Cerebral palsy research news

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Interventions and Management

1. Kinematic upper limb analysis outperforms electromyography at grading the severity of dystonia in children with cerebral palsy

Melissa Gar Yee Louey, Adrienne Harvey, Elyse Passmore, David Grayden, Morgan Sangeux

Clin Biomech (Bristol, Avon). 2024 Jun 17:117:106295. doi: 10.1016/j.clinbiomech.2024.106295. Online ahead of print.

Background: Severity of dyskinesia in children with cerebral palsy is often assessed using observation-based clinical tools. Instrumented methods to objectively measure dyskinesia have been proposed to improve assessment accuracy and reliability. Here, we investigated the technique and movement features that were most suitable to objectively measure the severity of dystonia in children with cerebral palsy. Methods: A prospective observational study was conducted with 12 participants with cerebral palsy with a predominant motor type of dyskinesia, spasticity, or mixed dyskinesia/spasticity who had upper limb involvement (mean age: 12.6 years, range: 6.7-18.2 years). Kinematic and electromyography data were collected bilaterally during three upper limb tasks. Spearman rank correlations of kinematic or electromyography features were calculated against dystonia severity, quantified by the Dyskinesia Impairment Scale. Findings: Kinematic features were more influential compared to electromyography features at grading the severity of dystonia in children with cerebral palsy. Kinematic measures quantifying jerkiness of volitional movement during an upper limb task with a reaching component performed best ($|rs| = 0.78$-0.9, $p < 0.001$). Interpretation: This study provides guidance on the types of data, features of movement, and activity protocols that instrumented methods should focus on when objectively measuring the severity of dystonia in children with cerebral palsy.

PMID: 38954886

2. The Effects of Whole-Body Vibration Therapy in Weight-Bearing and Non-Weight-Bearing Positions for Upper and Lower Extremities on Balance and Function in Cerebral Palsy Children: A Randomized Controlled Trial

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Cureus. 2024 May 31;16(5):e61404. doi: 10.7759/cureus.61404. eCollection 2024 May.

Background and objective Cerebral palsy (CP) is one of the most prevalent neurological conditions affecting children; it is characterized by poor motor control, restricted range of motion (ROM), and poor balance. While whole-body vibration therapy (WBVT) has been used to treat these symptoms, its efficacy in different configurations remains unexplored. Hence, this study aimed to determine and compare the effects of WBVT applied to either the upper extremities, lower extremities, or both upper and lower extremities in weight-bearing and non-weight-bearing positions on ROM (shoulders, elbows, wrists, hips, knees, and ankle joints), balance, and function in children with spastic hemiplegic CP. Methods This randomized clinical trial involved 60 hemiplegic spastic CP children aged 5-15 years. After randomization, all the participants were divided into six groups of equal size based on the WBVT application for upper extremities, lower extremities, or both in weight-bearing or non-weight-bearing positions. The therapy was applied three times per week for four consecutive weeks. The outcome measures were ROM, hand grip strength, balance quantification score using My Fitness Trainer (MFT) 2.0, and timed up and

go (TUG) scores. Results While all the groups were homogenous before treatment, after treatment, it was observed that all the ranges improved significantly in all groups. The same was observed for hand grip strength, balance score, and TUG test scores ($p<0.05$). The post-hoc analysis revealed that the weight-bearing position for the upper and lower extremities combined showed the highest level of improvement. Conclusions Based on our findings, WBVT in weight-bearing positions produces more significant results than in non-weight-bearing positions. We also observed that when WBVT is applied to the upper extremities, it can improve the function of the lower extremities and vice versa.

PMID: 38947699

3. Comparing the Pre-writing Skills of Diplegic Cerebral Palsy Children to Those of Normal Children

Nirvi Sharma

Cureus. 2024 May 30;16(5):e61352. doi: 10.7759/cureus.61352. eCollection 2024 May.

Introduction: The pencil grasp and drawing patterns are specific to different age levels. So, if one knows a certain pattern for that particular age, it will guide the intervention plan for children with cerebral palsy (CP). The chances of improvement in diplegic CP are possible with the help of early intervention; therefore, early intervention is only possible if one knows the areas of delay and the age at which the intervention should be started. Material and methods: It was a cross-sectional, case-control study. A total of 60 children were selected for the study, of which 30 (50%) were normal and 30 (50%) had diplegic cerebral palsy. A convenient sampling method is used for evaluation. Results: The t-value for pencil grasp between the two groups, i.e., normal and CP diplegic, was 3.515 (P=0.001), revealing a significant difference in the grasp pattern of the two groups. Similarly, the t-value for drawing patterns between the two groups, i.e., normal and CP diplegic, was 5.796 (P = 0.001). A significant difference was found in the drawing patterns of both groups. Conclusion: Our study found that diplegic CP children performed lower on the Erhardt Developmental Prehension Assessment (EDPA) and showed larger variation in the pencil grasp and drawing than the normal children.

PMID: 38947676

4. Mortality after spinal fusion in children with cerebral palsy and cerebral-palsy-like conditions: A 30-year follow-up study

No authors listed

Dev Med Child Neurol. 2024 Jul 4. doi: 10.1111/dmcn.16030. Online ahead of print.

No abstract available

PMID: 38965746

5. Effect of wheelchair seating systems on scoliosis progression for children with neurological and neuromuscular disorders: a retrospective study of Custom-Contoured Wheelchair Seating and Modular Wheelchair Seating

Jonathan Hosking

Arch Phys Med Rehabil. 2024 Jun 27:S0003-9993(24)01066-9. doi: 10.1016/j.apmr.2024.06.007. Online ahead of print.

Objectives: To retrospectively evaluate the comparative effect of two wheelchair seating systems, Custom-Contoured Wheelchair Seating (CCS) and Modular Wheelchair Seating (MWS), on scoliosis progression in children with neuromuscular and neurological disorders and to determine any predictors for scoliosis progression. Design: Longitudinal, retrospective cohort study SETTING: National Health Service regional posture and mobility service PARTICIPANTS: Non-ambulant paediatric wheelchair users with neuromuscular and neurological disorders (N = 75; 36 male, 39 female; mean age at seating intervention, 10.50 ± 3.97 years) issued CCS and MWS by the South Wales Posture and Mobility Service from 2012 to 2022. Interventions: Two specialized wheelchair seating systems, CCS and MWS. Main outcome measures: A generalized least squares (GLS) model was used to estimate the effect of seat type on Cobb angle over time. Results: Of the 75 participants enrolled, 51% had cerebral palsy. Fifty were issued CCS and 25 were issued MWS. Baseline Cobb angle was 32.9±18.9° for the MWS group and 48.0±31.0° for the CCS group. The GLS model demonstrated that time since seating intervention ($\chi2 = 122$, $p < .0001$), seating type ($\chi2 = 52.5$, $p < .0001$), and baseline scoliosis severity ($\chi2 = 41.6$, $p < .0001$) were predictive of scoliosis progression. Condition was not a strong predictor ($\chi2 = 9.96$, $p = .0069$), and sex ($\chi2 = 5.67$, $p = .13$) and age at intervention ($\chi2 = 4.47$, $p = .35$) were not predictive. Estimated contrasts of medical condition with seat type over time demonstrated smaller differences between MWS and CCS over time. Predicted scoliosis velocity was found to attenuate with use of CCS over time compared to MWS, although, scoliosis deteriorated regardless of intervention. Conclusions: Our findings showed paediatric wheelchair users with neurological and neuromuscular disorders prescribed CCS showed greater mitigation of scoliosis progression over time compared to those issued MWS.

PMID: 38944100

6. Improving trunk posture control in children with CP through a cable-driven robotic hippotherapy: A randomized controlled feasibility study

Ming Wu, Janis Kim, Deborah Gaebler-Spira

Gait Posture. 2024 Jun 20:113:209-214. doi: 10.1016/j.gaitpost.2024.06.020. Online ahead of print.

Background: Many children with cerebral palsy (CP) show impairments in trunk posture control, one crucial factor contributing to impairments in gait and arm manipulation. Research question: The goal of this study was to test the feasibility of the cable-driven hippotherapy system on improving trunk posture control and walking function in children with CP. Method: Ten children were recruited in this study with average age 6.4 ± 3.0 years old, and were randomly assigned to the robotic group and the conventional balance training group. A custom designed cable-driven robotic hippotherapy system was used to deliver controlled pelvis perturbations while children were sitting astride. Participants from both groups underwent intensive robotic hippotherapy training or conventional balance training, depending on their group assignment, for 6 weeks (3 time/week). Outcome measures were assessed pre and post 6 weeks of robotic or conventional balance training, and 8 weeks after the end of training (follow-up test). The primary outcome measure was trunk control, which was measured using the Trunk Control Measurement Scale (TCMS). In addition, the Gross Motor Function Measure (GMFM-66), self-selected overground walking speed, and 6-minute walking distance were also assessed. Results: The change in TCMS score from baseline to the post intervention was significantly greater for the robotic group than that for the conventional group (i.e., 6 ± 3 vs. -1 ± 5, $p = 0.048$, Mann-Whitney test). GMFM scores, self-selected overground walking speed, and 6-minute walking distance showed no significant improvement after robotic hippotherapy and after conventional balance training ($p > 0.05$). Significance: Results from this study indicated that it was feasible to improve trunk posture control in children with CP using a cable-driven robotic hippotherapy system. Knowledge obtained from this study may provide an insight for the development of new perturbation-based intervention approaches for improving trunk posture control in children with CP.

PMID: 38943825

7. The effectiveness of exergames in improving physical activity behaviour and physical literacy domains in adolescents with developmental coordination disorder and cerebral palsy: A scoping review

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Review Child Care Health Dev. 2024 Jul;50(4):e13293. doi: 10.1111/cch.13293.

Background: A large proportion of adolescents with developmental coordination disorder (DCD) are physically inactive. Physical literacy has been described as an important determinant in promoting health behaviours. The potential of exergames to improve physical literacy and activity has been recognized in typically developing children. The aim of the present scoping review was to identify and map the available evidence of this potential for adolescents with DCD. Methods: A scoping review was performed via a literature search in PubMed, Web of Science, Embase, ERIC and CINHAIL. Results: From 2860 search records, six studies (two studies in DCD and four studies in cerebral palsy [CP]) assessed physical activity, 12 studies discussed exergame features and 16 studies assessed physical literacy domains. In DCD, one study showed positive effects of exergaming on physical activity and the other failed to show any significant effects of exergaming. In CP, all four studies demonstrated positive effects of exergaming on energy expenditure and daily physical activity. Furthermore, positive effects of exergames on the different physical literacy domains were shown, namely motor competence, self-concept and affect, motivation and social/experiential. Finally, exergame features including multiplayer modes, realism, game rewards, challenges and enjoyment were shown to have a significant effect on motivating and encouraging adolescents to exert more effort while playing. Conclusion: Based on the positive effects of exergaming on physical activity in other populations, more in-depth research in adolescents with DCD is warranted such that the decline in physical activity behaviour that is present in individuals with DCD can be counteracted. Physical literacy should be regarded as an important determinant in this regard.

PMID: 38953549

8. Radial extracorporeal shock wave therapy for the management of spasticity in cerebral palsy: study protocol for a randomized controlled trial

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Front Neurol. 2024 Jun 13:15:1402452. doi: 10.3389/fneur.2024.1402452. eCollection 2024.

Background: Spasticity is the most common motor disorder in cerebral palsy (CP), and its management is complex, posing a significant challenge for the rehabilitation team. Radial extracorporeal shock wave therapy (rESWT) has emerged in recent

years as an effective, non-invasive, and low-risk alternative for the management of spasticity in CP patients, with only minor side effects such as small bruises or discomfort during application. There is great variability in rESWT administration protocols, ranging from a single session up to the 12 sessions. The most extensively studied protocol involves 3 rESWT sessions with a one-week interval between session. According to current literature, the effect of rESWT has not been investigated by extending the time interval between sessions beyond 1 week to determine if therapeutic effects on spasticity can be prolonged over time. Methods: Following a power calculation using the minimal clinical important difference of our primary outcome (R2 of Modified Tardieu Scale), 72 patients will be included in the study. Enrolment is based upon inclusion/exclusion criteria outlined in the Methods section. Participants will be randomized in 3 groups. Each patient will receive 2000 impulses in the Triceps Sural muscle (distributed by all the plantar flexor muscles: soleus and gastrocnemius), at a 2.2 Bars pressure and a frequency of 8 Hz. The Control Group will receive 3 rESWT sessions with a time interval of 1 week between each session. The Experimental Group A will receive 3 rESTW sessions with a time interval of 2 weeks between each session and the Experimental Group B will receive 3 rESTW sessions with a time interval of 4 weeks between each session. Discussion: This study will provide further information regarding the effect of rESWT on spasticity in patients with CP. If an increase in the time interval between rESWT sessions allows for the prolongation of therapeutic benefits on spasticity, it will be clinically relevant fact. With the same treatment dosage, patients will be able to benefit from its effects for a longer period of time. Clinical trial registration: ClinicalTrials.gov, identifier NCT05702606.

PMID: 38957349

9. Comparison of the Conjunct Effects of Electrical Stimulation and Whole-Body Vibration Therapy with Transcranial Direct Current Stimulation and Whole-body Vibration Therapy on Balance and Function in Children With Spastic Cerebral Palsy

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Cureus. 2024 Jun 1;16(6):e61511. doi: 10.7759/cureus.61511. eCollection 2024 Jun.

Background and objectives: Cerebral palsy is a neurodevelopmental condition that results in impaired movement and posture, often accompanied by disturbances in balance and functional abilities. Recent advances in neurorehabilitation, including whole-body vibration therapy (WBVT), functional electrical stimulation, and transcranial direct current stimulation, show promise in enhancing traditional interventions and fostering neuroplasticity. However, the efficacy of their conjunct effects remains largely uncharted territory and warrants further exploration. The objective of the study was to compare the conjunct effects of functional electrical stimulation (FES) and WBVT with transcranial direct current stimulation (tDCS) and WBVT on lower extremity range of motion (ROM), dynamic balance, functional mobility, isometric muscle strength and hand grip strength in children with spastic cerebral palsy. Methods: A randomized clinical trial was carried out on 42 children of both genders with spastic cerebral palsy, aged 5-15 years. The children were divided at random into three groups (14 in each group). In Group A, there were three (21.42%) males and 11 (78.57%) females, in Group B, eight (57.14%) were males and six (42.85%) were females, and in Group C, six (42.85%) children were males and eight (57.14%) were females. Group A received WBVT only, Group B received WBVT and FES, and Group C received WBVT and tDCS. The intervention was applied four times a week for four consecutive weeks. The data was collected two times before and immediately after four weeks of intervention. Lower extremity ROM was measured by a goniometer, functional mobility or dynamic balance was measured by a Time Up and Go test, isometric muscle strength was measured by a digital force gauge, and hand grip strength was assessed by a digital hand-held dynamometer. IBM SPSS Statistics for Windows, Version 27.0 (Released 2020; IBM Corp., Armonk, New York, United States) was utilized for statistical analysis. Results: The mean age of the children in groups A, B, and C was 12.21±2.11 years, 11.71±2.01, and 11.07±2.01 years respectively. Intergroup analysis revealed a statistically significant difference ($p<0.05$) in the lower extremity range of motion, and functional mobility. Hand grip strength and isometric muscle strength between three groups. Post hoc analysis revealed that WBVT with transcranial direct current stimulation combined showed the most improvement. Conclusion: The study concluded that positive effects were seen in all three groups but tDCS with WBVT was found to be most effective in improving lower extremity ROM, functional mobility or dynamic balance, isometric muscle strength, and hand grip strength in children with spastic CP. The differences between the groups were statistically significant. The effect size was substantial enough to surpass established clinical benchmarks, indicating that the observed improvements are likely to have meaningful and beneficial impacts on patient outcomes.

PMID: 38957262

10. Effectiveness of Botulinum Toxin Injection With Casting in Children With Spastic Cerebral Palsy: A Randomized Controlled Trial

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Cureus. 2024 Jun 2;16(6):e61515. doi: 10.7759/cureus.61515. eCollection 2024 Jun.

Background: The most common form of movement disorder presented in children with cerebral palsy is spasticity, and

dynamic equinus is the most common spastic ankle deformity. Botulinum toxin (BT) injection is now an established first-line treatment for focal spasticity. Aim: To assess the effects of BT injection with casting in the treatment of dynamic equinus in children diagnosed with cerebral palsy with spastic diplegia. Setting and design: A prospective randomized controlled trial was conducted among patients aged 2-12 years with cerebral palsy and spastic diplegia, attending the general outpatient department and admitted to the indoor facility of the Department of Physical Medicine and Rehabilitation and the Department of Pediatric Orthopedics at King George's Medical University, Lucknow. Material and methods: Two groups of 19 patients each were formed. Group A received BT injection with casting, whereas in group B, only a cast was applied. Outcome measures including spasticity by Modified Ashworth Scale (MAS), Modified Tardieu Scale (MTS), range of motion (ROM), passive ankle dorsiflexion, and Gross Motor Function Measure (GMFM-66) (dimensions D and E) were assessed before and after the intervention. Results: The participants in groups A and B were age-matched. A statistically significant difference was seen within group A and group B for MAS, passive ROM-dorsiflexion (PROM-DF), and passive ROM-plantarflexion (PROM-PF) at various follow-ups. In the 3rd week, MAS in each group was statistically insignificant (p-value> 0.05). Conclusion: There was a significant improvement in tone and a significant increase in the passive range of motion in both groups.

PMID: 38957257

11. Effectiveness of therapeutic interventions on participation in children with cerebral palsy: A systematic review and meta-analysis

Rigas Dimakopoulos, Theodora Vakalaki, Arietta Spinou, Ioannis Michopoulos, Marianna Papadopoulou

Meta-Analysis Child Care Health Dev. 2024 Jul;50(4):e13301. doi: 10.1111/cch.13301.

Background: Participation in life activities is an integral part of health and a main outcome of rehabilitation services for children and adolescents with disabilities. However, there is still no consensus on the most effective way to improve participation. The aim of this systematic review is to determine the effectiveness of therapeutic interventions on participation outcomes of children with cerebral palsy (CP). Methods: A systematic review was conducted, searching the databases PubMed, Cochrane Library, Science Direct, Web of Science and Scopus for randomized controlled trials (RCTs), between 2001 and 2023. Studies were eligible for inclusion if they evaluated children with CP undergoing any intervention and using any tool measuring participation as an outcome measure. A meta-analysis of treatment effect was conducted. A sensitivity analysis was conducted to identify the effect on participation when intervention targeted different International Classification of Functioning (ICF) domains. Results: A total of 1572 records were identified. Eight RCTs including 384 children (195 in the intervention group and 189 in the control group) were included in the systematic review and in the meta-analysis. A sensitivity analysis showed that interventions focusing on participation significantly improved participation; standardized mean difference (1.83; 95% CI: 1.33-2.32; $Z = 7.21$; $P < 0.00001$). When other types of interventions, that is, focusing on body functions and structures or activities, were used, then participation was not favourably affected. Interpretation: Interventions primarily targeting barriers to participation across several ICF domains have a greater influence on enhancing participation. Interventions aimed at enhancing specific motor skills, including gross and fine motor function or strength, do not necessarily have a positive impact on participation.

PMID: 38958263

12. Efficacy of aerobic exercise on the functioning and quality of life of children and adolescents with cerebral palsy: A systematic review and meta-analysis

No authors listed

Dev Med Child Neurol. 2024 Jul 3. doi: 10.1111/dmcn.16026. Online ahead of print.

No abstract available

PMID: 38961709

13. Effect of Cardiovascular Endurance Training on the Exercise Capacity and Endurance in Children With Cerebral Palsy

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Cureus. 2024 Jun 3;16(6):e61595. doi: 10.7759/cureus.61595. eCollection 2024 Jun.

Background: Cerebral palsy (CP) is non-progressive brain damage that occurs before, during, or shortly after birth. CP is associated with poor physical fitness, which is linked to health problems and the development of secondary illnesses like obesity, cardiovascular disease, and diabetes. Compared to healthy peers without CP, children with CP have considerably lower VO2 peaks, which reduces their performance and aerobic capacity. Objective: This study aimed to evaluate changes in exercise

capacity and endurance among children with CP, as well as fatigue levels among their parents and caregivers, after participation in cardiovascular endurance training. Methodology: This study included 16 children aged 7-12 years with CP (Gross Motor Function Classification System levels I, II, or III). Participants completed a 12-week cardiovascular endurance program consisting of 60-minute sessions three times weekly designed to achieve 64-95% of their heart rate maximum,based on the American College of Sports Medicine guidelines. Pre- and post-intervention measurements were recorded for the following: distance covered in a six-minute walk, maximal oxygen consumption (VO2 max) level, Early Activity Scale for Endurance rating, and Patient-Reported Outcomes Measurement Information System (PROMIS) Pediatric Fatigue Scale score and PROMIS Parent Proxy Scale and Fatigue Scale scores. Result: Upon completing the cardiovascular endurance training, the distance covered during a six-minute walk improved by 20.95 points, resting heart rate by 5.19 points, VO2 max by 0.06 points, Early Activity Scale for Endurance by 4.06 points, PROMIS Pediatric Fatigue Scale by 7.29 points, PROMIS Parent Proxy Scale by 6.81 points, and PROMIS Fatigue Scale by 5.07 points. The maximum heart rate also showed a slight improvement of 0.33 points ($p<0.01$). Conclusion: A structured exercise protocol aimed at improving cardiovascular endurance can benefit children with CP by improving their exercise capacity and endurance, which in turn can help decrease fatigue levels among their parents and caregivers.

PMID: 38962640

14. Sensitivity and specificity of the Neonatal Visual Assessment to predict motor and cognitive outcomes in infants born very preterm

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Early Hum Dev. 2024 Jun 24:195:106068. doi: 10.1016/j.earlhumdev.2024.106068. Online ahead of print.

Background: Very preterm infants are at increased risk of neurodevelopmental impairments. The Neonatal Visual Assessment (NVA) assesses visual function and outcomes and has been used to assess early neurodevelopmental outcomes. This study aimed to compare NVA results of very preterm and term-born infants and to calculate the sensitivity and specificity of the NVA at term equivalent age (TEA) and three months corrected age (CA) to predict motor and cognitive outcomes at 12 months CA in very preterm infants. Methods: This prospective observational cohort study recruited infants born before 31 weeks gestation and a healthy term-born control group. The NVA was assessed at TEA and three months CA, and neurodevelopmental outcomes (Bayley Scales of Infant and Toddler Development, Third Edition; Neurosensory Motor Developmental Assessment; Alberta Infant Motor Scale) were performed at 12 months CA. The sensitivity and specificity of the NVA to predict outcomes were calculated based on a previously published optimality score. Results: 248 preterm (54 % male) and 46 term-born infants (48 % male) were analysed. The mean NVA scores of preterm and term-born infants were significantly different at TEA (preterm 3.1±2.1; term-born 1.2±1.7, $p < 0.001$). The NVA had moderate sensitivity (59-78 %) and low specificity (25-27 %) at TEA, and low sensitivity (21-28 %) and high specificity (86-87 %) at three months CA for the prediction of preterm infants' outcomes at 12 months CA. Conclusion: The NVA at TEA and three months CA was not a strong predictor of motor and cognitive impairments in this contemporary cohort of very preterm infants.

PMID: 38968818

15. Wheelchair skills training improves power mobility and participation in young people with cerebral palsy

Mari Naaris, Marco Konings, Els Ortibus, Elegast Monbaliu

Dev Med Child Neurol. 2024 Jul 5. doi: 10.1111/dmcn.16019. Online ahead of print.

Aim: To explore the effect of a 4-week structured power wheelchair skills training programme (WSTP) intervention on mobility skills and participation in children and young people (CYP) with cerebral palsy (CP). Method: This was a one-group, repeated-measures study; baseline, intervention, and retention phases, each lasting 4 weeks, were used. Twelve participants (three females, nine males) with a mean age of 15 years 11 months (SD = 3 years 6 months) classified in Gross Motor Function Classification System levels IV and V participated in the study. To be included in the study, individuals had to be aged 6 to 21 years and currently using a power wheelchair. Participants received 12 WSTP training sessions of 45 minutes, 3 times per week. Power mobility skills were assessed using the Wheelchair Skills Test (WST) before baseline, before the intervention, after the intervention, and at the follow-up; mobility-related participation was assessed with the Canadian Occupational Performance Measure (COPM). Generalized mixed models with Bonferroni correction were used to assess the differences between the assessment points ($p < 0.05$). Results: Statistical analysis showed a 10.4% (12.5) increase in WST total scores ($p < 0.001$) after the intervention compared to before the intervention, and a 1-point (0.9) increase in the COPM performance subdomain ($p = 0.002$). Interpretation: Power mobility skills and mobility-related participation improved after a 4-week WSTP intervention in CYP with CP. Thus, task-based power mobility skills training based on the WSTP, and in line with individualized needs and capabilities, taking place in a natural environment, should be recommended. Power mobility skills training needs to be structured and individualized; the training interventions must consider the individual, the task, and the environment.
PMID: 38968335

16. Muscle contracture in children with cerebral palsy: Mechanosensitive pathways and cellular dysfunction

Andrea A Domenighetti

Dev Med Child Neurol. 2024 Jul 5. doi: 10.1111/dmcn.16034. Online ahead of print.

No abstract available

PMID: 38968275

17. The Acute Effects of Kinesio Taping on Drooling in Children with Cerebral Palsy: A Randomized Placebo-Controlled Trial

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Dev Neurorehabil. 2024 Jul 5:1-8. doi: 10.1080/17518423.2024.2374080. Online ahead of print.

Introduction: This study purpose of determining the short-term effects of kinesio taping on drooling in children with cerebral palsy (CP). Methods: CP were randomly divided into 3 groups as the kinesio tape (n = 16), sham tape (n = 16), and control (n = 16) groups. The drooling severity and frequency were assessed with the Drooling Severity and Frequency Scale, and the amount of saliva was measured by the 5-minute drooling quotient. All outcome measurements were repeated for all children at the baseline, after 45 minutes, and after 2 days of application. Results: There was a significant decrease found in drooling severity, frequency, and amount in the kinesio taping group ($p < .05$). There was no significant difference in the sham taping and control groups ($p > .05$). Conclusion: The use of kinesio tape in drooling reduced drooling severity, frequency, and amount.

PMID: 38967352

18. An analysis of stimulation methods used in rehabilitation equipment for children with cerebral palsy

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Review Front Neurol. 2024 Jun 18:15:1371332. doi: 10.3389/fneur.2024.1371332. eCollection 2024.

Objective: This paper summarizes the research progress into stimulation methods used in rehabilitation equipment for pediatric cerebral palsy (CP) for the past 20 years from 2003 to 2023. We also provide ideas for innovative research and development of artificial intelligence-based rehabilitation equipment. Methods: Through a certain search strategy, Keywords are searched in the China National Knowledge Network Database (CNKI), the Wanfang Database knowledge service platform, the Chongqing VIP information service, PubMed, Web of Science, Cochrane, ScienceDirect, Medline, Embase, and IEEE database. A total of 3,049 relevant articles were retrieved, and 49 articles were included that mentioned research and development of rehabilitation equipment. We excluded articles that were not specific to children with CP, were duplicated or irrelevant literature, were missing data, the full article was not available, the article did not describe the method of stimulation used with the rehabilitation equipment on children with CP, were not Chinese and English, and were the types of reviews and commentaries. Results: Physical stimulation is the main stimulation method of rehabilitation equipment for children with CP. Force stimulation is the main mode of physical stimulation, and there are 17 articles that have verified the clinical efficacy of force stimulation-based equipment. Conclusion: Research on the stimulation mode of pediatric cerebral palsy rehabilitation equipment is likely to focus on simulating the force of the Chinese medicine called "tuina manipulation." When this method is combined with artificial intelligence and personalized direction we believe this will lay the foundation for future development of a novel therapy for children with CP.

PMID: 38966084

19. Early-life malnutrition role in memory, emotional behavior and motor impairments in early brain lesions with potential for neurodevelopmental disorders: a systematic review with meta-analysis

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Review Nutr Neurosci. 2024 Jul 4:1-23. doi: 10.1080/1028415X.2024.2361572. Online ahead of print.

Objectives: The present study aims to evaluate the impact of early exposure to brain injury and malnutrition on episodic memory and behavior. Methods: For this, a systematic review was carried out in the Medline/Pubmed, Web of Science, Scopus, and LILACS databases with no year or language restrictions. Results: Initially, 1759 studies were detected. After screening, 53 studies remained to be read in full. The meta-analysis demonstrated that exposure to double insults worsens

episodic recognition memory but does not affect spatial memory. Early exposure to low-protein diets has been demonstrated to aggravate locomotor and masticatory sequelae. Furthermore, it reduces the weight of the soleus muscle and the muscle fibers of the masseter and digastric muscles. Early exposure to high-fat diets promotes an increase in oxidative stress and inflammation in the brain, increasing anxiety- and depression-like behavior and reducing locomotion. Discussion: Epigenetic modifications were noted in the hippocampus, hypothalamus, and prefrontal cortex depending on the type of dietetic exposure in early life. These findings demonstrate the impact of the double insult on regions involved in cognitive and behavioral processes. Additional studies are essential to understand the real impact of the double insults in the critical period.

PMID: 38963807

20. Understanding social cognition in children with cerebral palsy: exploring the relationship with executive functions and the intervention outcomes in a randomized controlled trial

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Eur J Pediatr. 2024 Jun 29. doi: 10.1007/s00431-024-05635-y. Online ahead of print.

Children with Cerebral Palsy (CP) experience Social Cognition (SC) difficulties, which could be related to executive functioning. While motor interventions are common, there is limited knowledge about the impact of cognitive interventions on SC in this population. This study examined the relationship between SC and Executive Function (EF) skills and the effectiveness of an EF intervention that included some SC tasks for improving SC in children with CP. SC and EF domains were assessed in 60 participants with CP (30 females; 8-12 years). The relationship between SC and EF baseline scores was analyzed by bivariate correlations and contingency tables. Participants were matched by age, sex, motor ability, and intelligence quotient and randomized into intervention or control groups. The intervention group underwent a 12-week home-based computerized EF intervention. Analysis of covariance was used to examine differences in SC components between groups at post-intervention and 9 months after. Significant positive correlations were found between the SC and EF scores. The frequencies of impaired and average scores in SC were distributed similarly to the impaired and average scores in EFs. The intervention group showed significant improvements in Affect Recognition performance post-intervention, which were maintained at the follow-up assessment, with a moderate effect size. Long-term improvements in Theory of Mind were observed 9 months after. Conclusions: This study highlights the association between SC and EFs. A home-based computerized cognitive intervention program improves SC in children with CP. Including SC tasks in EF interventions may lead to positive short- and long-term effects for children with CP. Clinical trial registration: NCT04025749 retrospectively registered on 19 July 2019.

PMID: 38951253

21. Developmental trajectories of spoken language comprehension and functional communication in children with cerebral palsy: A prospective cohort study

No authors listed

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No abstract available

PMID: 38961703

22. Novel Machine Learning Analysis Algorithm of DNA Methylation Patterns Identifies Cerebral Palsy with Concurrent Epilepsy

Jonathan Hicks, Karyn Robinson, Stephanie Lee, Adam Marsh, Robert Akins

Res Sq [Preprint]. 2024 Jun 19:rs.3.rs-4560364. doi: 10.21203/rs.3.rs-4560364/v1.

Background: Spastic cerebral palsy, the most common pediatric-onset disabling condition with an estimated prevalence of 0.2% in children, is a complex condition characterized by stiff movement, muscle contractures, and abnormal gait that can diminish quality of life. Spastic CP accounts for approximately 83% of all CP cases and frequently co-occurs with other complex conditions, like epilepsy. An estimated 42% of spastic CP cases have co-occurring epilepsy. Unfortunately, CP is often difficult to diagnose. Although most children with CP are born with it or acquire it immediately after birth, many are not identified until after 19 months of age with CP diagnosis often not confirmed until 5 years of age. New bioinformatic approaches to identify CP earlier are needed. Recent studies indicate that altered DNA methylation patterns associated with CP may have diagnostic value. The potential confounding effects of co-occurrent epilepsy on these patterns are not known. We

evaluated machine learning classification of CP patients with or without co-occurring epilepsy. Results: Whole blood samples were collected from 30 study participants diagnosed with epilepsy (n=4), spastic CP (n=10), both (n=8), or neither (n=8). A novel Support-Vector-Machine learning algorithm was developed to identify methylation loci that have ability to classify CP from controls in the presence or absence of epilepsy. This algorithm was also employed to measure classification ability of identified methylation loci. After preprocessing of data, isolation of important methylation loci was performed in a binary comparison between CP and controls, as well as in a 4-way scheme, encapsulating epilepsy diagnoses. The classification ability was similarly assessed. CP Classification performance was evaluated with and without inclusion of epilepsy as a feature. Median F1 scores were 0.67 in 4-class comparison, and 1.0 in the binary classification, outperforming Linear-Discriminant-Analysis (0.57 and 0.86, respectively). Conclusion: This novel algorithm was able to classify study participants with spastic CP and/or epilepsy from controls with significant performance. The algorithm shows promise for rapid identification in methylation data of diagnostic methylation loci. In this model, Support Vector Machines outperformed Linear Discriminant Analysis in classification. In the evaluation of epigenetics-based diagnostics for CP, epilepsy may not be a significant confounding factor.

PMID: 38946953

23. Use of computational modeling to examine fingertip force production in children with hemiplegic cerebral palsy

Miranda C Ludovice, Katherine R Saul, Derek G Kamper

J Biomech. 2024 Jun 19:172:112198. doi: 10.1016/j.jbiomech.2024.112198. Online ahead of print.

Most children with hemiplegic cerebral palsy (HCP), one of the most prevalent subtypes of cerebral palsy, struggle with grasping and manipulating objects. This impairment may arise from a diminished capacity to properly direct forces created with the finger pad due to aberrant force application. Children with HCP were asked to create maximal force with the index finger pad in the palmar (normal) direction with both the paretic and non-paretic hands. The resulting forces and finger postures were then applied to a computational musculoskeletal model of the hand to estimate the corresponding muscle activation patterns. Subjects tended to create greater shear force relative to normal force with the paretic hand ($p < 0.05$). The resultant force was directed 33.6°±10.8° away from the instructed palmar direction in the paretic hand, but only 8.0°±7.3° in the non-paretic hand. Additionally, participants created greater palmar force with the non-paretic hand than with the paretic hand ($p < 0.05$). These differences in force production are likely due to differences in muscle activation pattern, as our computational models showed differences in which muscles are active and their relative activations when recreating the measured force vectors for the two hands ($p < 0.01$). The models predicted reduced activation in the extrinsic and greater reductions in activation in the intrinsic finger muscles, potentially due to reduced voluntary activation or muscle atrophy. As the large shear forces could lead to objects slipping from grasp, muscle activation patterns may provide an important target for therapeutic treatment in children with HCP.

PMID: 38964009

24. Family expectations and demand for home-based videogaming therapy in children with cerebral palsy in Costa Rica: a mixed methods study

Daniela Chan-Víquez, Heilyn Fernández-Huertas, Fernanda Chacón-Vargas, Carles Montserrat-Gonzalez, Darcy Fehlings, Sarah Munce, F Virginia Wright, Elaine Biddiss

Disabil Rehabil. 2024 Jun 30:1-12. doi: 10.1080/09638288.2024.2362952. Online ahead of print.

Purpose: To understand the expectations and demand for a movement-tracking videogame (Bootle Blast) for home-based, upper limb (UL) rehabilitation among Costa Rican children with cerebral palsy (CP). Methods: Data were collected via telephone screening (demand) and child-parent dyads Zoom interviews (expectations). Descriptive statistics and data transformation were used to report on demand success criteria (i.e., recruitment rate, having an appropriate screen and space to play, setting a weekly play time goal (PTG) ≥45 min, identifying one UL therapy goal). The DEPICT model for collaborative qualitative analysis was used in the thematic analysis of interview data. Results: Fifteen dyads participated (1.6 ± 1 recruited/month). All had a flat-screen TV in a suitable location to play, were able to set a UL therapy goal, and established PTGs ranging from 45-120 min per week. Identified themes were: 1) Socio-cultural factors heighten demand, 2) Feelings of hope prevail for the intervention, and 3) Collaborative goal setting supports realistic expectations for Bootle Blast. Conclusions: Dyads had positive and realistic expectations about implementing the proposed videogaming intervention. This study provides insights on tailoring a family-centered, therapy gaming intervention to improve access to motor rehabilitation for children with CP in rural/remote settings and low-middle income countries.

PMID: 38946018

25. The maintenance and interface of two wheelchairs used by children with cerebral palsy in Kenya: a cross-sectional study

Jessica Tsotsoros, Hailey Chamberlin, Reagan Collins, Katlyn McDonald, Luke McAuley

Review Disabil Rehabil Assist Technol. 2024 Jul 1:1-7. doi: 10.1080/17483107.2024.2374047. Online ahead of print.

Current wheelchairs used in low-resource settings lack the adjustability required for children with cerebral palsy and are not well-suited for rough terrain environments. This study aimed to examine the durability and functional interface of two wheelchairs specifically designed for use in low-resource settings. This descriptive study assessed 14 wheelchairs used by children with cerebral palsy living in Kenya, Africa (Momentum Wheels for Humanity's Liberty II wheelchair n = 6, Beeline's Honey Bee wheelchair n = 8). Four physical and occupational therapists evaluated durability using the Wheelchair Components Questionnaire (WCQ) and functionality using the Wheelchair Interface Questionnaire (WIQ). Medians were used to compare differences in the chair types using the Wilcoxon-Mann-Whitney test in Statistical Analysis Software (SAS) 9.4 with an alpha = 0.05. Median scores on the WCQ were 8.3/10 for the Liberty II and 7.8/10 for Beeline's Honey Bee wheelchair; however, the durability of the wheel locks was lower in the Beeline wheelchair (5.1/10 compared to the Liberty II 8.1/10 (p = 0.002). Median scores on the WIQ were lower and significantly different in the area of preventing distal lower extremity pain (Liberty II =3.7/10 and Beeline = 7.6/10, p = 0.045). Low scores occurred in both chairs in the areas of transfers and transporting the chairs in the community. The Beeline wheelchairs demonstrated higher average ratings for all areas of the WIQ, indicating the wheelchairs fit the children better and were more functional for use in the home and community environment.

PMID: 38949225

26. The validity and reliability of the Turkish version of the functional mobility scale in patients with cerebral palsy

Göktuğ Karataş, Ebru Şahin, Nihan Erdinç Gündüz, Özlem El, Ali Karakaş, Özlen Peker

Turk J Phys Med Rehabil. 2024 Jan 15;70(2):188-196. doi: 10.5606/tftrd.2024.13359. eCollection 2024 Jun.

Objectives: The aim of this study was to investigate the validity and reliability of the Turkish version of the Functional Mobility Scale (FMS) in patients with cerebral palsy. Patients and methods: The validity and reliability study was conducted with 100 cerebral palsy patients (66 males, 34 females; mean age: 6.4±2.7 years; range, 2 to 18 years) between July 2015 and July 2018. The translation of the FMS was performed according to international standards. For test-retest reliability, 54 patients were reevaluated one week after the initial test with the Turkish version of the FMS, and Cohen's weighted kappa values were analyzed. The validity of the scale was assessed by correlating the FMS with the Gross Motor Function Classification System and the Gillette Functional Assessment Questionnaire Walking Scale. Twenty patients were evaluated by two researchers for interobserver reliability. Results: The kappa coefficients for test-retest reliability were 0.90 for FMS 5 m, 0.92 for FMS 50 m, and 0.91 for FMS 500 m. An evaluation of the validity revealed a significant correlation between FMS and the Gross Motor Function Classification System for all distances (r=-0.95, r=-0.96, and r=-0.92 for 5, 50, and 500 m, respectively; p <0.001), as well as the Gillette Functional Assessment Questionnaire Walking Scale (r=-0.95, r=-0.94, and r=-0.91 for 5, 50, and 500 meters, respectively; p <0.001). The kappa coefficients related to interobserver reliability were 0.73 for 5 m, 0.69 for FMS 50 m, and 0.81 for FMS 500 m. Conclusion: The Turkish version of the FMS can be considered a valid and reliable instrument for the assessment of cerebral palsy patients.

PMID: 38948644

27. Falls in people with mobility limitations: a cross-sectional analysis of a US registry of assistive device users

Corey Morrow, Richard Schein, Gede Pramana, Christine McDonough, Mark Schmeler

Disabil Rehabil Assist Technol. 2024 Jul 3:1-7. doi: 10.1080/17483107.2024.2369654. Online ahead of print.

Purpose of the Article: To (1) summarise the personal and clinical characteristics of persons with disabilities (PwDs) in the US who were evaluated for mobility assistive equipment (MAE) in the functional mobility assessment and uniform dataset (FMA/UDS) and (2) stratify subpopulations of PwD who reported falling versus those who do not report a fall. Materials and Methods: This study was a retrospective, descriptive cohort analysis of adults with disabilities using the FMA/UDS. Data are collected during a user's initial evaluation for a new mobility device. The sample is intentionally general to be inclusive of all mobility device users. The primary variable of interest was a patient-reported fall within the 3 months leading up to their evaluation for a new mobility device. Subpopulation characteristics were stratified by this binary fall variable. Results and Conclusions: This study provides descriptions of PwDs being evaluated for a new mobility device. There were 11,084 PwDs with 31 different primary diagnoses. During their new mobility device evaluation, 52.2% of PwDs reported at least one fall in the last 3 months. For those who reported a fall, 46.6% of PwDs were using a walking aid or no device at all before the new mobility device evaluation. Additionally, persons with progressively acquired disabilities (i.e., Parkinson's disease, osteoarthritis and cardiopulmonary disease) reported higher rates of falls than those with congenital disabilities (i.e., cerebral palsy and spina bifida). These findings will influence future studies comparing different types of devices and their influence on falls and user satisfaction.Implications for rehabilitation52.2% of persons with disabilities (PwDs) seeking a new wheelchair evaluation reported at least one fall in the last 3 months.Persons with progressively acquired disabilities (i.e., Parkinson's

disease, osteoarthritis and cardiopulmonary disease) reported higher rates of falls than those with congenital disabilities (i.e., cerebral palsy and spina bifida).Earlier interventions for fall prevention including professional wheelchair evaluations may be warranted, but further research is necessary to explore long-term effectiveness.

PMID: 38958175

28. 'I'm proud of my son with CP': Cerebral palsy caregivers' experiences, Gauteng province

Faith Maronga-Feshete, Sonti Pilusa, Abigail Dreyer

Afr J Disabil. 2024 Jun 27:13:1357. doi: 10.4102/ajod.v13i0.1357. eCollection 2024.

Background: Caregivers of children with cerebral palsy (CP) are critical in the survival and well-being of their children. Despite the caregivers' particularly demanding responsibilities, literature on their experiences is limited. Objectives: This study explored the caregivers' experiences of providing care to children with CP. Method: An explorative qualitative study design using semi-structured interviews was employed. All interviews were audio-recorded, transcribed verbatim and analysed guided by Colaizzi's seven-step methodology. Results: Two themes emerged: the challenges in caregiving and positive experiences of providing care. Caregivers faced financial, psychological, social and physical challenges such as stigmatisation, a lack of work accommodations, time constraints due to demands of providing care, strained family relations, isolation, exclusion, emotional and physical exhaustion in their caregiving role. Despite the challenges, they also had fulfilling, positive experiences. Caregivers became more resilient, some relationships were strengthened and awareness of the CP condition increased over time. Conclusion: Caring for a child with CP is challenging. Cerebral palsy is a permanent disability; therefore, a holistic, long-term perspective to supporting caregivers is necessary to ensure they can care for their children adequately. Contribution: There is a need for various support structures for caregivers to lessen the burden of care. It is necessary to establish the relationships between the support structures available and the way that these structures are viewed and consequently utilised by the caregivers. This study highlights the experiences and needs of caregivers to inform stakeholders on intervention strategies.

PMID: 38962747

29. A Preliminary Investigation of Within-Word Silent Intervals Produced by Children With and Without Neurodevelopmental Disorders

Meghan Darling-White, Christine N Sisk

Am J Speech Lang Pathol. 2024 Jul 4:1-18. doi: 10.1044/2024_AJSLP-23-00183. Online ahead of print.

Purpose: The categorization of silent intervals during speech production is necessary for accurate measurement of articulation rate and pauses. The primary purpose of this preliminary study was to examine the within-word silent interval associated with the stop closure in word-final stop consonants produced by children with and without neurodevelopmental disorders. Method: Seven children diagnosed with either cerebral palsy or Down syndrome (i.e., children with neurodevelopmental disorders) and eight typically developing children produced a reading passage. Participants were between the ages of 11 and 16 years. Fifty-eight words from the reading passage were identified as having word-final stop consonants. The closure duration of the word-final stop consonant was calculated, both in absolute duration and percent pause time. The articulation rate of the entire passage was calculated. The number of closure durations that met or exceeded the minimum duration threshold to be considered a pause (150 ms) was examined descriptively. Results: Children with neurodevelopmental disorders produced significantly longer closure durations and significantly slower articulation rates than typically developing children. Children with neurodevelopmental disorders produced closure durations that met or exceeded the minimum duration threshold of a pause, but typically developing children, generally, did not. Conclusion: These data indicate the need to examine the location of silent intervals that meet the minimum duration threshold of a pause and correct for articulatory events during the measurement of articulation rate and pauses in children with neurodevelopmental disorders.

PMID: 38963752

30. Survival of individuals with cerebral palsy: A Victorian longitudinal cohort study spanning four decades

No authors listed

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No abstract available

PMID: 38965752

31. The search for blood biomarkers that indicate risk of adverse neurodevelopmental outcomes in fetal growth

restriction

Hannah Musco, Kate Beecher, Kirat K Chand, Roslyn N Boyd, Paul B Colditz, Julie A Wixey

Front Pediatr. 2024 Jun 20:12:1396102. doi: 10.3389/fped.2024.1396102. eCollection 2024.

Fetal growth restriction (FGR) impacts 5%-10% of pregnancies and is associated with increased risk of mortality and morbidity. Although adverse neurodevelopmental outcomes are observed in up to 50% of FGR infants, a diagnosis of FGR does not indicate the level of risk for an individual infant and these infants are not routinely followed up to assess neurodevelopmental outcomes. Identifying FGR infants at increased risk of adverse neurodevelopmental outcomes would greatly assist in providing appropriate support and interventions earlier, resulting in improved outcomes. However, current methods to detect brain injury around the time of birth lack the sensitivity required to detect the more subtle alterations associated with FGR. Blood biomarkers have this potential. This systematic review assessed the current literature on blood biomarkers for identifying FGR infants at increased risk of adverse neurodevelopmental outcomes at >12 months after birth. Four databases were searched from inception to 22 February 2024. Articles were assessed for meeting the inclusion criteria by two reviewers. The quality of the included article was assessed using Quality Assessment of Diagnostic Accuracy Studies-2. A summary of findings is presented as insufficient articles were identified for meta-analysis. Excluding duplicates, 1,368 records were screened with only 9 articles considered for full text review. Only one article met all the inclusion criteria. Quality assessment indicated low risk of bias. Both blood biomarkers investigated in this study, neuron specific enolase and S100B, demonstrated inverse relationships with neurodevelopmental assessments at 2 years. Four studies did not meet all the inclusion criteria yet identified promising findings for metabolites and cytokines which are discussed here. These findings support the need for further research and highlight the potential for blood biomarkers to predict adverse outcomes.

PMID: 38966491

32. Branching into adulthood when you live with cerebral palsy

Georgina Henry

Dev Med Child Neurol. 2024 Jul 4. doi: 10.1111/dmcn.16035. Online ahead of print.

No abstract available

PMID: 38965786

33. Management of Cerebrospinal Fluid Leak After Intrathecal Baclofen Pump Procedures in Adolescents With Cerebral Palsy: A Retrospective Study

B Randall Brenn, Joydeep Baidya, Dinesh K Choudhry

Cureus. 2024 Jun 3;16(6):e61582. doi: 10.7759/cureus.61582. eCollection 2024 Jun.

Study objective: Epidural blood patches (EBPs) are frequently performed in children with cerebral palsy (CP) to manage post-dural puncture headache (PDPH) due to cerebrospinal fluid (CSF) leak after intrathecal baclofen pump (ITBP) placement or replacement procedures. The purpose of our study was to review the incidence and management of CSF leak following ITBP placement or replacement procedures in children with CP. The study was a retrospective review of 245 patients representing 310 surgical cases of baclofen pump insertion (n=141) or reinsertion (n=169) conducted at a 125-bed children's hospital with prominent specialty orthopedics surgical cases. Measurements: Demographic and clinical information was obtained from the anesthesia pain service database on all new ITBP placement and subsequent replacements over an eight-year period. Main results: The overall incidence of CSF leak in our population was 16% (50 of 310) and 18% (25 of 141) with a new ITBP placement. Children with diplegia were associated with a threefold risk of developing CSF leak. Of patients who developed CSF leak (n=50), 68% (n=34) were successfully treated conservatively, while 32% (n=16) required EBPs. EBPs were successful in 87.5% (14 of 16) of patients at relieving PDPH on the first attempt. Conclusions: CSF leak is a known problem after ITBP placement and replacement. Most patients were successfully treated with conservative management and EBPs were successful in patients failing conservative therapy. Diagnosing PDPH in non-verbal patients can be challenging.

PMID: 38962607

34. Extracellular Vesicle ASC: A Novel Mediator for Lung-Brain Axis in Preterm Brain Injury

Natalie Starke, Naga Venkata Divya Challa, Huijun Yuan, Shaoyi Chen, Matthew R Duncan, Erika Dlrm Cabrera Ranaldi, Juan Pablo de Rivero Vaccari, Alini Schott, Ana Cecilia Aguilar, Yee-Shun Lee, Aisha Khan, Jo Duara, April Tan, Merline Benny, Augusto F Schmidt, Karen Young, Eduardo Bancalari, Nelson Claure, Shu Wu

Am J Respir Cell Mol Biol. 2024 Jul 3. doi: 10.1165/rcmb.2023-0402OC. Online ahead of print.

Bronchopulmonary dysplasia (BPD) and neurodevelopmental impairment (NDI) are among the most common morbidities affecting preterm infants. Although BPD is a predictor of poor NDI, it is currently uncertain how BPD contributes to brain injury in preterm infants. Extracellular vesicles (EVs) are involved in inter-organ communication in diverse pathological processes. Apoptosis-associated speck-like protein containing a caspase recruitment domain (ASC) is pivotal in inflammasome assembly and activation of inflammatory response. We assessed expression profiles of alveolar macrophage (AM) markers, CD11b, CD11c, and CD206, and ASC in EVs isolated from the plasma of preterm infants at risk for BPD at 1 week of age. We found that infants on higher fraction inspired oxygen (FiO2) therapy (HO2, ≥30%) had increased levels of AM-derived EV-ASC compared with infants on lower FiO2 (LO2, <30%). To assess the function of these EVs, we performed adoptive transfer experiments by injecting them into the circulation of newborn mice. We discovered that mice that received EVs from infants on HO2 had increased lung inflammation, decreased alveolarization, and disrupted vascular development, the hallmarks of BPD. Importantly, these EVs crossed the blood-brain barrier and the EVs from infants on HO2 caused inflammation, reduced cell survival, and increased cell death with features of pyroptosis and necroptosis in the hippocampus. These results highlight a novel role for AM-derived EV-ASC in mediating the lung-to-brain crosstalk that is critical in the pathogenesis of BPD and brain injury and identify potential novel targets for preventing and treating BPD and brain injury in preterm infants.

PMID: 38959416

35. Cervicothoracic ventral-dorsal rhizotomy for treatment of brachial hypertonia in cerebral palsy

Sunny Abdelmageed, Mahalia Dalmage, James M Mossner, Robin Trierweiler, Tim Krater, Jeffrey S Raskin

Childs Nerv Syst. 2024 Jul 3. doi: 10.1007/s00381-024-06479-5. Online ahead of print.

Purpose: Cervicothoracic ventral-dorsal rhizotomy (VDR) is a potential treatment of medically refractory hypertonia in patients who are not candidates for intrathecal baclofen, particularly in cases of severe upper limb hypertonia with limited to no function. A longitudinal cohort was identified to highlight our institutional safety and efficacy using cervicothoracic VDR for the treatment of hypertonia. Methods: Retrospective data analysis was performed for patients that underwent non-selective cervicothoracic VDR between 2022 and 2023. Non-modifiable risk factors, clinical variables, and operative characteristics were collected. Results: Six patients (three female) were included. Four patients underwent a bilateral C6-T1 VDR, one patient underwent a left C7-T1 VDR, and another underwent a left C6-T1 VDR. Three patients had quadriplegic mixed hypertonia, one patient had quadriplegic spasticity, one patient had triplegic mixed hypertonia, and one patient had mixed hemiplegic hypertonia. The mean difference of proximal upper extremity modified Ashworth scale (mAS) was - 1.4 ± 0.55 ($p = 0.002$), and - 2.2 ± 0.45 ($p < 0.001$) for the distal upper extremity. Both patients with independence noted quality of life improvements as well as increased ease with dressing and orthotics fits. Caregivers for the remaining four patients noted improvements in caregiving provision, mainly in dressing, orthotics fit, and ease when transferring. Conclusion: Cervicothoracic VDR is safe and provides tone control and quality of life improvements in short-term follow-up. It can be considered for the treatment of refractory hypertonia. Larger multicenter studies with longer follow-up are necessary to further determine safety along with long-term functional benefits in these patients.

PMID: 38958730

36. Interventions to improve executive functions in children aged 3 years and under: A systematic review

Andrea F Duncan, Gwyn J Gerner, Mary Lauren Neel, Vera J Burton, Rachel Byrne, Seth Warschausky

Child Care Health Dev. 2024 Jul;50(4):e13298. doi: 10.1111/cch.13298.

Background: Early executive functioning (EF) skills are foundational capabilities that predict school readiness, academic development and psychiatric risk. Early interventions enhancing these capabilities could have critical import in improving outcomes. However, to develop interventions, it is necessary to identify specific EF skills that will vary with child age. Thus, we aimed to examine the characteristics and efficacy of interventions targeting EF in infancy and early childhood up to age 3. Methods: A comprehensive search of PubMed, Embase, CINAHL and APA PsycINFO databases was performed for studies published before December 2022. Randomized and non-randomized studies of interventions designed to improve at least one EF skill in children ≤3 years were included. EF skills included attentional control, inhibition/self-regulation, activity initiation, working memory, cognitive flexibility, planning ability, problem-solving and performance monitoring. We independently extracted data, used the revised Cochrane Risk-of-Bias tool to assess the quality of the evidence and conducted Synthesis Without Meta-analysis (SWiM). The overall quality of the evidence and the strength of recommendations was determined using elements of the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. Results: Thirty-five studies met inclusion criteria (original n = 7467). Studies were highly variable in the EF skill targeted, target subject (i.e., child, parent and teacher), nature and dosage of the intervention, and timing of outcome assessment. Most interventions focused on improving impulse control and self-regulation. The overall quality of evidence was low to moderate with a high risk of bias, though six studies had low risk of bias but yielded mixed findings of efficacy. Conclusions: The relatively small number of early EF intervention studies uses such variable methods that there is currently no converging evidence of efficacy

to recommend a specific intervention. Thus, findings support the need for a more systematic, targeted approach to the design and implementation of early EF interventions for target populations.

PMID: 38958229

37. Mortality and neurodevelopmental outcomes at 2 years' corrected age of very preterm infants with necrotising enterocolitis or spontaneous intestinal perforation: The EPIPAGE-2 cohort study

Victoria Butler, Ludovic Treluyer, Juliana Patkaï, Aline Biset, Pierre-Henri Jarreau, Pierre-Yves Ancel, Jean-Christophe Rozé, Laetitia Marchand-Martin, Mélanie Durox, Alexandre Lapillonne, Jean-Charles Picaud, Delphine Mitanchez, Charlotte Tscherning, Valérie Biran, Gilles Cambonie, Emmanuel Lopez, Jean-Michel Hascoet, Luc Desfrere, Clément Chollat, Elodie Zana-Taïeb, Héloïse Torchin

Eur J Pediatr. 2024 Jul 2. doi: 10.1007/s00431-024-05675-4. Online ahead of print.

Purpose: The primary objective was to evaluate the impact of necrotising enterocolitis (NEC) and spontaneous intestinal perforation (SIP) on mortality and neurodevelopmental outcomes at 2 years' corrected age (CA) in infants born before 32 weeks' gestation (WG). Methods: We studied neurodevelopment at 2 years' CA of infants with NEC or SIP who were born before 32 WG from the EPIPAGE-2 cohort study. The primary outcome was death or the presence of moderate-to-severe motor or sensory disability defined by moderate-to-severe cerebral palsy or hearing or visual disability. The secondary outcome was developmental delay defined by a score < 2 SDs below the mean for any of the five domains of the Ages and Stages Questionnaire. Results: At 2 years' CA, 46% of infants with SIP, 34% of infants with NEC, and 14% of control infants died or had a moderate-to-severe sensorimotor disability ($p < 0.01$). This difference was mainly due to an increase in in-hospital mortality in the infants with SIP or NEC. Developmental delay at 2 years' CA was more frequent for infants with SIP than controls (70.8% vs 44.0%, $p = 0.02$) but was similar for infants with NEC and controls (49.3% vs 44.0%, $p = 0.5$). On multivariate analysis, the likelihood of developmental delay was associated with SIP (adjusted odds ratio = 3.0, 95% CI 1.0-9.1) but not NEC as compared with controls. Conclusion: NEC and SIP significantly increased the risk of death or sensorimotor disability at 2 years' CA. SIP was also associated with risk of developmental delay at 2 years' CA.

PMID: 38955846

38. Evaluating the Validity of Tests to Predict Sprint and Change of Direction Speed in Para-Athletes With Brain Impairments

Raul Reina, Emma M Beckman, Mark J Connick, Jemima G Spathis, Sean M Tweedy

Adapt Phys Activ Q. 2024 Jul 2:1-18. doi: 10.1123/apaq.2023-0197. Online ahead of print.

Maximum running speed is a performance determinant in para-athletics and cerebral palsy football. Sixty international para-athletes with brain impairments completed five activity-limitation tests (standing broad jump, four bounds for distance, split jumps, 10-m speed skip, and running in place) and two criterion tests (40-m sprint and modified agility test). The same three tests (standing broad jump, four bounds for distance, and 10-m speed skip) that correlated with running performance in nondisabled runners ($.67 < r < -.82$; $p < .05$; 75% of variance) also correlated in para-athletes with brain impairments ($.41 < r < -.62$; $p < .01$; 55% of variance). Standing broad jump, four bounds for distance, split jumps, and running in place also correlated with change-of-direction speed ($.43 < r < -.63$; $p < .01$; 58% of variance). Results indicate that methods of classification for para-athletics with nondisabled runners are also valid with para-athletes with brain impairments, and new sport-specific relationships were found for assessing the performance of rapid and short sprints toward different directions, specific of a team para-sport like cerebral palsy football.

PMID: 38955336

39. Correlation of amniotic fluid inflammatory markers with preterm birth: a meta-analysis

Cong Wang, Qin Chen, Yan Wang

Meta-Analysis J Obstet Gynaecol. 2024 Dec;44(1):2368764. doi: 10.1080/01443615.2024.2368764. Epub 2024 Jul 2.

Background: The relationship between amniotic fluid inflammatory biomarkers and preterm birth in second- or third-trimester pregnancy has been a focus, and understanding the correlation between these markers and preterm birth is important for early identification and intervention in preterm birth. The aim of this study was to explore potential inflammatory biomarkers in second- or third-trimester pregnancy amniotic fluid associated with preterm birth. Methods: On November 30, 2023, we searched literature involved the influence of second- or third-trimester pregnancy amniotic fluid inflammatory biomarkers on preterm birth through PubMed, Web of Science, Embase, Scope, CNKI, WanFang, VIP and China Biomedical Databases. The search languages were Chinese and English. Included outcomes indexes were combined utility analysis via R software. Results:

A total of 11 articles were included in the combined utility analysis. This combined analysis revealed significant differences in several inflammatory biomarkers in amniotic fluid between the two groups (MD = 6.87, 95%CI: 0.26 - 13.47, P < 0.01); the difference in amniotic fluid IL-6 between the two groups (MD = 5.73, 95%CI: 3.13-8.32, P < 0.01); the difference in amniotic fluid IL-10 between the two groups (MD = 0.11, 95%CI: -3.26-3.48, P < 0.01); the difference in amniotic fluid CRP between the two groups (MD = 21.34, 95%CI: 11.69-30.89, P < 0.01); the difference in amniotic fluid MCP-1 between the two groups (MD = 312.14, 95%CI: 211.34-412.97, P < 0.01); the difference in the amniotic fluid MMP-9 between the two groups (MD = 0.86, 95%CI: -0.10-1.82, P < 0.01); and the difference in TNF-α in amniotic fluid between the two groups (MD = 22.78, 95% CI: -5.05-50.61, P < 0.01). Conclusions: The inflammatory biomarkers IL-1β, IL-6, IL-10, CRP, TNFα, MCP-1 and MMP-9 in the amniotic fluid of patients in the second- or third-trimester pregnancy were all correlated with preterm birth.

PMID: 38952221

40. An Unexpected Phenomenon: A Case of Citalopram-Induced Dyskinesia

Fabienne J Jean, Michael Poulose

Case Reports Cureus. 2024 May 30;16(5):e61364. doi: 10.7759/cureus.61364. eCollection 2024 May.

Dyskinetic movements are characterized as hyperkinetic, repetitive movements of the extremities, facial, and oral musculature, most associated with prolonged dopamine D2 receptor blockade. In rare instances, dyskinetic movements can be brought on by selective serotonin reuptake inhibitor (SSRI) usage via an indirect D2 blockade mechanism, mimicking the D2 blockade observed with dopamine receptor blocking agents (DRBAs), such as in first-generation antipsychotics. This mimicked D2 blockade by SSRIs is said to be due to increased tonic inhibition by serotonin on dopaminergic neurons in the dopaminergic pathways of the brain, specifically the nigrostriatal pathway. In this case report, we look at a patient with a history of cerebral palsy who developed acute dyskinetic movements after short-term citalopram usage. The objective is to bring attention to the possible extrapyramidal side effects (EPS) of SSRI usage.

PMID: 38947732

41. Severe brain injury and trends of gestational-age-related neurodevelopmental outcomes in infants born very preterm: A population cohort study

Lan-Wan Wang, Chi-Hsiang Chu, Yung-Chieh Lin, Chao-Ching Huang

Dev Med Child Neurol. 2024 Jun 30. doi: 10.1111/dmcn.16003. Online ahead of print.

Aim: To investigate the impact of severe neonatal brain injury (SNBI) on gestational age-related trends in neurodevelopmental impairment (NDI) outcome in infants born very preterm. Method: A population-based cohort study recruited 1091 infants born at a gestational age of less than 31 weeks between 2011 and 2020. The trends in neonatal morbidities, mortality, and 24-month NDI severity (no/mild, moderate, severe) by epoch (2011-2015, 2016-2020) and gestational age (22-25 weeks, 26-28 weeks, 29 -30 weeks) were determined in infants with and without SNBI inclusion. Results: There was increased antenatal steroid use and higher maternal education and socioeconomic status over time. The rates of neonatal morbidities and mortality had no temporal changes. Among 825 infants with follow-up, those in the 22 to 25 weeks gestational age group had declining trends in cerebral palsy and severe cognitive impairment, with decreased rates of severe NDI from 19% to 8% across epochs, particularly in those without SNBI (from 16% to 2%). Relative to its occurrence in epoch 2011 to 2015, risk of severe NDI was significantly reduced in epoch 2016 to 2020 (adjusted relative risk 0.39, 95% confidence interval 0.16-0.96) for infants born at 22 to 25 weeks gestational age, and the risk dropped even lower in these infants without SNBI (0.12, 0.02-0.84). Interpretation: Infants born at 22 to 25 weeks gestational age had decreased rates of severe NDI in the decade between 2011 and 2020, particularly those without SNBI. The improvement might be attributed to better perinatal/neonatal and after-discharge care.

PMID: 38946133

42. Response to letter to editor re "Comparison of the efficiency of transcutaneous electrical nerve stimulation and manual therapy in children with cerebral palsy with lower urinary system dysfunction- a randomized prospective trial"

Betul Unal, Pelin Pisirici, Aygul Koseoglu Kurt, Halil Tugtepe

J Pediatr Urol. 2024 Jun 4:S1477-5131(24)00295-X. doi: 10.1016/j.jpurol.2024.05.030. Online ahead of print.

No abstract available

PMID: 38945787

43. Efficacy of Oral Trihexyphenidyl Plus Clonazepam Versus Trihexyphenidyl for the Treatment of Dystonia in Children With Dystonic Cerebral Palsy: An Open-Label Randomized Controlled Trial

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Pediatr Neurol. 2024 Jun 14:158:35-40. doi: 10.1016/j.pediatrneurol.2024.06.004. Online ahead of print.

Background: Trihexyphenidyl and clonazepam are commonly used to treat dystonia in children with cerebral palsy (CP). However, there is a notable gap in the literature when it comes to studies that combine these first-line agents for the management of dystonia. Methods: This open-label, randomized controlled trial aimed to compare the efficacy of adding oral clonazepam to trihexyphenidyl (THP + CLZ) versus using trihexyphenidyl alone (THP) in reducing the severity of dystonia, as measured by the Barry-Albright Dystonia (BAD) score. The study was conducted over a 12-week therapy period in children with dystonic CP aged two to 14 years. Results: Each group enrolled 51 participants. The THP + CLZ group showed significantly better improvement in dystonia severity at 12 weeks compared with the THP group alone (-4.5 ± 2.9 vs -3.4 ± 1.7, P = 0.02). Furthermore, the THP + CLZ group exhibited superior improvement in the severity of choreoathetosis, upper limb function, pain perception by the child, and quality of life, with P values of 0.02, 0.009, 0.01, and 0.01, respectively. The number of participants experiencing treatment-emergent adverse events was comparable in both groups (P = 0.67). Importantly, none of the participants in any of the groups reported any serious adverse events. Conclusion: A combination of oral THP + CLZ proves to be more efficacious than using THP alone for the treatment of dystonic CP in children aged two to 14 years in terms of reducing the severity of dystonia.

PMID: 38945037