Cerebral palsy research news

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Interventions and Management

1. Bimanual Coordination in Children with Bilateral Cerebral Palsy: A Cross-Sectional Study

Grace-Anne M Herard, Ya-Ching Hung, Marina B Brandao, Andrew M Gordon

Phys Occup Ther Pediatr. 2024 Jul 15:1-16. doi: 10.1080/01942638.2024.2376062. Online ahead of print.

Aim: To compare bimanual coordination in children with bilateral cerebral palsy (BCP) with that of children with typical development (TD) and correlate bimanual coordination with clinical measures of hand function. Methods: 3-D kinematic data were collected from 14 children with BCP (mean age 13 years 1 month; range 7.3-17.2 years, 5 females) and 14 age-matched children with TD (mean age 13 years 1 month, range 7.0-16.0 years, 7 females) as they opened a drawer with one hand and activated a switch inside it with the other hand at self-paced and as-fast-as-possible speeds. Hand roles varied in each condition. Participants' hand function levels were classified using the Manual Ability Classification System. Unimanual dexterity and bimanual performance were evaluated using the Box and Blocks Test and Both Hands Assessment respectively. Results: Participants with BCP performed the bimanual task more slowly ($p < 0.001$) and sequentially, as evidenced by greater time differences between the two hands achieving the end goal ($p = 0.01$). Faster speeds, particularly when the less affected hand opened the drawer, facilitated time-related measures of bimanual coordination ($p < 0.05$). Bimanual coordination correlated with all clinical measures of hand function ($p < 0.05$). Conclusion: For children with BCP, speed and hand used for each subcomponent of the task influence bimanual coordination. Better bimanual coordination is associated with less impairment of both hands.

PMID: 39007684

2. HABIT training in unilateral spastic cerebral palsy children having mirror movement disorder

Javeria Shahid, Mir Arif Hussain Talpur, Hassan Rauf

J Pak Med Assoc. 2024 Jul;74(7):1342-1344. doi: 10.47391/JPMA.10421.

The single-arm feasibility study was planned to evaluate the therapeutic effect of hand arm bimanual intensive training in improving the fine and gross motor functions of hand, and in the reduction of intensity with respect to mirror movement disorder. The sample comprised unilateral spastic cerebral palsy children aged 6-16 years who were having mirror movement disorder and were able to make a gross grip. The hand arm bimanual intensive training was provided to the participants for 6 hours per day for 15 days for a total of 90 hours. Comparison of baseline and post-intervention showed that the functional independence level of children had improved, with improvement in unimanual and bimanual hand performance ($p<0.05$). However, there was no improvement seen in the severity of mirror movements ($p>0.05$). Hence, hand arm bimanual intensive training was found to be effective in increasing the functional independence of cerebral palsy children by improving the hand function, but there was no effect on mirror movement disorder.

PMID: 39028067

3. The effect of horse riding simulator on upper extremity skills, trunk control and functionality in cerebral palsy: a randomized controlled trial

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Disabil Rehabil. 2024 Jul 18:1-8. doi: 10.1080/09638288.2024.2380785. Online ahead of print.

Purpose: The aim of this study was to investigate the effect of horse riding simulator on upper extremity skills, trunk control and functionality in cerebral palsy (CP). Materials and methods: This randomized controlled trial included total 32 CP, 16 in horse riding simulator group (HRSG) and 16 in control group (CG). ABILHAND-Kids, Jebsen-Taylor Hand Function Test (JTHFT), Gross Motor Function Measurement-sitting dimension (GMFM-B), Trunk Control Measurement Scale (TCMS), Pediatric Evaluation of Disability Inventory (PEDI) were evaluated before and after procedure. Results: It was observed that there were improvements in both groups for ABILHAND-Kids scores after intervention, but the change in HRSG was significantly higher ($p < 0.001$). For all parameters of JTHFT (except writing dominant, non-dominant, turning cards-dominant), there was a significant difference between groups in favor of HRSG ($p < 0.001$-0.002). There was no change in GMFM-B values with intervention for both groups ($p > 0.05$). There were significant changes in favor of HRSG group in terms TCMS-Total ($p = 0.003$). There were significant changes in HRSG compared to CG for PEDI (pPEDI-Self-care<0.001, pPEDI-Mobility<0.001, pPEDI-Social function=0.016, respectively). Conclusions: It has been found that HRS in addition to conventional physiotherapy have positive effects on upper extremity skills, trunk control and functional abilities in daily life in the rehabilitation process of CP.The study protocol is registered on ClinicalTrials.gov (Identifier: NCT05518370).

PMID: 39022889

4. The relation between visual functions, functional vision, and bimanual function in children with unilateral cerebral palsy

Monica Crotti, Els Ortibus, Nofar Ben Itzhak, Lize Kleeren, Lisa Decraene, Nicolas Leenaerts, Hilde Feys, Lisa Mailleux

Res Dev Disabil. 2024 Jul 16:152:104792. doi: 10.1016/j.ridd.2024.104792. Online ahead of print.

Background: Accurate visual information is needed to guide and perform efficient movements in daily life. Aims: To investigate the relation between visual functions, functional vision, and bimanual function in children with unilateral cerebral palsy (uCP). Methods and procedures: In 49 children with uCP (7-15 y), we investigated the relation between stereoacuity (Titmus Stereo Fly test), visual perception (Test of Visual Perceptual Skills), visuomotor integration (Beery Buktenica Test of Visual-Motor Integration) and functional vision (Flemish cerebral visual impairment questionnaire) with bimanual dexterity (Tyneside Pegboard Test), bimanual coordination (Kinarm exoskeleton robot, Box opening task), and functional hand use (Children's Hand-use Experience Questionnaire; Assisting Hand Assessment) using correlations (rs) and elastic-net regularized regressions (d). Outcomes and results: Visual perception correlated with bimanual coordination (rs=0.407-0.436) and functional hand use (rs=0.380-0.533). Stereoacuity (rs=-0.404), visual perception (rs=-0.391 to -0.620), and visuomotor integration (rs=-0.377) correlated with bimanual dexterity. Functional vision correlated with functional hand use (rs=-0.441 to -0.458). Visual perception predicted bimanual dexterity (d=0.001-0.315), bimanual coordination (d=0.004-0.176), and functional hand use (d=0.001-0.345), whereas functional vision mainly predicted functional hand use (d=0.001-0.201). Conclusions and implications: Visual functions and functional vision are related to bimanual function in children with uCP highlighting the importance of performing extensive visual assessment to better understand children's difficulties in performing bimanual tasks.

PMID: 39018791

5. The Utility of the Surgical Apgar Score in Assessing the Risk of Perioperative Complications Following Spinal Fusion Surgery for Pediatric Patients with Scoliosis and Cerebral Palsy

Kensuke Shinohara, Tracey P Bryan, Carrie E Bartley, Michael P Kelly, Vidyadhar V Upasani, Peter O Newton

Spine (Phila Pa 1976). 2024 Jul 17. doi: 10.1097/BRS.0000000000005098. Online ahead of print.

Study design: Cohort study. Objective: Validate the Surgical Apgar Score (SAS) as a means of predicting perioperative major complications occurring within 30 days after scoliosis surgery in pediatric patients with cerebral palsy (CP). Summary of background data: A patient's SAS, which is composed of three commonly recorded intraoperative variables, predicts postoperative complications after various types of spine surgery. This has not; however, been studied in pediatric patients with scoliosis and CP, a population that experiences a high incidence of complications after corrective spinal surgery. Methods: Pediatric CP patients who underwent spinal correction surgery were included in this study. Patient background, surgical variables, and perioperative complications occurring within 30 days after surgery were collected. Patients were divided into 4 groups based on their SAS: SAS 0-4, SAS 5-6, SAS 7-8, SAS 9-10. The incidences of perioperative complications for each group were compared using a receiver operating characteristic analysis. Area under curve (AUC) is reported. Results: A total of 111 patients met the inclusion criteria. There were no death cases. There were 44 (39.6%) perioperative major complications in

37 (33.3%) patients that occurred within 30 days after spine surgery. The most frequent perioperative complications were pulmonary issues (13.5%). The incidence of perioperative major complication in each SAS group was as follows: SAS 0-4; 51.6%, SAS 5-6; 30.2%, SAS 7-8; 18.5%, SAS 9-10; 0/0. When the SAS 7-8 group was set as the reference, there was no significant difference compared to SAS 5-6 (P=0.34), while the incidence rate was significantly increased in SAS 0-4 (P=0.02). The AUC was 0.65 (95% Confidence Interval: 0.54-0.75). Conclusions: Overall, there were 37 (33.3%) patients with CP who had a major complication within 30 days after spinal surgery. Lower SAS, with the 0-4 group being the cutoff, were associated with significantly higher complication rates than higher SAS groups.

PMID: 39016387

6. Reoperation, Readmission, and Postoperative Bleeding in Pediatric Cerebral Palsy Patients Undergoing Spinal Arthrodesis

Michael J Miskiewicz, Shabnam Parsa, Matthew Magruder, Amr Abdelgawad

Cureus. 2024 Jun 17;16(6):e62520. doi: 10.7759/cureus.62520. eCollection 2024 Jun.

Background Cerebral palsy (CP) is one of the most common neuromuscular disorders in children, and spinal abnormalities are vastly more common in people with CP compared to the general population. Further investigation is needed to improve our understanding of the perioperative factors that place children with CP at greater risk of postoperative complications. This study aims to investigate (1) whether pediatric CP patients have higher rates of postoperative complications after spinal fusion and (2) risk factors for postoperative bleeding, readmission, and reoperation. Methodology The 2019 American College of Surgeons National Surgical Quality Improvement Program Pediatric database was used for this study. Chi-square tests were used to compare patient demographics, frequency of comorbidities, intraoperative factors, and postoperative complications between CP and non-CP patients. Multivariable logistic regression modeling was conducted to determine if CP was an independent risk factor for the composite variable that included postoperative bleeding, readmission, and reoperation. Results A total of 4,445 patients were included in the study, with 606 CP and 3,839 non-CP patients. Several comorbidities were more prevalent in the CP cohort, most notably asthma, gastrointestinal disease, previous cardiac surgery, and hematologic disorders. Multivariable logistic regression modeling revealed that CP, older age, non-Caucasian race, American Society of Anesthesiologists (ASA) class of 3 or higher, posterior surgical approach, previous cardiac surgery, and ostomy were significantly correlated with higher postoperative complications. Conclusions This study demonstrates that CP, older age, non-Caucasian race, ASA class of 3 or higher, posterior approach, previous cardiac surgery, and ostomy are independent risk factors for postoperative complications, including readmission, reoperation, and postoperative bleeding requiring transfusions. Consequently, there is a pressing need for additional research to establish perioperative strategies that reduce postoperative risks for these patients. Spine surgeons should consider the findings of this study when communicating the potential risks of spinal fusion surgery with patients and their families.

PMID: 39022514

7. Collagen architecture and biomechanics of gracilis and adductor longus muscles from children with cerebral palsy

Ross P Wohlgemuth, Vedant A Kulkarni, Marie Villalba, Jon R Davids, Lucas R Smith

J Physiol. 2024 Jul;602(14):3489-3504. doi: 10.1113/JP285988. Epub 2024 Jun 20.

Cerebral palsy (CP) describes some upper motoneuron disorders due to non-progressive disturbances occurring in the developing brain that cause progressive changes to muscle. While longer sarcomeres increase muscle stiffness in patients with CP compared to typically developing (TD) patients, changes in extracellular matrix (ECM) architecture can increase stiffness. Our goal was to investigate how changes in muscle and ECM architecture impact muscle stiffness, gait and joint function in CP. Gracilis and adductor longus biopsies were collected from children with CP undergoing tendon lengthening surgery for hamstring and hip adduction contractures, respectively. Gracilis biopsies were collected from TD patients undergoing anterior cruciate ligament reconstruction surgery with hamstring autograft. Muscle mechanical testing, two-photon imaging and hydroxyproline assay were performed on biopsies. Corresponding data were compared to radiographic hip displacement in CP adductors (CPA), gait kinematics in CP hamstrings (CPH), and joint range of motion in CPA and CPH. We found at matched sarcomere lengths muscle stiffness and collagen architecture were similar between TD and CP hamstrings. However, CPH stiffness ($R2 = 0.1973$), collagen content ($R2 = 0.5099$) and cross-linking ($R2 = 0.3233$) were correlated to decreased knee range of motion. Additionally, we observed collagen fibres within the muscle ECM increase alignment during muscular stretching. These data demonstrate that while ECM architecture is similar between TD and CP hamstrings, collagen fibres biomechanics are sensitive to muscle strain and may be altered at longer in vivo sarcomere lengths in CP muscle. Future studies could evaluate the impact of ECM architecture on TD and CP muscle stiffness across in vivo operating ranges. KEY POINTS: At matched sarcomere lengths, gracilis muscle mechanics and collagen architecture are similar in TD patients and patients with CP. In both TD and CP muscles, collagen fibres dynamically increase their alignment during muscle stretching. Aspects of muscle mechanics and collagen architecture are predictive of in vivo knee joint motion and radiographic hip displacement in patients with CP. Longer sarcomere lengths in CP muscle in vivo may alter collagen architecture and biomechanics to drive deficits in joint mobility and gait function.

PMID: 39008710

8. Total Knee Arthroplasty in Patients with Cerebral Palsy: A Large Database Analysis

Alexander J Acuña, Robert Burnett, Conor M Jones, Enrico M Forlenza, Brett Levine, Craig Della Valle

J Knee Surg. 2024 Jul 17. doi: 10.1055/a-2368-4807. Online ahead of print.

Introduction: Cerebral palsy (CP) is a neurodevelopmental condition which can result in altered gait biomechanics, joint dysfunction, and imbalance. The complications associated with total knee arthroplasty (TKA) in patients with CP have not yet been well described. Therefore, our analysis sought to compare 90-day and 2-year complications following TKA in patients with and without CP. Methods: The PearlDiver Mariner database was utilized to identify patients with CP undergoing primary TKA between 2010-2020. This cohort was matched 1:4 to a control cohort without neurodegenerative disorders based on age, sex, Elixhauser Comorbidity Index (ECI), tobacco use, obesity, and diabetes. A total of 3,257 patients (CP: n=657; Control: n=2,600) were included in our final analysis. Multivariable logistic regression analysis was utilized to determine the risk of CP on medical and surgical complications at 90-days and all-cause revision rates at 2-years. Results: Patients with CP had an increased risk of acute kidney injury (Odds Ratio (OR): 1.66; 95% Confidence Interval (CI): 1.07-2.5; p=0.019), pneumonia (OR: 5.63, 95% CI: 3.69-8.67; p<0.001), urinary tract infection (OR: 5.01, 95% CI: 3.85-6.52; p<0.001), and transfusion (OR: 2.21, 95% CI: 1.50-3.23; p<0.001). CP patients additionally had a higher incidence of emergency department (ED) visits (OR: 5.24, 95% CI: 3.76-7.32; p<0.001) and re-admissions (OR: 5.24, 95% CI: 2.57-4.96; p<0.001). There were no differences in rates of periprosthetic joint infection (PJI) (OR: 1.23, 95% CI: 0.69-2.10; p=0.463), surgical site infection (SSI) (OR: 0.51, 95% CI: 0.12-1.46; p=0.463), and re-operation (or: 1.35, 95% CI: 0.71-2.43; p=0.339) at 90-days post-operatively. All-cause revision rates at 2-years were comparable (OR: 1.02, 95% CI: 0.67-1.51, p=0.927). Discussion: In this database review, we found that CP patients have a higher risk of medical complications in the acute post-operative period following TKA. Ninety-day surgical complication and 2-year revision rates in CP patients were comparable to matched controls.

PMID: 39019470

9. Three-Dimensional Instrumented Gait Analysis for Children with Cerebral Palsy: An Evidence-Based Clinical Practice Guideline: Erratum

No authors listed

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No abstract available

PMID: 39023764

10. The effects of ankle mulligan mobilisation in children with cerebral palsy: A randomized single blind control study

Ratib Shaban Ragheb Abushameh, Zehra Guchan Topcu, Ayse Nur Tunal, Akram Amro, Azzam Al Arab

Randomized Controlled Trial J Pak Med Assoc. 2024 Jul;74(7):1219-1223. doi: 10.47391/JPMA.10328.

Objective: To assess the impact of range of motion changes before and after Mulligan mobilisation with ankle movement interventions on the daily lives of children with diplegic cerebral palsy. Methods: The single blind randomised controlled study was conducted from July 30, 2022, to January 10, 2023, at 3 rehabilitation centres in Hebron, Palestine, after approval from the ethics review committee of Eastern Mediterranean University, Northern Cyprus, and comprised children with cerebral palsy, who were randomised into intervention group IG and control group CG. All the subjects received regular physiotherapy sessions, overseen by their parents, while those in group IG received mobilisation with ankle movement treatment 3 times per week for 4 weeks. Post-intervention assessment of ankle range of motion, balance, functional performance and quality of life was done using a goniometer, the timed up and go test, 88-item gross motor function measure, 6-minute walk test and the cerebral palsy quality of life questionnaire. Data was analysed using SPSS 24. Results: Of the 64 patients, 40(63%) were girls, and 24(37%) were boys. The overall age range was aged 4-12 years. There were 32(50%) patients in each of the two groups. Mobilisation with movement had a significant effect on active and passive range of motion for the left and right ankles (p<0.05) as well as on balance, gross motor function and quality of life (p>0.05). However, mobilisation with movement had no significant effect on the the distance covered during the 6-minute walk test (p>0.05). Conclusions: Mobilisation with movement had a significant impact on active and passive ankle range of motion, balance and quality of life in diplegic children with cerebral palsy, but it had no impact on gait function. Clinical trial registration number: The study was registered at the United States National Institutes of Health (ClinicalTrials.gov) with registration number NCT05500924.

PMID: 39028043

11. Effects of Whole-Body Vibration Therapy in Weight-Bearing and Non-Weight Bearing Positions for Upper and Lower Extremities on Balance and Cervical Joint Position Sense in Children With Cerebral Palsy

Syed Ali Hussain, Mohammad Reza Hadian Rasanani, Zainab Hassan, Azadeh Shadmehr, Saeed Talebian, Mubin Mustafa Kiyani

Cureus. 2024 Jun 16;16(6):e62481. doi: 10.7759/cureus.62481. eCollection 2024 Jun.

Introduction: Cerebral palsy (CP) is a complex pathological entity that affects muscular control, coordination, proprioception, fine and gross motor abilities, position, stability, and, in some cases, cognition. This study aimed to compare the effects of whole-body vibration therapy (WBVT) in weight bearing and non-weight bearing positions for the upper and lower extremities on balance and cervical joint position sense in children with spastic CP. Methods: A randomized controlled trial was carried out on 60 hemiplegic children with spastic CP aged 5-15 years. Following randomization, all participants were allocated into six equal-sized groups based on the application of WBVT for upper extremities, lower extremities, or both simultaneously in either weight-bearing or non-weight-bearing positions. Pediatric balance scale (PBS) and laser tracker system were used to assess functional balance and cervical joint position sense. Results: One-way analysis of variance for Inter-group analysis showed a statistically significant difference among all groups in PBS and cervical joint position sense ($p<0.05$). Conclusion: WBVT was found to be beneficial in improving balance and cervical joint position sense in both weight-bearing and non-weight-bearing positions for the upper and lower extremities in children with cerebral palsy. However, the simultaneous application of WBVT in weight-bearing positions for both upper and lower extremities showed the most significant improvements in improving both balance and cervical joint position sense, indicating the most efficacious position of this treatment approach in children with cerebral palsy.

PMID: 39015866

12. Hearing and speech interactions in children with cerebral palsy, in the first 2 years : Focus on cerebral palsy

Ursula Findlen, Celine Richard

Pediatr Res. 2024 Jul 13. doi: 10.1038/s41390-024-03403-0. Online ahead of print.

Children with cerebral palsy (CP) face communication challenges stemming from neural lesions, hearing issues, and executive function impairments, which are further complicated by interactions between motor and hearing impairments. These challenges lead to limitations in daily activities and are compounded by delays in diagnosis and interventions, adversely affecting speech, language, and cognitive function. In infants with CP, impaired motor function disrupts both feedforward and feedback mechanisms crucial for speech sound production, exacerbating the overall impact on communication development. Understanding the interplay between hearing loss and speech production in children with CP, especially in the crucial early developmental stages, is essential for implementing timely interventions and guiding multidisciplinary care teams in both clinical and home settings. IMPACT QUESTIONS: Children with cerebral palsy (CP) face communication challenges due to neural, hearing, and motor issues, impacting speech and language development. Early and comprehensive testing, including auditory brainstem response, is crucial for timely diagnosis and intervention to mitigate adverse effects. The article emphasizes the need for advanced diagnostics and multidisciplinary interventions to improve communication skills and cognitive outcomes in children with CP.

PMID: 39003333

13. Rethinking the Accessibility of Hearing Assessments for Children with Developmental Disabilities

Angela Yarnell Bonino, Deborah Mood, Mary S Dietrich

J Autism Dev Disord. 2024 Jul 18. doi: 10.1007/s10803-024-06461-9. Online ahead of print.

We aim to determine the accessibility of gold-standard hearing assessments - audiogram or auditory brainstem response (ABR) - during the first 3 months of hearing health care for children with and without developmental disabilities. Electronic health records were examined from children (0-18 years) who received hearing health care at three hospitals. Children with developmental disabilities had a diagnosis of autism, cerebral palsy, Down syndrome, or intellectual disability. Assessments from the first 3 months were reviewed to determine if ≥ 1 audiogram or ABR threshold was recorded. To evaluate differences in assessment based on disability status, logistic regression models were built while accounting for age, race, ethnicity, sex, and site. Of the 131,783 children, 9.8% had developmental disabilities. Whereas 9.3% of children in the comparison group did not access a gold-standard assessment, this rate was 24.4% for children with developmental disabilities (relative risk (RR) = 3.79; $p < 0.001$). All subgroups were at higher risk relative to the comparison group (all $p < 0.001$): multiple diagnoses (RR = 13.24), intellectual disabilities (RR = 11.52), cerebral palsy (RR = 9.87), Down syndrome (RR = 6.14), and autism (RR = 2.88). Children with developmental disabilities are at high risk for suboptimal hearing evaluations that lack a gold-standard assessment. Failure to access a gold-standard assessment results in children being at risk for late or missed diagnosis for reduced hearing. Results highlight the need for (1) close monitoring of hearing by healthcare providers, and (2) advancements

in testing methods and guidelines.

PMID: 39023803

14. The ethical significance of user-control in AI-driven speech-BCIs: a narrative review

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Review Front Hum Neurosci. 2024 Jun 27:18:1420334. doi: 10.3389/fnhum.2024.1420334. eCollection 2024.

AI-driven brain-computed interfaces aimed at restoring speech for individuals living with locked-in-syndrome are paired with ethical implications for user's autonomy, privacy and responsibility. Embedding options for sufficient levels of user-control in speech-BCI design has been proposed to mitigate these ethical challenges. However, how user-control in speech-BCIs is conceptualized and how it relates to these ethical challenges is underdetermined. In this narrative literature review, we aim to clarify and explicate the notion of user-control in speech-BCIs, to better understand in what way user-control could operationalize user's autonomy, privacy and responsibility and explore how such suggestions for increasing user-control can be translated to recommendations for the design or use of speech-BCIs. First, we identified types of user control, including executory control that can protect voluntariness of speech, and guidance control that can contribute to semantic accuracy. Second, we identified potential causes for a loss of user-control, including contributions of predictive language models, a lack of ability for neural control, or signal interference and external control. Such a loss of user control may have implications for semantic accuracy and mental privacy. Third we explored ways to design for user-control. While embedding initiation signals for users may increase executory control, they may conflict with other aims such as speed and continuity of speech. Design mechanisms for guidance control remain largely conceptual, similar trade-offs in design may be expected. We argue that preceding these trade-offs, the overarching aim of speech-BCIs needs to be defined, requiring input from current and potential users. Additionally, conceptual clarification of user-control and other (ethical) concepts in this debate has practical relevance for BCI researchers. For instance, different concepts of inner speech may have distinct ethical implications. Increased clarity of such concepts can improve anticipation of ethical implications of speech-BCIs and may help to steer design decisions.

PMID: 39006157

15. Treatment with robot-assisted gait trainer Walkbot along with physiotherapy vs. isolated physiotherapy in children and adolescents with cerebral palsy. Experimental study

Raquel Olmos-Gómez, Inmaculada Calvo-Muñoz, Antonia Gómez-Conesa

BMC Neurol. 2024 Jul 15;24(1):245. doi: 10.1186/s12883-024-03750-9.

Background: Improving walking ability is a key objective in the treatment of children and adolescents with cerebral palsy, since it directly affects their activity and participation. In recent years, robotic technology has been implemented in gait treatment, which allows training of longer duration and repetition of the movement. To know the effectiveness of a treatment with the robotic-assisted gait trainer Walkbot combined with physiotherapy compared to the isolated physiotherapy treatment in children and adolescents with cerebral palsy, we carried out a clinical trial. Methods: 23 participants, were divided into two groups: experimental and control. During 5 weeks, both groups received their physiotherapy sessions scheduled, in addition experimental group received 4 sessions per week of 40 min of robot. An evaluation of the participants was carried out before the intervention, at the end of the intervention, and at follow-up (two months after the end of the intervention). Gait was assessed with the Gross Motor Function Measure-88 dimensions D and E, strength was measured with a hydraulic dynamometer, and range of motion was assessed using the goniometer. A mixed ANOVA was performed when the assumptions of normality and homoscedasticity were met, and a robust mixed ANOVA was performed when these assumptions were not met. Statistical significance was stipulated at $p < 0.05$. For the effect size, $\eta 2$ was calculated. Results: Significant differences were found regarding the time x group interaction in the Gross Motor Function Measure-88 in dimension D [$\eta 2 = 0.016$], in the flexion strength of the left [$\eta 2 = 0.128$] and right [$\eta 2 = 0.142$] hips, in the extension strength of the right hip [$\eta 2 = 0.035$], in the abduction strength of the left hip [$\eta 2 = 0.179$] and right [$\eta 2 = 0.196$], in the flexion strength of the left knee [$\eta 2 = 0.222$] and right [$\eta 2 = 0.147$], and in the range of motion of left [$\eta 2 = 0.071$] and right [$\eta 2 = 0.053$] knee flexion. Conclusions: Compared to treatments without walking robot, physiotherapy treatment including Walkbot improves standing, muscle strength, and knee range of motion in children and adolescents with cerebral palsy. Trial registration: ClinicalTrials.gov: NCT04329793. First posted: April 1, 2020.

PMID: 39009990

16. EPIC-CP pilot trial study protocol: a multicentre, randomised controlled trial investigating the feasibility and acceptability of social prescribing for Australian children with cerebral palsy

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Masyitah Mohamed, Anne Olaso, Matthew van Hoek, Debbie van Hoek, Mackenzie Woodbury, Alunya Wilkinson, Georgina Chambers, Karen Zwi, Russell Dale, Valsamma Eapen, Raghu Lingam, Iva Strnadová, Susan Woolfenden; EPIC-CP Group

BMJ Open. 2024 Jul 13;14(7):e076304. doi: 10.1136/bmjopen-2023-076304.

Introduction: The social determinants of health contribute to poorer health outcomes for children with cerebral palsy (CP) and are barriers to families accessing health services. At an individual level, social determinants of health are experienced as unmet social needs, for example, unsafe housing conditions. There is emerging evidence that clinical pathways for the systematic identification and referral to services for unmet social needs can support families to address these needs. These clinical pathways have not been implemented for children with CP. The objectives are to investigate the feasibility and acceptability of two co-designed social needs clinical pathways for parents/caregivers of children with CP-social prescribing (ie, Community Linker plus resource pack) compared with resource pack only. Methods and analysis: This pilot randomised controlled trial will run at the three tertiary paediatric rehabilitation services in New South Wales, Australia. A total of 120 participants will be recruited, with randomisation stratified by study site. A survey tool will be used to identify families experiencing unmet social needs. Parents/caregivers who report one or more unmet social need/s and consent will be eligible. The active control group will receive a resource pack containing information on community services to support unmet social needs. The social prescribing intervention group will receive one-on-one Community Linker support, in addition to the resource pack. The survey tool, intervention, logic model, and resource pack were co-designed with patient families and their healthcare workers. Feasibility of the research design and the clinical pathways will be evaluated using the number/proportion of parents/caregivers who complete the survey tool, consent, engage with the intervention, and complete research measures. Acceptability will be evaluated using questionnaires and qualitative interviews. Ethics and dissemination: Human research ethics approval was granted by the Sydney Children's Hospitals Network Human Research Ethics Committee (2022/ETH01688). Participants and stakeholders will receive updates and findings via regular communication channels including meetings, presentations, and publications. Trial registration number: Australia New Zealand Clinical Trials Registry: 12622001459718.

PMID: 39002958

17. UK research priority setting for childhood neurological conditions

Jill Cadwgan, Jane Goodwin, Barbara Babcock, Molly Brick, Richard Chin, Ava Easton, Ben Green, Siobhan Hannan, Rhys P D Inward, Suzannah Kinsella, Callum King, Manju A Kurian, Phillip Levine, Andrew Mallick, Jeremy Parr, Carol Anne Partridge, Sam Amin, Dan Lumsden, J Helen Cross, Ming J Lim; UK Childhood Neurological Disorders PSP Group

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Aim: To identify research priorities regarding the effectiveness of interventions for children and young people (CYP) with childhood neurological conditions (CNCs). These include common conditions such as epilepsies and cerebral palsy, as well as many rare conditions. Method: The National Institute for Health and Care Research (NIHR) and the James Lind Alliance (JLA) champion and facilitate priority setting partnerships (PSPs) between patients, caregivers, and clinicians (stakeholders) to identify the most important unanswered questions for research (uncertainties). A NIHR-JLA and British Paediatric Neurology Association collaboration used the JLA PSP methodology. This consisted of two surveys to stakeholders: survey 1 (to identify uncertainties) and survey 2 (a prioritization survey). The final top 10 priorities were agreed by consensus in a stakeholder workshop. Results: One hundred and thirty-two charities and partner organizations were invited to participate. In survey 1, 701 participants (70% non-clinicians, including CYP and parent and caregivers) submitted 1800 uncertainties from which 44 uncertainties were identified for prioritization in survey 2; from these, 1451 participants (83% non-clinicians) selected their top 10 priorities. An unweighted amalgamated score across participant roles was used to select 26. In the final workshop, 14 health care professionals, 11 parent and caregivers, and two CYP ranked the 26 questions to finalize the top 10 priorities. Ten top priority questions were identified regarding interventions to treat CYP with CNCs and their associated comorbidities, for example, sleep, emotional well-being, and distressing symptoms. Interpretation: The results of this study will inform research into the effectiveness of interventions for children with neurological conditions.

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18. "This can certainly work…": stakeholder perspectives of the feasibility of a caregiver-led training program for caregivers of children with cerebral palsy in a rural setting in Malawi

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Introduction: Caregiver training is a key component of rehabilitation for children with complex lifelong disabilities such as cerebral palsy. However critical shortages of therapists in low- and middle-income countries like Malawi, reduce access to therapy. Introducing expert caregivers to assist with the provision of basic training on the condition for fellow caregivers offers a potential solution. However, there is a paucity of evidence regarding the implementation of such strategies in low-resource settings. The aim of this study was to explore perspectives of stakeholders regarding the feasibility of implementing a caregiver

-led and delivered training program for caregivers of children with cerebral palsy in Malawi. Methods: Over 5 days in January 2023, a caregiver-led training program, the "Malamulele Onward Carer-to-Carer Training Program," was conducted in Blantyre, Malawi. A South African master trainer traveled to Malawi and delivered the program to potential stakeholders including caregivers of children with cerebral palsy; physiotherapists; and community-based organization representatives. Stakeholder perspectives regarding the acceptability, demand, practicality and adaptation of the program were obtained through a combination of focus group discussions, in-depth interviews, and daily field notes. Data from the focus group discussions and in-depth interviews were analyzed using thematic analysis. Results: The caregiver-led training program was deemed acceptable despite two areas identified as potential areas of concern; that the expert caregivers may cross practice boundaries and that their fellow caregivers may look down upon them. A demand for this program was expressed because of perceived relative advantages and relevance to caregiver needs. Participants indicated that the intervention could be easily delivered using local materials, absorbed and supported by existing community structures. Conclusion: A caregiver-led training program offers an innovative way of supporting caregivers of children with complex disabilities such as cerebral palsy in low-resource settings. The stakeholder engagement demonstrated the positive perspectives of all stakeholders. The areas for modification and adaptation highlighted by the stakeholders will be useful in strengthening the implementation of the program in Malawi.

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19. Clinical profile and associated comorbidities of cerebral palsy in children visiting Orotta National Referral Hospital, Eritrea: a cross-sectional study

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Background: Cerebral Palsy (CP) is one of the most common physical disabilities in children. This study aimed to explore the clinical spectrum of CP at Orotta National Referral and Teaching Hospital, including CP subtypes, gross motor function, patterns of associated comorbidities, and possible risk factors in children aged 2 to 12 years. Methods: A hospital-based cross-sectional study was conducted from January to April 2022 in 153 children with suspected motor symptoms. The Surveillance of CP in Europe (SCPE) decision tree was used as an inclusion criteria guideline and the evaluation of the participants was done using a standardized questionnaire and clinical examination. Descriptive statistics, chi-square test, and logistic regression were employed to statistically analyze the data. Results: Eighty-four children who fulfilled the clinical criteria were included in the study. The median age was 5-years [IQR: 3.8] with an equal distribution of males and females. Quadriplegic CP was the most common subtype (51.2%) followed by unilateral (hemiplegic) CP (22.6%), and dyskinetic CP (14.3%). Most children had severe gross motor impairment GMFCS level IV-V and females were almost three times more likely to have GMFCS level IV/V than males (AOR: 2.70; CI: 1.08-6.72; p-value = 0.033.) More than half (52.4%) of the neonates either did not cry within five minutes and/or needed breathing resuscitation, 55.3% had to be admitted to the NICU with a median of 5 days' hospital stay. Between the first week of birth and the first year of life, 28.6% had trouble feeding, 26.2% had an infection, 10.7% had difficulty breathing, 20.2% had seizures and 6% had jaundice. Feeding problems (64.3%), speech problems of some sort (91.7%), and epilepsy (46.4%) were the most commonly associated comorbidities with CP. Conclusions: The clinical profile of the CP patients was found to be dominated by the spastic subtype and moderate to severe disability. Since perinatal risk factors were found to be dominant, strengthening maternal and child healthcare systems is recommended to minimize incidents of preventable risk factors and the burden of the disability.

PMID: 39026171

20. Identification of a novel nonsense SLC16A2 gene mutation in an infant with severe neurologic phenotype: A case report

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Rationale: Allan-Herndon-Dudley syndrome (AHDS) results from a pathogenic variant in the hemizygous subunit of the SLC16A2 gene, which encodes monocarboxylate transporter 8 and follows an X-linked recessive pattern. AHDS manifests as neuropsychomotor developmental delay, intellectual disability, movement disorders, and thyroid hormone abnormalities. It is frequently misdiagnosed as cerebral palsy or hypothyroidism. Patient concerns: A 9-month-old male infant exhibited poor head control, hypodynamia, motor retardation, hypertonic limbs, and thyroid abnormalities. Despite levothyroxine supplementation and rehabilitation therapy, no improvements were observed. Whole-exome sequencing identified a novel nonsense mutation in SLC16A2 (c.124G > T, p.E42X), which unequivocally established the diagnosis. Diagnoses: AHDS was confirmed. Interventions: Levothyroxine treatment commenced early in infancy, followed by 3 months of rehabilitation therapy, starting at 5 months of age. The combined administration of levothyroxine and methimazole was initiated at 1 year and 10 months of age, respectively. Outcomes: While improvements were noted in thyroid hormone levels, neurological developmental delays persisted. Lessons: AHDS should be considered in patients presenting with atypical neurological features and thyroid hormone abnormalities such as elevated triiodothyronine and decreased thyroxine levels. The early utilization of exome sequencing aids in prompt diagnosis. The identified SLC16A2 nonsense mutation correlates with severe neurological phenotypes and adds to

the spectrum of genetic variations associated with AHDS.

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21. Mental Health Diagnoses Risk Among Children and Young Adults With Cerebral Palsy, Chronic Conditions, or Typical Development

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Importance: Mental health (MH) issues in children with cerebral palsy (CP) are poorly understood compared with other pediatric populations. Objective: To examine MH diagnosis code assignment among children and young adults with CP and compare with typically developing (TD) and chronic condition (CC) pediatric populations. Design, setting, and participants: This case-control study used International Statistical Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes to create a CP case set and CC and TD control sets using electronic health record data of children and young adults from a large tertiary care children's hospital in the midwestern United States between 2010 and 2022. Case-control matching was performed to control for demographic factors. Data were analyzed from June to December 2023. Exposures: All MH diagnosis codes were mapped to ICD-10-CM and categorized using Clinical Classifications Software Refined (CCSR). Main outcomes and measures: The incidence rates of MH CCSR categories were calculated. Descriptive and comparative statistics were used to evaluate the significance and odds associated with factors. Results: Data from 216 794 individuals (mean [SD] baseline age, 4.3 [5.1] years; 118 562 [55%] male) were analyzed, including 3544 individuals with CP, 142 160 individuals with CC, and 71 080 TD individuals. The CP cohort spread across Gross Motor Function Classification System (GMFCS) levels I (981 individuals [28%]), II (645 individuals [18%]), III (346 individuals [10%]), IV (502 individuals [14%]), and V (618 individuals [17%]). Rates varied significantly for anxiety (824 individuals with CP [23%]; 25 877 individuals with CC [9%]; 6274 individuals with TD [18%]), attention-deficit/hyperactivity disorder (534 individuals with CP [15%]; 22 426 individuals with CC [9%]; 6311 individuals with TD [16%]); conduct or impulse disorder (504 individuals with CP [14%]; 13 209 individuals with CC [5%]; 3715 individuals with TD [9%]), trauma or stress disorders (343 individuals with CP [10%]; 18 229 individuals with CC [8%]; 5329 individuals with TD [13%]), obsessive-compulsive disorder (251 individuals with CP [7%]; 3795 individuals with CC [1%]; 659 individuals with TD [3%]), depression (108 individuals with CP [3%]; 12 224 individuals with CC [5%]; 4007 individuals with TD [9%]), mood disorders (74 individuals with CP [2%]; 4355 individuals with CC [2%]; 1181 individuals with TD [3%]), and suicidal ideation (72 individuals with CP [2%]; 7422 individuals with CC [5%]; 3513 individuals with TD [5%]). There was significant variation in odds of MH diagnoses by GMFCS level (I-II vs III-V: odds ratio [OR], 1.23; 95% CI, 1.09-1.40; P = .001). Among individuals with CP, males were more likely than females to have diagnosis codes for conduct or impulse disorders (OR, 1.41; 95% CI, 1.16-1.73) and attention-deficit/hyperactivity disorder (OR, 1.41 [95% CI, 1.15-1.73]). Black individuals, compared with White individuals, were more likely to have diagnoses for obsessive-compulsive disorder (OR, 1.57 [95% CI, 1.14-2.16]), other mood disorders (OR, 1.85 [95% CI, 1.01-3.38]), and trauma or stress disorders (OR, 1.94 [95% CI, 1.44-2.63]). Odds for trauma or stress disorders were elevated for individuals who identified as other races compared with White individuals (OR, 2.80 [95% CI, 2.03-3.87]). Conclusions and relevance: In this case-control study of children and young adults with CP and matched comparisons, anxiety and conduct or impulse diagnoses were higher in individuals with CP. The lower diagnosis rates of depression and suicidal ideation may indicate underdiagnosis among individuals with CP. There is likely a need for assessment tools that are more suitable for children with CP.

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22. Preoperative gastric volume assessment using ultrasound in cerebral palsy pediatric patients: A prospective observational study

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Background: Although cerebral palsy is a risk factor for aspiration, there is insufficient research on residual gastric volume after preoperative fasting in children with cerebral palsy. We evaluated the incidence of a full stomach by ultrasound assessment of the gastric volume in children with cerebral palsy who underwent orthopedic surgery after preoperative fasting. Methods: The patients fasted for 8h for solid foods and 2h for clear liquids. We obtained the gastric antral cross-sectional area using ultrasound in the semi-recumbent and right lateral decubitus positions. A calculated stomach volume > 1.5 mL.kg-1 was considered as full, which poses a high aspiration risk. The primary outcome was the incidence of full stomach, and the secondary outcomes were the qualitative gastric volume and correlation of disease severity categorized according to the Gross Motor Function Classification System with the residual gastric volume, gastric volume per body weight, and qualitative gastric volume. Results: Thirty-seven pediatric patients with cerebral palsy, scheduled for elective orthopedic surgery, were included for analysis. Full-stomach status was observed in none, and the gastric volume per body weight was 0.5 (0.4-0.7) mL.kg-1. No significant differences were observed in the residual gastric volume (p = 0.114), gastric volume per body weight (p = 0.117), or

qualitative grade of gastric volume (p = 0.642) in relation to disease severities. Conclusion: Children with cerebral palsy who fasted preoperatively had empty or nearly empty stomachs. Further studies are required to determine the optimal fasting duration for such children.

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23. Hypercalcaemia secondary to hypervitaminosis A in a young man with cerebral palsy

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No abstract available

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