Cerebral palsy research news

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Professor Nadia Badawi AM
CP Alliance Chair of Cerebral Palsy Research

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Interventions and Management

1. Wrist-Worn devices to encourage affected upper limb movement in unilateral cerebral palsy: Participatory design workshops
Rebekah Brown, Janice Elizabeth Pearse, Tom Nappey, Dan Jackson, Grace Edmonds, Yu Guan, Anna Purna Basu

Front Rehabil Sci. 2022 Dec 21;3:1021760. doi: 10.3389/fresc.2022.1021760. eCollection 2022.

Background: Unilateral (Hemiplegic) cerebral palsy (UCP) causes weakness and stiffness affecting one sided of the body, often impacting activities of daily living. Upper limb therapy at effective intensity is not accessible to most. Aim: To determine stakeholder views on design of an approach using wrist-worn devices and a smartphone application to encourage use of the affected upper limb for children with hemiplegia. Method: Four participatory design workshops and one young people's advisory group workshop incorporating views of five young people with hemiplegia, 13 typically developing peers aged 8-18 years, four parents, three occupational therapists, one teacher and two paediatricians. Two special educational needs co-ordinators were consulted separately. Peers were included to explore a study design whereby each child with hemiplegia would have a participating "buddy". Topics included views on an acceptable wrist-worn device and smartphone application, participant age range, involvement of a buddy, and barriers to using the technology in a school setting. Ethical/welfare considerations included data security, and potential risks around providing smartphones to young children. Results: Children wanted a comfortable, conventional-appearing wristband incorporating a watch face and a secure, well-fitting strap. They were prepared to wear a band on each wrist. They wanted support with explaining the study to schoolteachers. Most schools restricted smartphone use during the school day: the study design accommodated this. Children agreed with a game as reward but had different views on an acceptable game; direct access to feedback data was preferred by some. Parents commented on the lack of access to upper limb therapy for children with UCP; therapists concurred. The proposed participant age range was widened based on feedback. Typically developing children were prepared to be buddies to help a friend with CP. Stakeholders were reassured by data security explanations and plans to provide internet safety information to participants. Conclusion: The participatory design process informed plans for the proof-of-concept stage of the study, hopefully leading to an approach that will be fun, easy to integrate into everyday life, and have the capacity to increase use of the affected arm and hand.

PMID: 36619529

2. Finding Effective Adjustment Levels for Upper Limb Exergames: Focus Group Study With Children With Physical Disabilities
Martina Eckert, Beatriz Domingo Soria, Noelia Terroso Gil

JMIR Serious Games. 2023 Jan 13;11:e36110. doi: 10.2196/36110.

Background: We developed the Blexer system consisting of a database and a web interface for therapists that can host

different types of adaptive and personally configurable virtual reality exergames based on Kinect (Microsoft Corp) motion capture to provide entertaining exercises for children with motor disabilities. It allows for parameter adjustment and the monitoring of results remotely, thereby providing a useful tool to complement traditional physical therapy sessions with home exercises. Objective: The aim of this study was to observe the motor benefits achieved through the use of a video exergame and the importance and implications of correctly setting the game's difficulty parameters. Methods: This was an observational case study of 6 children with different physical disabilities receiving physical therapy at school combined with the use of a fully configurable exergame under research that forms a part of the Blexer environment. The game integrates 4 repeatedly appearing upper limb exercises with individually adjustable difficulties (intermittent arm rising, arm forward and backward movement, rising and holding of one arm, and trunk control in all directions). The outcomes were 3 assessments of 2 efficacy measures: Box and Block Test and Jebsen Taylor Hand Function Test. Results: A total of 5 children with cerebral palsy (mean 8.4, SD $^{-}$ 2.7 years; Gross Motor Function Classification II-2/5, 40%; III-2/5, 40%; and IV-1/5, 20%) and 1 child with obstetric brachial plexus palsy (aged 8 years; Mallet Classification III) received between 8 and 11 sessions of training (10-20 minutes per session), depending on age, motivation, and fatigue. Significant associations were observed between game parameter settings and improvements in motor function, on the one hand, and between the type of improvement and disability severity, on the other: with adjusted game parameters goal and time in the range of 70% to 100%, only less affected children improved in the Box and Block Test (+11 blocks vs -1 block), and more affected children improved more in the Jebsen Taylor Hand Function Test (+90 seconds vs +27 seconds). Conclusions: When defining the difficulty parameters for an exergame, we suggest a classification in levels ranging from very easy to very hard. For practical use, we suggest setting the difficulty for the player to an easy or medium level rather than high-commitment goals, as this leads to a longer playtime with more fun and, therefore, seems to improve the results of the game and, consequently, mobility.

PMID: 36637882

3. What Is the Relationship between Trunk Control Function and Arm Coordination in Adults with Severe-to-Moderate Quadriplegic Cerebral Palsy?
María Isabel Cornejo, Alba Roldan, Raul Reina

Int J Environ Res Public Health. 2022 Dec 22;20(1):141. doi: 10.3390/ijerph20010141.

Adults with tetraparesis cerebral palsy (i.e., wheelchair users) tend to experience more accelerated ageing, resulting in physical deterioration that increases the impact of the disability, leading to a loss of mobility that interferes with people's daily activities and participation in the community. The aim of this work is to study the relationship between trunk control and the function of the less-affected arm in this population. For this purpose, 41 para-athletes were invited to participate in this study, performing five tests to assess upper limb coordination, two tests to assess manual dexterity [i.e., Box and Block Test (BBT) and Box and Ball Test (BBLT)] and three tests to assess intra-limb coordination in different planes. Trunk control was assessed in both static and dynamic sitting conditions. The results show moderate correlations between static postural control and manual dexterity tests in the BBT ($r = -0.553$; $p = 0.002$) and BBLT ($r = -0.537$; $p = 0.004$). Large correlations were also found between static postural control and intra-limb tasks in horizontal ($r = 0.769$; $p = 0.001$) and vertical movements ($r = 0.739$; $p = 0.009$). Better static trunk control is related to a better upper limb function in the sagittal plane. Considerations and implications are explained in the manuscript.

PMID: 36612469

4. Improvement of the gait pattern after selective dorsal rhizotomy derives from changes of kinematic parameters in the sagittal plane
Wenbin Jiang, Shuyun Jiang, Yan Yu, Qijia Zhan, Min Wei, Rong Mei, Fang Chen, Yao Guo, Bo Xiao

Front Pediatr. 2022 Dec 23;10:1047227. doi: 10.3389/fped.2022.1047227. eCollection 2022.

Objective: Selective dorsal rhizotomy (SDR) can decrease spasticity in children suffering from spastic cerebral palsy (SCP) and thus improve their moving ability when supplemented with the post-operational rehabilitation program. In this case, the study aims to investigate the gait changes in children with mild SCP after SDR in short-term follow-up. Methods: The information of ambulatory SCP cases who underwent SDR in our center was retrospectively reviewed, and comparisons of changes in spasticity, motor function and data of gait analysis before and after SDR were analyzed. Results: In total, 32 cases were included in this study, with a mean age of 5.9 ± 2.1 years old. Noticeable decrease was found in the median value of the pre-operational MAS score after SDR at last follow-up in both sides of adductors, gastrocnemius, soleus, and left hamstrings. The

Gross Motor Function Measure-66 score increased from 70.6 ± 9.2 to 73.4 ± 8.2, and the gait deviation index increased after SDR compared with the pre-operational data (right side: 65.8 ± 8.8 vs. 60.1 ± 10.7; left side: 63.5 ± 10.1 vs. 57.0 ± 9.9). Noticeable changes were found that the maximum angle of affected ankles in the sagittal plane (the dorsal-flexion angle) increased from 2.5° to 8.2°, the angles at initial contact (1% gait cycle) of affected knees in the sagittal plane decreased from 34.0° to 27.8°, and the angles at the end of swing phase (100% gait cycle) of affected knees in the sagittal plane decreased from 35.8° to 28.3°. Conclusion: In short-term follow-up, SDR can lower spasticity in children with SCP. Post-operational gait analysis showed improvements in gross motor function and gait, which derived from the changes in the sagittal plane (ankle and knee). A longer follow-up duration is thus needed to clarify the long-term outcome.

PMID: 36619509

5. Resident muscle stem myogenic characteristics in postnatal muscle growth impairments in children with cerebral palsy

Ryan E Kahn, Timothy Krater, Jill E Larson, Marysol Encarnacion, Tasos Karakostas , Neeraj M Patel, Vineeta T Swaroop, Sudarshan Dayanidhi

Am J Physiol Cell Physiol. 2023 Jan 9. doi: 10.1152/ajpcell.00499.2022. Online ahead of print.

Children with cerebral palsy (CP), have impaired postnatal muscle growth, with some muscles developing contractures. Functionally, children are either able to walk or primarily use wheelchairs. Satellite cells are muscle stem cells (MuSC) required for postnatal development and source of myonuclei. Only MuSC abundance has been previously reported in contractured muscles, with myogenic characteristics assessed only in vitro. We investigated if MuSC myogenic, myonuclear and myofiber characteristics in situ differs between contractured and non-contractured muscles, across functional levels, and compared to typically developing (TD) children with musculoskeletal injury. Open muscle biopsies were obtained from thirty-six children (30 CP, 6 TD) during surgery; contracture correction for adductors or gastrocnemius, or from vastus lateralis (bony surgery in CP, ACL repair in TD). Muscle cross-sections were immunohistochemically labeled for MuSC abundance, activation, proliferation, nuclei, myofiber borders, type-1 fibers, collagen content in serial sections. Although, MuSC abundance was greater in contractured muscles, primarily in type-1 fibers, their myogenic characteristics (activation, proliferation) were lower compared to non-contractured muscles. Overall, MuSC abundance, activation and proliferation appear to be associated with collagen content. Myonuclear number was similar between all muscles, but only in contractured muscles were there associations between myonuclear number, MuSC abundance and fiber cross-sectional area. Puzzlingly, MuSC characteristics were similar between ambulatory and non-ambulatory children. Non-contractured muscles in children with CP had a lower MuSC abundance compared to TD-ACL injured children, but similar myogenic characteristics. Contractured muscles may have an altered developmental progression of postnatal MuSC pool establishment, needed for lifelong efficient growth and repair.

PMID: 36622072

6. Factors Associated With Short-Term Recovery Following Single-Event Multilevel Surgery for Children With Cerebral Palsy

Nancy Lennon, Grace Gerry, Isabel Biermann, Jason Beaman, Nicole Mamula, Abigail Gilmore, Tim Niiler, M Wade Shrader, Laura L Owens

Pediatr Phys Ther. 2023 Jan 1;35(1):93-99. doi: 10.1097/PEP.0000000000000976.

Purpose: To examine the role of multiple factors, including therapy dose, on recovery of mobility function during post-single-event multilevel surgery (SEMLS) rehabilitation in youth with cerebral palsy. Methods: Several factors expected to influence postoperative change in Gross Motor Function Measure (GMFM) were examined: age, Gross Motor Function Classification System (GMFCS) level, cognition, number of osteotomies, surgical complications, medical comorbidities, number of therapy sessions, and preoperative measures of gait, balance, and gross motor function. Results: Sixty-nine youth with cerebral palsy, GMFSC levels I-IV, who had undergone SEMLS and rehabilitation had on average 2.6 osteotomies and 89 postoperative therapy sessions. Fewer osteotomies, higher therapy dose, higher preoperative GMFM, and lower GMFM at postoperative admission were significant in determining GMFM change. Conclusions: The most relevant factors on post-SEMLS recovery were therapy dose, surgical burden, and level of gross motor function immediately before and after surgery.

PMID: 36638036

7. Commentary on "Factors Associated With Short-Term Recovery Following Single-Event Multilevel Surgery for Children With Cerebral Palsy"
Amy F Bailes, Lori J Poliski

Pediatr Phys Ther. 2023 Jan 1;35(1):100. doi: 10.1097/PEP.0000000000000978.

No abstract available

PMID: 36638037

8. Inpatient Physical Therapy After Orthopedic Lower Extremity Surgery in Children With Cerebral Palsy
Amy F Bailes, Colleen Mangeot, Natalie J Murphy, Zachary Richardson, James McCarthy, Beth M McManus

Pediatr Phys Ther. 2023 Jan 1;35(1):57-64. doi: 10.1097/PEP.0000000000000970. Epub 2022 Oct 25.

Purpose: To characterize and examine the variability in receipt of inpatient (IP) physical therapy after lower extremity (LE) orthopedic surgery for individuals with cerebral palsy (CP) across hospital-level (region, bed size) and individual characteristics (gender, age, race/ethnicity, insurance type, technology dependency, and surgical burden). Methods: We retrospectively analyzed physical therapy billing data of children with CP who had LE orthopedic surgery from October 1, 2015, through September 30, 2017, from the Pediatric Health Information Services (PHIS) database. Results: Seventy-five percent of individuals received IP physical therapy during the hospital stay. Individuals from the South and West and those who were technology dependent were less likely to receive IP therapy. Those at large hospitals, aged 11 to 14 years, and with a high surgical burden were more likely to receive therapy. Conclusions: Results provide a starting point for future research on the discrepancies of acute physical therapy services in children diagnosed with CP. (Supplemental digital content video abstract available at: http://links.lww.com.ezproxy.library.sydney.edu.au/PPT/A420).

PMID: 36638029

9. Commentary on "Inpatient Physical Therapy After Orthopedic Lower Extremity Surgery in Children With Cerebral Palsy"
Nancy Lennon, Brittany Virgil

Pediatr Phys Ther. 2023 Jan 1;35(1):65. doi: 10.1097/PEP.0000000000000982.

No abstract available

PMID: 36638030

10. Physical Exercises in Combination with Botulinum Toxin in Treating Children with Cerebral Palsy: A Literature Review
Abhishek Sharma, Sakshi Vats, Aksh Chahal

J Lifestyle Med. 2022 Sep 30;12(3):138-147. doi: 10.15280/jlm.2022.12.3.138.

Background: Botulinum Toxin type-A (BoNT-A) is a safe and effective treatment for reducing spasticity in children with cerebral palsy (CP). BoNT-A injection into the muscles alleviate spasticity by interrupting neurotransmission at motor endplate (MEP). Physical activities combined with botulinum injections can help children with CP to become physically independent and improve their health-related quality of life. Methods: 'Botulinum toxin' and 'Physical exercises' for children and adolescents, were searched in three major online databases (PubMed, Science Direct, and Scopus). Through the inclusion and

exclusion processes from total 1,233, nine articles were selected for review. Results: All studies included were experimental trials including various interventions. Botulinum toxins when paired with physical exercises to treat hypertonia, a condition in which a little change in tone can affect a child's balance, strength and motor function, as well as secondary concerns such as malalignment and repair contractures. Conclusion: BoNT and physical exercises are two promising therapeutic techniques for treating children with CP that enable them for enhancing use and function of their afflicted limb.

PMID: 36628177

11. Extracellular vesicle characteristics and microRNA content in cerebral palsy and typically developed individuals at rest and in response to aerobic exercise
Ivan J Vechetti, Jessica Norrbom, Björn Alkner, Emma Hjalmarsson, Alexandra Palmcrantz, Eva Pontén, Jessica Pingel, Ferdinand von Walden, Rodrigo Fernandez-Gonzalo

Front Physiol. 2022 Dec 21;13:1072040. doi: 10.3389/fphys.2022.1072040. eCollection 2022.

In this study, the properties of circulating extracellular vesicles (EVs) were examined in cerebral palsy (CP) and typically developed (TD) individuals at rest and after aerobic exercise, focusing on the size, concentration, and microRNA cargo of EVs. Nine adult individuals with CP performed a single exercise bout consisting of 45 min of Frame Running, and TD participants completed either 45 min of cycling (n = 10; TD EX) or were enrolled as controls with no exercise (n = 10; TD CON). Blood was drawn before and 30 min after exercise and analyzed for EV concentration, size, and microRNA content. The size of EVs was similar in CP vs. TD, and exercise had no effect. Individuals with CP had an overall lower concentration (~25%, $p < 0.05$) of EVs. At baseline, let-7a, let-7b and let-7e were downregulated in individuals with CP compared to TD ($p < 0.05$), while miR-100 expression was higher, and miR-877 and miR-4433 lower in CP compared to TD after exercise ($p < 0.05$). Interestingly, miR-486 was upregulated ~2-fold in the EVs of CP vs. TD both at baseline and after exercise. We then performed an in silico analysis of miR-486 targets and identified the satellite cell stemness factor Pax7 as a target of miR-486. C2C12 myoblasts were cultured with a miR-486 mimetic and RNA-sequencing was performed. Gene enrichment analysis revealed that several genes involved in sarcomerogenesis and extracellular matrix (ECM) were downregulated. Our data suggest that circulating miR-486 transported by EVs is elevated in individuals with CP and that miR-486 alters the transcriptome of myoblasts affecting both ECM- and sarcomerogenesis-related genes, providing a link to the skeletal muscle alterations observed in individuals with CP.

PMID: 36620222

12. Caregiver Perceptions of an Interdisciplinary Intensive Therapy Program: A Qualitative Study
Jamie B Hall, Dana Chole, Taylor C Pruitt, Kylie Linkeman

Pediatr Phys Ther. 2023 Jan 11. doi: 10.1097/PEP.0000000000000994. Online ahead of print.

Purpose: To explore perceptions of caregivers of children with neurodevelopmental conditions participating in an interdisciplinary intensive therapy program. Methods: Semi-structured interviews were completed with caregivers. The intensive program consisted of occupational, physical, and/or speech therapy 3 to 6.5 hours/day, 3 to 5 days/week, for 4 weeks. Team-based collaborative goal setting was used to determine each child's plan of care. Reflexive thematic analysis identified interview themes. Results: Thirteen caregivers participated. Children ranged in age from 6 to 13 years; diagnoses included cerebral palsy (n = 10), spina bifida (n = 1), ataxia (n = 1), and stroke (n = 1). An overarching theme of Immersive was identified; other themes included Everybody's Empowered, Principles of Neuroplasticity, Progress Across the ICF (International Classification of Functioning, Disability, and Health) Framework, It Takes a Team, and Benefits Outweigh the Challenges. Conclusions: Caregivers valued interdisciplinary intensive therapy. For children with complex rehabilitation needs, an interdisciplinary, intensive therapy program may be a viable alternative to traditional therapy models for service delivery.

PMID: 36637445

13. Validity and reliability of the turkish version of the early activity scale for endurance in preschool children with cerebral palsy
Tuğba Dere, Selen Serel Arslan, İpek Alemdaroğlu-Gürbüz

Dev Neurorehabil. 2023 Jan 10;1-8. doi: 10.1080/17518423.2023.2166616. Online ahead of print.

This study presented the Turkish translation of the Early Activity Scale for Endurance (T-EASE) which was developed to evaluate the endurance for physical activity of preschool children with Cerebral Palsy (CP), and its validity and reliability. Fifty -five children with CP aged between 2 and 5 years were included in the study. The Gross Motor Function Classification Scale (GMFCS) and Pediatric Outcomes Data Collection Instrument (PODCI) were used to determine motor function levels and quality of life of the study population. The T-EASE had good test-retest reliability (ICC = 0.996), internal consistency (α = 0.903), higher construct validity approved by confirmatory factor analysis, and criterion validity supported by the weak-to-strong correlations between T-EASE and GMFCS, and PODCI. The T-EASE scores were significantly different between GMFCS levels ($p < .05$). The T-EASE was found to be valid and reliable to determine the endurance for physical activity of Turkish pre-school children with CP with the sensitivity to changes in motor function levels.

PMID: 36628489

14. Co-Design of an Intervention to Increase the Participation in Leisure Activities Including Adolescents with Cerebral Palsy with GMFCS Levels IV and V: A Study Protocol

Rocío Palomo-Carrión, Caline Cristine De Araújo Ferreira Jesus, Camila Araújo Santos Santana, Raquel Lindquist, Roselene Alencar, Helena Romay-Barrero, Elena Contell-Gonzalo, Karolinne Souza Monteiro, Elena Pinero-Pinto, Egmar Longo

J Clin Med. 2022 Dec 26;12(1):182. doi: 10.3390/jcm12010182.

The participation of adolescents with cerebral palsy (CP) within the community is reduced compared to their peers and is a barrier to their socialization, self-determination and quality of life. Patient and Public Involvement (PPI) is a key strategy for successful interventions, especially when involvement of the stakeholders takes place at all stages of the research. Co-design can be crucial for success as researchers, patients with CP and their families work together to bring the necessary elements to the interventions to be designed. The objectives will be: (1) To co-design an intervention aimed at improving the participation of adolescents with significant motor disabilities within the community in partnership with adolescents with CP, families and rehabilitation professionals. (2) To assess the feasibility of the co-design process in partnership with interested parties. The study will be based on Participatory Action Research (PAR) and will be held in Spain and Brazil. In both countries, the study will be carried out remotely with nine adolescents aged 12 to 17 years with CP, Gross Motor Function Classification System (GMFCS) levels IV-V, their families and six health professionals (physiotherapists and occupational therapists). Different dialogue groups will be created to involve adolescents, families and health professionals to the research's project. To manage their involvement in the co-design process, the Involvement Matrix (IM) will be used, and according to the IM phases, four steps will be included in the research: (1) Preparation; (2) Co-design; (3) Analysis: results of the intervention protocol and the study's feasibility and (4) Dissemination of results. Partnering with the public to design an intervention to improve participation can bring better results compared to protocols designed only by health professionals. In addition, it will allow for knowing the needs of adolescents with CP in terms of participation within the community. The study will also explore which roles were chosen by all participants and how they felt while actively participating in the process of co-designing an intervention protocol and their own perspectives on the use of the involvement matrix.

PMID: 36614983

15. Erratum: Instrumented strength assessment in typically developing children and children with a neural or neuromuscular disorder: A reliability, validity and responsiveness study

Frontiers Production Office

Published Erratum Front Physiol. 2022 Dec 23;13:1120014. doi: 10.3389/fphys.2022.1120014. eCollection 2022.

[This corrects the article DOI: 10.3389/fphys.2022.855222.].

PMID: 36620223

16. Motor Speech Interventions for Children With Cerebral Palsy: A Systematic Review
Johanna Korkalainen, Patricia McCabe, Andy Smidt, Catherine Morgan

J Speech Lang Hear Res. 2023 Jan 12;66(1):110-125. doi: 10.1044/2022_JSLHR-22-00375. Epub 2023 Jan 9.

Purpose: Dysarthria is common among children with cerebral palsy (CP) and results in poor speech intelligibility and subsequently low communicative participation. Neuroplasticity evidence suggests that adherence to principles of motor learning (PML) improves motor speech intervention outcomes. Motor speech interventions aim to improve speech intelligibility and ultimately facilitate participation, but the effectiveness of these interventions and their inclusion of PML are not clear. Aims are as follows: (a) evaluate the effectiveness motor speech interventions in improving speech intelligibility; (b) summarize the aims, outcome measures, and outcomes relating to the International Classification of Functioning and Disability Child and Youth; and (c) summarize the principles of motor learning used in the intervention. Method: Eight databases were searched, complemented by a hand search. Studies of any level of evidence were included if they used a motor speech intervention and measured speech in children with CP aged 0-18 years. Studies before 2000 or not in English were excluded. The review was conducted and reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Study quality was rated using the Single Case Experimental Design Scale and Physiotherapy Evidence Database-P rating scales. The strength of evidence was evaluated with Grading of Recommendations, Assessment, Development and Evaluation. Results: Of 1,036 initial articles, 21 were included. Eight interventions were identified including 131 participants aged 3-18 years. All studies aimed to improve speech intelligibility or articulation and reported improvement at sound, word, or sentence level. One study reported improvements in communicative participation. The strength of evidence ranged from very low to moderate for one intervention. Adherence to PML was inconsistent. Conclusions: The quality of evidence is very low to moderate. More research on motor speech interventions that adhere to PML is required. Supplemental material: https://doi-org.ezproxy.library.sydney.edu.au/10.23641/asha.21817959.

PMID: 36623233

17. Commentary on "Opportunities for Participation: A Mapping Review of Inclusive Physical Activity for Youth With Disabilities"
Dora Gosselin, Ashley Collier

Pediatr Phys Ther. 2023 Jan 1;35(1):84. doi: 10.1097/PEP.0000000000000981.

No abstract available

PMID: 36638034

18. Relationship Between Nutritional Status and Severity of Cerebral Palsy: A Multicentre Cross-Sectional Study
Yiting Zhao, Hongmei Tang, Tingting Peng, Jinling Li, Liru Liu, Chaoqiong Fu, Hongyu Zhou, Shiya Huang, Yuan Huang, Peishan Zeng, Wenda Wang, Lu He, Kaihsou Xu

Multicenter Study J Rehabil Med. 2023 Jan 12;55:jrm00367. doi: 10.2340/jrm.v55.4395.

Background: Nutritional problems are common in children with cerebral palsy (CP), yet the relationship between nutritional status and the severity of CP is unclear. Objective: To describe the nutritional status and characteristics of children with CP, and to explore the relationship between severity of CP and nutritional status in children. Methods: This multicentre cross-sectional study included children with CP in China. Weight and height were measured and converted to z-scores. Gross Motor Function Classification System (GMFCS), Eating and Drinking Ability Classification System (EDACS), Subjective Global Nutritional Assessment (SGNA), social life ability, and blood indicators were tested. Results: All 1,151 participants were given oral-feeding and 50.8% of them demonstrated undernutrition. Compared with those in GMFCS or EDACS levels I-III, the odds of moderate and severe undernutrition were 2.6 and 8.9 times higher in GMFCS levels IV and V, and 4.3 and 12.6 times higher in EDACS levels IV and V, respectively. Except for serum 25-hydroxyvitamin D, no significant differences were found in

blood indicators among normal, undernourished and overnourished groups. Conclusion: Degrees of undernutrition in children with CP are correlated with the severity of eating and drinking dysfunction and with gross motor impairment. Blood indicators may not reflect nutritional status in children with CP.

PMID: 36633287

19. Access to dental care for children with special health care needs: a cross-sectional community survey within Jeddah, Saudi Arabia
Shatha S Zahran, Ghalia Y Bhadila, Shahad A Alasiri, Abdulrahman A Alkhashrami, Sumer M Alaki

J Clin Pediatr Dent. 2023 Jan;47(1):50-57. doi: 10.22514/jocpd.2022.032. Epub 2023 Jan 3.

The aim of this study was to investigate the level of dental care access among children with special health care needs (CSHCN) in Jeddah, Saudi Arabia and the barriers hindering this access. Data of this cross-sectional study were obtained from self-administered surveys distributed through seven CSHCN centers. Children with autistic spectrum disorder (ASD), Down syndrome, cerebral palsy, and developmental delay were included. Univariate and bivariate analyses were conducted to describe the data. A total of 602 study participants were included in the analyses. Only 24.9% of the participated caregivers routinely visited the dentist for their CSHCN. Half of CSHCN caregivers found difficulties obtaining dental treatment. This trend was significantly greater in 12-18 years old children ($p = 0.013$) and in families commuting for more than one hour to dental clinics ($p = 0.045$). The most common reported barrier was fear of the dentist (61.6%) followed by child uncooperativeness (37.8%) and treatment costs (27.8%). CSHCN lack sufficient dental care for a variety of reasons, primarily fear of dentists, child uncooperativeness, and treatment costs. Dentists require more training and education to facilitate better access to dental care for CSHCN.

PMID: 36627220

20. Comparison of Gross Motor Outcomes Between Children With Cerebral Palsy From Appalachian and Non-Appalachian Counties
Rachel Bican, Garey Noritz, Jill Heathcock

Pediatr Phys Ther. 2023 Jan 1;35(1):66-73. doi: 10.1097/PEP.0000000000000971.

Purpose: This study evaluated gross motor outcomes between children with cerebral palsy from non-Appalachian and Appalachian counties in the United States. Methods: For this retrospective, matched-case controlled study, data were sourced from electronic medical record and compared between groups. Groups were matched by age and Gross Motor Function Classification System (GMFCS) level. Results: Children from Appalachian counties had significantly higher Gross Motor Function Measure, 66 (GMFM-66) scores and had a cerebral palsy diagnosis reported in the electronic medical record significantly later compared with children from non-Appalachian counties, controlling for age and GMFCS level. Conclusion: Although it has been documented that families and children from Appalachian counties have poorer overall health outcomes, motor development may not be affected. Our study found that children with cerebral palsy from Appalachian counties scored significantly higher on the GMFM-66 across GMFCS levels.

PMID: 36638031

21. "Comparison of Gross Motor Outcomes Between Children With Cerebral Palsy From Appalachian and Non-Appalachian Counties"
Lindsey Blevins, R Bertie Gatlin

Pediatr Phys Ther. 2023 Jan 1;35(1):74. doi: 10.1097/PEP.0000000000000987.

No abstract available

PMID: 36638032

22. Characteristics and Challenges of Epilepsy in Children with Cerebral Palsy-A Population-Based Study
Ana Dos Santos Rufino, Magnus Påhlman, Ingrid Olsson, Kate Himmelmann

J Clin Med. 2023 Jan 1;12(1):346. doi: 10.3390/jcm12010346.

The aim of this population-based study was to describe the prevalence and characteristics of epilepsy in children with cerebral palsy (CP), focusing on antiseizure medication (ASM) and seizure outcome. Findings were related to CP type, gross motor function and associated impairments. Data on all 140 children with CP born in 2003-2006 were taken from the CP register of Western Sweden. Medical records were reviewed at ages 9-12 and 13-16 years. In total 43% had a diagnosis of epilepsy. Epilepsy was more common in children with dyskinetic CP, who more often had a history of infantile spasms, continuous spike -and-wave during sleep and status epilepticus. Neonatal seizures, severe intellectual disability, severe motor disability and autism were associated with a higher risk of epilepsy. Many children were on polytherapy, and valproate was frequently used, even in girls. At age 13-16 years, 45% of the children with epilepsy were seizure free for at least one year. Onset after 2 years of age, female sex and white matter injury were associated with good seizure outcome. Despite the risk of relapse, reduction or discontinuation of ASM could be an option in selected cases. It is important to optimize ASM and to consider the possibility of epilepsy surgery.

PMID: 36615146

23. Daytime contacts and general practitioner consultations, and pain as a reason for encounter in children with cerebral palsy; a Norwegian national registry linkage study
Selma Mujezinović Larsen, Torunn Bjerve Eide, Cathrine Brunborg, Kjersti Ramstad

Scand J Prim Health Care. 2022 Dec;40(4):474-480. doi: 10.1080/02813432.2022.2144992. Epub 2022 Dec 1.

Aim: The aim of this study was to compare the prevalence of daytime contacts and consultations, and pain as a reason for encounter (RFE) with a general practitioner (GP), in children with cerebral palsy (CP) (cases) to that of the general paediatric population (controls). Methods: The study linked the Norwegian Directorate of Health's database for the control and reimbursement of health expenses, and the Norwegian Quality and Surveillance Registry for Cerebral Palsy, including children born from 1996 to 2012 in the period 2006 to 2018. All daytime contacts were included. International Classification for Primary Care was applied for RFE. Results: Cases accounted for 0.46% of all daytime contacts and 0.27% of all daytime consultations, the latter corresponding with the estimated national prevalence of CP. GPs registered more administrative contact and coded pain as an RFE less frequently in consultations with cases (6%) than with controls (12%). Interpretation: Children with CP did not consult GPs more than the general paediatric population did. In consultations, GPs should ask for pain even if the child with CP or parent does not address pain. The local multidisciplinary team should encourage the family to consider consulting a GP if the child is in pain. KEY MESSAGES: Prevalence of GP consultations in children with CP is similar to that of children in the general population. GPs perform more administrative work for children with CP than for their other paediatric patients. GPs code pain as an RFE less frequently in consultations with children with CP than in consultations with children in the general population.

PMID: 36633354

24. The Association of Placental Abruption and Pediatric Neurological Outcome: A Systematic Review and Meta-Analysis
Irina Oltean, Ajay Rajaram, Ken Tang, James MacPherson, Tadiwanashe Hondonga, Aanchal Rishi, Regan Toltesi, Rachel Gowans, Ashkan Jahangirnia, Youssef Nasr, Sarah L Lawrence, Dina El Dewellawy

Review J Clin Med. 2022 Dec 27;12(1):205. doi: 10.3390/jcm12010205.

Placental histopathology provides insights, or "snapshots", into relevant antenatal factors that could elevate the risk of perinatal brain injury. We present a systematic review and meta-analysis comparing frequencies of adverse neurological outcomes in infants born to women with placental abruption versus without abruption. Records were sourced from MEDLINE, Embase, and the CENTRAL Trials Registry from 1946 to December 2019. Studies followed the PRISMA guidelines and compared

frequencies of neurodevelopmental morbidities in infants born to pregnant women with placental abruption (exposure) versus women without placental abruption (comparator). The primary endpoint was cerebral palsy. Periventricular and intraventricular (both severe and any grades of IVH) and any histopathological neuronal damage were the secondary endpoints. Study methodologic quality was assessed by the Ottawa-Newcastle scale. Estimated odds ratios (OR) and hazards ratio (HR) were derived according to study design. Data were meta-analyzed using a random effects model expressed as pooled effect sizes and 95% confidence intervals. We included eight observational studies in the review, including 1245 infants born to women with placental abruption. Results of the random effects meta-analysis show that the odds of infants born to pregnant women with placental abruption who experience cerebral palsy is higher than in infants born to pregnant women without placental abruption (OR 5.71 95% CI (1.17, 27.91); I2 = 84.0%). There is no statistical difference in the odds of infants born to pregnant women with placental abruption who experience severe IVH (grade 3+) (OR 1.20 95% CI (0.46, 3.11); I2 = 35.8%) and any grade of IVH (OR 1.20 95% CI (0.62, 2.32); I2 = 32.3%) vs. women without placental abruption. There is no statistically significant difference in the odds of infants born to pregnant women with placental abruption who experience PVL vs. pregnant women without placental abruption (OR 6.51 95% CI (0.94, 45.16); I2 = 0.0%). Despite our meta-analysis suggesting increased odds of cerebral palsy in infants born to pregnant women with placental abruption versus without abruption, this finding should be interpreted cautiously, given high heterogeneity and overall poor quality of the included studies.

PMID: 36615006

25. A Randomized Comparative Effectiveness Study of Reflexology, Sucrose, and Other Treatments for Needle Procedures in Newborns
Mahmut Caner Us, Mine Güneş Saran, Burcu Cebeci, Erkan Akkuş, Esma Şeker, Şadiye Sezin Şimşek Aybar

Pediatr Neurol. 2022 Dec 5;140:47-54. doi: 10.1016/j.pediatrneurol.2022.11.019. Online ahead of print.

Background: Approximately 10 to 14 painful procedures per day are performed in infants during the hospital stay. We aimed to determine the effect of reflexology applied to the sole during painful procedures on pain perception in newborns compared with other nonpharmacologic methods. Methods: Our study was planned as a randomized controlled trial in term infants being followed up in the neonatal intensive care unit and maternity ward. To reduce pain during collection of venous blood or heel lance reflexology on the soles of the foot, 24% sucrose solution, kangaroo care, and classical music listening were applied to the infants. The Neonatal Infant Pain Scale (NIPS) was used to assess newborns during acute pain. Results: A total of 300 patients were enrolled in the study. Higher pain scores and crying times were observed during heel blood collection. All analgesic methods significantly reduced NIPS scores during heel blood collection. Sucrose was the most effective method, followed by reflexology. The best method that significantly shortened the crying time was again sucrose solution followed by reflexology, kangaroo care, and classical music, during heel blood collection. However, none of the nonpharmacologic methods was effective during venous blood collection. Conclusions: Although sucrose was the most effective method, reflexology has significant positive effects, especially on average heartbeat, reducing pain, and shortening crying times during heel blood sampling. Reflexology might be considered among the nonpharmacologic methods to be applied before routine interventions, but still, there is a need for further studies to investigate the efficiency.

PMID: 36608413

26. Assessment of general movements in preterm infants as a predictor of cerebral palsy
Néstor Rosendo, Agustina Vericat

Arch Argent Pediatr. 2023 Jan 12;e202202764. doi: 10.5546/aap.2022-02764.eng. Online ahead of print.

At present, the early identification of cerebral palsy still poses a major challenge for the health system worldwide. Great advances have been made in neonatology in reducing mortality, but not morbimortality. Cerebral palsy remains the most common sequela of all developmental disorders, especially among those born prematurely. The possibility of early detection before 5 months of age has many benefits for the child and their family, since it allows very early initiation of treatment. In this study, we describe a highly sensitive and specific tool known as Prechtl's assessment of general movements and its potential complementation with technological apps for early detection.

PMID: 36625684

27. Stories of restitution: Family experiences of diagnosis and help-seeking for a child with cerebral palsy
Emmanuel Asante, Joanne S Lymn, Claire Diver

J Pediatr Nurs. 2023 Jan 10;S0882-5963(22)00325-6. doi: 10.1016/j.pedn.2022.12.010. Online ahead of print.

Background: The experience of living with children with CP is dominated by the voice of the mother while others are rarely reported. Incorporation of the voices of other family members is important for a holistic understanding. Methods: Drawing on the philosophical perspectives of pragmatism, generic qualitative methodology, and Frank's narratives, this article highlights how restitution was constructed by 30 family members. Findings: They constructed restitution by hoping for a cure through either biomedical and/or alternative models of treatment, followed by intransitive and transcendent restitution. Discussion: This appears to be the first time that restitution has been extended to families living with children with chronic illnesses. Application to practice: This would mean that paediatric nursing professionals and other health professionals dealing with family members living with children with CP could attend to their stories in an open and focused manner to honour and validate their stories as well as their experiences.

PMID: 36635113

28. Parental Coping, Representations, and Interactions with Their Infants at High Risk of Cerebral Palsy
Silja Berg Kårstad, Åse Bjørseth, Johanna Lindstedt, Anne Synnøve Brenne, Helene Steihaug, Ann-Kristin Gunnes Elvrum

J Clin Med. 2022 Dec 29;12(1):277. doi: 10.3390/jcm12010277.

The aim of this study is to describe parental coping, representations, and interactions during the time of inclusion in the Small Step early intervention program for infants at high risk of cerebral palsy (CP) in Norway (ClinicalTrials.gov: NCT03264339). Altogether, 11 infants (mean age 4.8 months, SD: 1.5) and their parents (mothers: n = 10, fathers: n = 9) were included. Parental coping was assessed using the Parenting Stress Index-Short Form (PSI-SF) and the Hospital Anxiety and Depression Scale (HADS). Parental representations and parent-infant interactions were assessed using the Working Model of the Child Interview (WMCI) and the Parent-Child Early Relational Assessment (PCERA). Parents' PSI-SF and HADS scores were within normal range; however, 26.7% showed symptoms of stress, 52.6% showed symptoms of anxiety, and 31.6% showed symptoms of depression above the cut-off. WMCI results indicate that 73.7% of the parents had balanced representations. For PCERA, the subscale Dyadic Mutuality and Reciprocity was of concern, while two other subscales were in areas of strength and three subscales in some concern areas. There were no differences between mothers and fathers. Most of the parents had balanced representations, some had mental or stress symptoms and many were struggling with aspects of the parent-infant interaction. This knowledge could be useful when developing more family-centered interventions.

PMID: 36615077

29. Developmental Functioning of Infants and Toddlers with Neurodevelopmental Disorders
Megan Callahan, Johnny L Matson, Celeste Tevis

Dev Neurorehabil. 2023 Jan 10;1-12. doi: 10.1080/17518423.2023.2166615. Online ahead of print.

Purpose: The current study aimed to investigate developmental functioning in infants and toddlers with autism spectrum disorder (ASD), seizures, cerebral palsy (CP), and atypical development. Methods: An ANOVA was utilized to investigate the differences between neurodevelopmental group on BDI-2 developmental quotient and a MANOVA was used to investigate the differences between the groups and five developmental domains. Results: The results indicated statistically significant differences in overall developmental functioning and each subdomain of the BDI-2. Discussion: These findings provide the basis for further research to investigate comorbidities of the three neurodevelopmental disorders and parse out the impact of intellectual disability (ID).

PMID: 36628488

30. Deep brain stimulation effect in genetic dyskinetic cerebral palsy: The case of ADCY5- related disease
Laura Cif, Diane Demailly, Claire Gehin, Emilie Chan Seng, Morgan Dornadic, Sophie Huby, Gaetan Poulen, Agathe Roubertie, Matthieu Villessot, Thomas Roujeau, Philippe Coubes

Mol Genet Metab. 2022 Dec 30;138(1):106970. doi: 10.1016/j.ymgme.2022.106970. Online ahead of print.

Background: Cerebral Palsy (CP) represents a frequent cause of disability in childhood. Early in life, genetic disorders may present with motor dysfunction and diagnosed as CP. Establishing the primary, genetic etiology allows more accurate prognosis, genetic counselling, and planning for symptomatic interventions in homogeneous etiological groups. Deep brain stimulation (DBS) is recommended in refractory movement disorders, including isolated pediatric dystonias. For dystonia evolving in more complex associations in genetic CP, the effect of DBS is still understudied and currently only sporadically described. Objectives: To report the effect of DBS applied to the globus pallidus pars interna (GPi) in children with complex movement disorders caused by pathogenic ADCY5 variants, diagnosed as dyskinetic CP previous to genetic diagnostic. Methods: We conducted a retrospective study on evolution of treatment with DBS in ADCY5-related disease. A standardized proforma including the different type of movement disorders and associated neurological signs was completed at each follow-up time, based on video recordings, as well as functional assessments used in children with CP. Results: Four children (mean of age, 13 ± 2.9 years) received GPi-DBS. The same de novo pathogenic missense variant (c.1252C > T, p.R418W) was identified in three out of four and a splice site variant (c.2088 + 2G > T) in one subject. Developmental delay and overlapping features including axial hypotonia, chorea, dystonic attacks, myoclonus, and cranial dyskinesia were present. The median age at DBS was 9 years and follow-up with DBS, 2.6 years. We identified a pattern of clinical response with early suppression of dystonic attacks, followed by improvement of myoclonus and facial dyskinesia. Effect on chorea was delayed and more limited. Two patients gained notable functional benefit related to sitting, standing, gait, use of upper limbs and speech. Conclusion: ADCY5-related disease may benefit from GPi-DBS. The most significant clinical response relates to the early and sustained benefit on dystonic attacks and a variable but still positive response on the other hyperkinetic features. Genetic etiology of CP will contribute to further elucidate genotype-phenotype correlations and to refine DBS indication as network-related symptomatic interventions.

PMID: 36610259

Prevention and Cure

31. National PReCePT Programme: a before-and-after evaluation of the implementation of a national quality improvement programme to increase the uptake of magnesium sulfate in preterm deliveries
Hannah B Edwards, Maria Theresa Redaniel, Carlos Sillero-Rejon, Ruta Margelyte, Tim J Peters, Kate Tilling, William Hollingworth, Hugh McLeod, Pippa Craggs, Elizabeth Hill, Sabi Redwood, Jenny Donovan, Emma Treloar, Ellie Wetz, Natasha Swinscoe, Gary A Ford, John Macleod, Karen Luyt

Arch Dis Child Fetal Neonatal Ed. 2023 Jan 8;fetalneonatal-2022-324579. doi: 10.1136/archdischild-2022-324579. Online ahead of print.

Objective: To evaluate the effectiveness and cost-effectiveness of the National PReCePT Programme (NPP) in increasing use of magnesium sulfate (MgSO4) in preterm births. Design: Before-and-after study. Setting: Maternity units (N=137) within NHS England and the Academic Health Science Network (AHSN) in 2018. Participants: Babies born ≤30 weeks' gestation admitted to neonatal units in England. Interventions: The NPP was a quality improvement (QI) intervention including the PReCePT (Preventing Cerebral Palsy in Pre Term labour) QI toolkit and materials (preterm labour proforma, staff training presentations, parent leaflet, posters for the unit and learning log), regional AHSN-level support, and up to 90 hours funded backfill for a midwife 'champion' to lead implementation. Main outcome measures: MgSO4 uptake post implementation was compared with pre-NPP implementation uptake. Implementation and lifetime costs were estimated. Results: Compared with pre-implementation estimates, the average MgSO4 uptake for babies born ≤30 weeks' gestation, in 137 maternity units in England, increased by 6.3 percentage points (95% CI 2.6 to 10.0 percentage points) to 83.1% post implementation, accounting for unit size, maternal, baby and maternity unit factors, time trends, and AHSN. Further adjustment for early/late initiation of NPP activities increased the estimate to 9.5 percentage points (95% CI 4.3 to 14.7 percentage points). From a societal and lifetime perspective, the health gains and cost savings associated with the NPP effectiveness generated a net monetary benefit of £866 per preterm baby and the probability of the NPP being cost-effective was greater than 95%. Conclusion: This national QI programme was effective and cost-effective. National programmes delivered via coordinated regional clinical networks can accelerate uptake of evidence-based therapies in perinatal care.

PMID: 36617442