z-scores (BMIZ) decreased with age (- 0.102/year). Using the US CP charts, both countries showed decreasing HAZ with age, in Argentina (- 0.066/year) and in Germany (- 0.032/year). BMIZ increased more among children with feeding tubes (0.062/year), similar in both countries. Argentinian children with oral feeding decrease their Weight z-score (WAZ) by - 0.553 compared to their peers. With WHO charts BMIZ presented an excellent fit for GMFCS I-III. HAZ presents a poor fit to growth references. BMIZ and WAZ presented a good fit to US CP Charts. Growth differences due to ethnicity also act in children with CP, and are related to motor impairment, age and feeding modality, possibly reflecting differences in environment or health care.

PMID: 37268651

18. Consequences of oxygen deprivation on myelination and sex-dependent alterations

Rafael Bandeira Fabres, Débora Sterzeck Cardoso, Brian Aranibar Aragón, Bruna Petrucelli Arruda, Pamela Pinheiro Martins, Juliane Midori Ikebara, Alexander Drobyshevsky, Alexandre Hiroaki Kihara, Luciano Stürmer de Fraga, Carlos Alexandre Netto, Silvia Honda Takada

Review Mol Cell Neurosci. 2023 Jun 1;126:103864. doi: 10.1016/j.mcn.2023.103864. Online ahead of print.

Oxygen deprivation is one of the main causes of morbidity and mortality in newborns, occurring with a higher prevalence in preterm infants, reaching 20 % to 50 % mortality in newborns in the perinatal period. When they survive, 25 % exhibit neuropsychological pathologies, such as learning difficulties, epilepsy, and cerebral palsy. White matter injury is one of the main features found in oxygen deprivation injury, which can lead to long-term functional impairments, including cognitive delay and motor deficits. The myelin sheath accounts for much of the white matter in the brain by surrounding axons and enabling the efficient conduction of action potentials. Mature oligodendrocytes, which synthesize and maintain myelination, also comprise a significant proportion of the brain's white matter. In recent years, oligodendrocytes and the myelination process have become potential therapeutic targets to minimize the effects of oxygen deprivation on the central nervous system. Moreover, evidence indicate that neuroinflammation and apoptotic pathways activated during oxygen deprivation may be influenced by sexual dimorphism. To summarize the most recent research about the impact of sexual dimorphism on the neuroinflammatory state and white matter injury after oxygen deprivation, this review presents an overview of the oligodendrocyte lineage development and myelination, the impact of oxygen deprivation and neuroinflammation on oligodendrocytes in neurodevelopmental disorders, and recent reports about sexual dimorphism regarding the neuroinflammation and white matter injury after neonatal oxygen deprivation.

PMID: 37268283

19. Indomethacin Prophylaxis Is Associated with Reduced Risk of Intraventricular Hemorrhage in Extremely Preterm Infants Born in the Context of Amniotic Infection Syndrome

Kathrin Hanke, Ingmar Fortmann, Alexander Humberg, Kirstin Faust, Angela Kribs, Sebastian Prager, Ursula Felderhoff-Müser, Marcus Krüger, Matthias Heckmann, Anja Jäger, Oliver Andres, Juliane Spiegler, Christoph Härtel, Egbert Herting, Wolfgang Göpel

Neonatology. 2023 May 31;1-10. doi: 10.1159/000529140. Online ahead of print.

Background: Amniotic infection syndrome (AIS) with perinatal inflammation may increase the susceptibility to intraventricular hemorrhage (IVH) in preterm infants. Given its anti-inflammatory and ductus arteriosus constricting capacities, we hypothesized that prophylactic administration of indomethacin reduces the incidence, severity, and consequences of IVH in the context of perinatal inflammation. Methods: We evaluated data of infants born between 2009 and 2020 of 22 + 0-25+6 weeks of gestation from 68 German Neonatal Network centers. The effect of indomethacin prophylaxis on outcomes was analyzed in univariate analyses and multivariate regression models including a subgroup of infants with available data on 5-year follow-up. Results: 4760 infants were included with a median gestational age of 24.6 SSW [interquartile range (IQR) 24.1w-25.2w] and a birth weight of 640 g [IQR 550-750 g]. 1767/4760 (37.1%) preterm infants were born in the context of AIS and 527/4760 (11.1%) received indomethacin prophylaxis. AIS infants receiving prophylactic indomethacin had lower rates of IVH (32.7%

vs. 36.9%, p = 0.04), IVH III/IV (9.7% vs. 16.0%, p = 0.02) and the combined outcome of severe IVH or death (15.9% vs. 23.2%, p = 0.01) as compared to infants without prophylaxis. Multivariate logistic regression analyses confirmed our observations. In a subgroup analysis of 730 preterm infants at 5 years of age, we did not find any correlation between prophylactic indomethacin and intelligence quotient <70 or cerebral palsy. Conclusions: Our observational data demonstrate that prophylactic indomethacin is associated with a reduced risk of IVH in the highly vulnerable subgroup of preterm infants <26 weeks of gestation born from AIS.

PMID: 37257433

20. Emergency Department Use by Young Adults With Chronic Illness Before and During the COVID-19 Pandemic

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J Emerg Nurs. 2023 Apr 27;S0099-1767(23)00092-2. doi: 10.1016/j.jen.2023.04.006. Online ahead of print.

Introduction: There was a significant decrease in emergency department encounters during the COVID-19 pandemic. Our large urban emergency department observed decreased encounters and admissions by youths with chronic health conditions. This study aimed to compare the frequency of emergency department encounters for certain young adults before the pandemic and during the COVID-19 pandemic. Methods: A retrospective cohort study using medical records of patients ages 20 to 26 years from October 2018 to September 2019 and February 2020 to February 2021. Files set for inclusion were those with a primary diagnosis of human immunodeficiency virus, diabetes mellitus, epilepsy, cerebral palsy, sickle cell disease, asthma, and certain psychiatric disorders for potentially preventable health events. Results: We included 1203 total encounters (853 before the pandemic and 350 during the pandemic), with the total number of subjects included in the study 568 (293 before the pandemic to 239 during the pandemic). During the pandemic, young adults with mental health conditions (53.1%) accounted for most encounters. Encounters requiring hospital admissions increased from 27.4% to 52.5% during the pandemic, primarily among patients with diabetes (41.8% vs 61.1%) and mental health conditions (50% vs 73.3%). Discussion: The number of young adults with certain chronic health conditions decreased during COVID-19, with encounters for subjects with mental health conditions increasing significantly. The proportion of admissions increased during the pandemic with increases for subjects with mental health disorders and diabetes. The number of frequent users decreased during COVID-19. Future research is needed to understand better the causes for these disparities in young adults with chronic conditions who use the emergency department as a source of care.

PMID: 37256242

21. Patients and Parents' Satisfaction and Self-Reported Evaluation After Single-Event Multilevel Surgery in Cerebral Palsy

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J Pediatr Orthop. 2023 May 23. doi: 10.1097/BPO.0000000000002432. Online ahead of print.

Purpose: The aim of this study was to analyze the results of single-event multilevel surgery (SEMLS) in cerebral palsy (CP) based on objective gait outcomes and self-reported evaluations. Methods: In total, 258 patients with spastic diplegic CP, GMFCS I-III, who underwent SEMLS and with preoperative and postoperative gait analyses, were included in the SEMLS group (SG). The same database was used to compose the control group (CG) formed of 88 subjects who had performed at least 2 gait analyses and did not undergo surgical intervention between tests. Demographic data, Gait Deviation Index (GDI), and a self-reported questionnaire were analyzed, and results were compared between groups. Results: The GDI decreased from 59.6 to 57.9 in the CG and increased from 51.3 to 58.4 in the SG (P<0.001). There was no change in patients' walking ability in the CG. The number of patients who walk community distances increased after SEMLS in the group that had a GDI improvement >5 points (from 12.3% to 24.7%, P=0.008) and in patients GMFCS I and II (from 9.2% to 20.4%, P=0.028). According to patient and parental responses on satisfaction, the most significant improvements were reported in self-esteem, mobility, body image, and independence. In total, 51.1% of the patients were extremely satisfied or satisfied, while 3.9% were unsatisfied or extremely unsatisfied with the treatment results. Of the parents surveyed, 60.1% were extremely satisfied or satisfied, whereas just 5.0% were unsatisfied or extremely unsatisfied. Conclusions: In the studied group, an improvement in outdoor walking for community distances after SEMLS, as reported in questionnaires, was observed only when GDI increase was >5 points and in GMFCS I and II.

PMID: 37254037

22. The influence of non-stationarity of spike signals on decoding performance in intracortical brain-computer interface: a simulation study

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Front Comput Neurosci. 2023 May 12;17:1135783. doi: 10.3389/fncom.2023.1135783. eCollection 2023.

Introduction: Intracortical Brain-Computer Interfaces (iBCI) establish a new pathway to restore motor functions in individuals with paralysis by interfacing directly with the brain to translate movement intention into action. However, the development of iBCI applications is hindered by the non-stationarity of neural signals induced by the recording degradation and neuronal property variance. Many iBCI decoders were developed to overcome this non-stationarity, but its effect on decoding performance remains largely unknown, posing a critical challenge for the practical application of iBCI. Methods: To improve our understanding on the effect of non-stationarity, we conducted a 2D-cursor simulation study to examine the influence of various types of non-stationarities. Concentrating on spike signal changes in chronic intracortical recording, we used the following three metrics to simulate the non-stationarity: mean firing rate (MFR), number of isolated units (NIU), and neural preferred directions (PDs). MFR and NIU were decreased to simulate the recording degradation while PDs were changed to simulate the neuronal property variance. Performance evaluation based on simulation data was then conducted on three decoders and two different training schemes. Optimal Linear Estimation (OLE), Kalman Filter (KF), and Recurrent Neural Network (RNN) were implemented as decoders and trained using static and retrained schemes. Results: In our evaluation, RNN decoder and retrained scheme showed consistent better performance under small recording degradation. However, the serious signal degradation would cause significant performance to drop eventually. On the other hand, RNN performs significantly better than the other two decoders in decoding simulated non-stationary spike signals, and the retrained scheme maintains the decoders' high performance when changes are limited to PDs. Discussion: Our simulation work demonstrates the effects of neural signal non-stationarity on decoding performance and serves as a reference for selecting decoders and training schemes in chronic iBCI. Our result suggests that comparing to KF and OLE, RNN has better or equivalent performance using both training schemes. Performance of decoders under static scheme is influenced by recording degradation and neuronal property variation while decoders under retrained scheme are only influenced by the former one.

PMID: 37251598

23. Prebiotics to prevent necrotising enterocolitis in very preterm or very low birth weight infants

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Review Cochrane Database Syst Rev. 2023 Jun 1;6(6):CD015133. doi: 10.1002/14651858.CD015133.pub2.

Background: Dietary supplementation with prebiotic oligosaccharides to modulate the intestinal microbiome has been proposed as a strategy to reduce the risk of necrotising enterocolitis (NEC) and associated mortality and morbidity in very preterm or very low birth weight (VLBW) infants. Objectives: To assess the benefits and harms of enteral supplementation with prebiotics (versus placebo or no treatment) for preventing NEC and associated morbidity and mortality in very preterm or VLBW infants. Search methods: We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, the Maternity and Infant Care database and the Cumulative Index to Nursing and Allied Health Literature (CINAHL), from the earliest records to July 2022. We searched clinical trials databases and conference proceedings, and examined the reference lists of retrieved articles. Selection criteria: We included randomised controlled trials (RCTs) and quasi-RCTs comparing prebiotics with placebo or no prebiotics in very preterm (< 32 weeks' gestation) or VLBW (< 1500 g) infants. The primary outcomes were NEC and all-cause mortality, and the secondary outcomes were late-onset invasive infection, duration of hospitalisation since birth, and neurodevelopmental impairment. Data collection and analysis: Two review authors separately evaluated risk of bias of the trials, extracted data, and synthesised effect estimates using risk ratio (RR), risk difference (RD), and mean difference (MD), with associated 95% confidence intervals (CIs). The primary outcomes of interest were NEC and all-cause mortality; our secondary outcome measures were late-onset (> 48 hours after birth) invasive infection, duration of hospitalisation, and neurodevelopmental impairment. We used the GRADE approach to assess the level of certainty of the evidence. Main results: We included seven trials in which a total of 705 infants participated. All the trials were small (mean sample size 100). Lack of clarity on methods to conceal allocation and mask caregivers or investigators were potential sources of bias in three of the trials. The studied prebiotics were fructo- and galacto-oligosaccharides, inulin, and lactulose, typically administered daily with enteral feeds during birth hospitalisation. Meta-analyses of data from seven trials (686 infants) suggest that prebiotics may result in little or no difference in NEC (RR 0.97, 95% CI 0.60 to 1.56; RD none fewer per 1000, 95% CI 50 fewer to 40 more; low-certainty evidence), all-cause mortality (RR 0.43, 95% CI 0.20 to 0.92; 40 per 1000 fewer, 95% CI 70 fewer to none fewer; low-certainty evidence), or late-onset invasive infection (RR 0.79, 95% CI 0.60 to 1.06; 50 per 1000 fewer, 95% CI 100 fewer to 10 more; low-certainty evidence) prior to hospital discharge. The certainty of this evidence is low because of concerns about the risk of bias in some trials and the imprecision of the effect size estimates. The data available from one trial provided only very low-certainty evidence about the effect of prebiotics on measures of neurodevelopmental impairment (Bayley Scales of Infant Development (BSID) Mental Development Index score < 85: RR 0.84, 95% CI 0.25 to 2.90; very low-certainty evidence; BSID Psychomotor Development Index score < 85: RR 0.24, 95% 0.03 to 2.00; very low-certainty evidence; cerebral palsy: RR 0.35, 95% CI 0.01 to 8.35; very low-certainty evidence).

PMID: 37262358