Cerebral palsy research news

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Interventions and Management

1. Comprehensive whole-genome sequence analyses provide insights into the genomic architecture of cerebral palsy

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Nat Genet. 2024 Mar 29. doi: 10.1038/s41588-024-01686-x. Online ahead of print.

We performed whole-genome sequencing (WGS) in 327 children with cerebral palsy (CP) and their biological parents. We classified 37 of 327 (11.3%) children as having pathogenic/likely pathogenic (P/LP) variants and 58 of 327 (17.7%) as having variants of uncertain significance. Multiple classes of P/LP variants included single-nucleotide variants (SNVs)/indels (6.7%), copy number variations (3.4%) and mitochondrial mutations (1.5%). The COL4A1 gene had the most P/LP SNVs. We also analyzed two pediatric control cohorts (n = 203 trios and n = 89 sib-pair families) to provide a baseline for de novo mutation rates and genetic burden analyses, the latter of which demonstrated associations between de novo deleterious variants and genes related to the nervous system. An enrichment analysis revealed previously undescribed plausible candidate CP genes (SMOC1, KDM5B, BCL11A and CYP51A1). A multifactorial CP risk profile and substantial presence of P/LP variants combine to support WGS in the diagnostic work-up across all CP and related phenotypes.

PMID: 38553553

2. Quiet standing and anteroposterior limits of stability in adolescents and young adults with bilateral spastic cerebral palsy

Hidehito Tomita, Daisuke Kawaguchi, Shuhei Takahashi, Hitoshi Asai

Hum Mov Sci. 2024 Mar 27:95:103215. doi: 10.1016/j.humov.2024.103215. Online ahead of print.

Stance stability in individuals with bilateral spastic cerebral palsy (BSCP) in various standing postures including the quiet standing (QS) and limits of stability (LoS) has been widely studied. However, the relationships between the QS and LoS remain unclear. This study aimed to determine the relationships between the positions and postural sway in the QS and anteroposterior LoS in individuals with BSCP. It included 27 adolescents and young adults with BSCP (BSCP group) and 27 adolescents and young adults without disability (control group). The position of center of pressure in the anteroposterior direction (CoPy position) and the path length of center of pressure (CoP path length) during the QS and the anterior and posterior LoS (A-LoS and P-LoS, respectively) were measured using a force platform. The CoPy positions in the A-LoS and P

-LoS in the BSCP group were limited compared with those in the control group. In the BSCP group, the more anterior the CoPy position in the QS, the more anterior (i.e., limited) it was in the P-LoS. Although the CoP path length in the QS was larger in the BSCP group, those in the A-LoS and P-LoS were larger in the control group. The BSCP group also showed that the more anterior the CoPy position or the longer the CoP path length in the QS, the more decreased the anteroposterior LoS range was. Therefore, assessing various standing postures, including QS and anteroposterior LoS, is important to manage balance impairments in individuals with BSCP.

PMID: 38552561

3. Management and treatment of musculoskeletal problems in adults with cerebral palsy: Experience gained from two lifespan clinics

Mark Katsma, Haiqing Liu, Xiaoyu Pan, Kyle J Ryan, David P Roye, Henry G Chambers

J Pediatr Rehabil Med. 2024;17(1):19-33. doi: 10.3233/PRM-240018.

No abstract available

PMID: 38552124

4. The critical need to accelerate cerebral palsy research with consumer engagement, global networks, and adaptive designs

Sruthi P Thomas, Iona Novak, Anina Ritterband-Rosenbaum, Karin Lind, Annabel Webb, Paul Gross, Maria McNamara; CP Global Clinical Trials Network

J Pediatr Rehabil Med. 2024;17(1):9-17. doi: 10.3233/PRM-240014.

The prevalence of cerebral palsy (CP) varies globally, with higher rates and burden of disease in low- and middle-income countries. CP is a lifelong condition with no cure, presenting diverse challenges such as motor impairment, epilepsy, and mental health disorders. Research progress has been made but more is needed, especially given consumer demands for faster advancements and improvements in the scientific evidence base for interventions. This paper explores three strategies to accelerate CP research: consumer engagement, global clinical trial networks, and adaptive designs. Consumer engagement involving individuals with lived experience enhances research outcomes. Global clinical trial networks provide efficiency through larger and more diverse participant pools. Adaptive designs, unlike traditional randomized controlled trials, allow real-time modifications based on interim analyses, potentially answering complex questions more efficiently. The establishment of a CP Global Clinical Trials Network, integrating consumer engagement, global collaboration, and adaptive designs, marks a paradigm shift. The Network aims to address consumer-set research priorities. While challenges like ethical considerations and capacity building exist, the potential benefits for consumers, clinicians, researchers, and funding bodies are substantial. This paper underscores the urgency of transforming CP research methodologies for quicker translation of novel treatments into clinical practice to improve quality of life for those with CP.

PMID: 38552123

5. Pure grit: Ordinary and extraordinary

Matthew MacCarthy

J Pediatr Rehabil Med. 2024;17(1):139-141. doi: 10.3233/PRM-240012.

No abstract available

PMID: 38552122

6. Development of A New Scoring System in Higher Animals for Testing Cognitive Function in the Newborn Period: Effect of Prenatal Hypoxia-Ischemia

Zhongjie Shi, Nadiya Sharif, Kehuan Luo, Sidhartha Tan

Dev Neurosci. 2024 Mar 28. doi: 10.1159/000538607. Online ahead of print.

Introduction Enhanced models for assessing cognitive function in the neonatal period are imperative in higher animals. Postnatal motor deficits, characteristic of cerebral palsy, emerge in newborn kits within our prenatal-rabbit model of hypoxia-ischemia (HI). In humans, prenatal HI leads to intellectual disability and cerebral palsy. In a study examining cognitive

function in newborn rabbits, we explored several questions. Is there a distinction between conditioned and unconditioned kits? Can the kits discern the human face or the lab coat? Do motorically-normal kits, born after prenatal HI, exhibit cognitive deficits? Methods The conditioning protocol was randomly assigned to kits from each litter. For conditioning, the same human, wearing a lab coat, fed the rabbit kits for 9 days before the cognitive test. The 6-arm radial maze was chosen for its simplicity and ease of use. Normally appearing kits, born after uterine ischemia at 79% or 92% term in New Zealand White rabbits, were compared to Naïve kits. On postpartum day 22/23 or 29/30, the 6-arm maze helped determine if the kits recognized the original feeder from bystander (Test-1) or the lab coat on bystander (Test-2). The use of masks of feeder/bystander (Test-3) assessed confounding cues. A weighted score was devised to address variability in entry to maze arms, time, and repeated-trial learning. Results In conditioned kits, both Naïve and HI kits exhibited a significant preference for the face of the feeder, but not the lab coat. Cognitive deficits were minimal in normal-appearing HI kits. Conclusion The weighted score system was amenable to statistical manipulation.

PMID: 38547848

7. Test-retest reliability of corticokinematic coherence in young children with cerebral palsy: An observational longitudinal study

Josselin Démas, Mathieu Bourguignon, Rodolphe Bailly, Sandra Bouvier, Sylvain Brochard, Mickael Dinomais, Patrick Van Bogaert

Neurophysiol Clin. 2024 Mar 27;54(4):102965. doi: 10.1016/j.neucli.2024.102965. Online ahead of print.

Objectives: To assess the test-retest reliability of the corticokinematic coherence (CKC), an electrophysiological marker of proprioception, in children with cerebral palsy (CP). Methods: Electroencephalography (EEG) signals from 15 children with unilateral or bilateral CP aged 23 to 53 months were recorded in two sessions 3 months apart using 128-channel EEG caps. During each session, children's fingers were moved at 2 Hz by an experimenter, in separate recordings for the more-affected (MA) and less-affected (LA) hands. The CKC was computed at the electrode and source levels, at movement frequency F0 (2 Hz) and its first harmonic F1 (4 Hz). A two-way mixed-effects model intraclass-correlation coefficient (ICC) was computed for the maximum CKC strength across electrodes at F0 and F1 obtained during the two sessions. Results: ICC of the CKC strength acquired from LA and MA hands pooled together were respectively 0.51 (95% CI: 0.30-0.68) at F0 and 0.96 (95% CI: 0.93-0.98) at F1. The mean distances separating the CKC peaks in the source space at the two evaluation times were in the order of a centimeter. Conclusion: CKC is a robust electrophysiologic marker to study the longitudinal changes in cortical processing of proprioceptive afferences in young children with CP.

PMID: 38547685

8. Evaluation of the Usability of a Serious Game in Virtual Reality with a Focus on the Perception and Experience of Health Professionals for Motor Rehabilitation in Children with Cerebral Palsy

Fabiana Rita Camara Machado, Guilherme Dos Santos Novak, Sérgio Kakuta Kato, Alcyr Alves de Oliveira

Games Health J. 2024 Mar 28. doi: 10.1089/g4h.2023.0030. Online ahead of print.

Introduction: Cerebral palsy (CP) is a nonprogressive neuropathological condition that requires lifelong neurocognitive-motor rehabilitation. Evidences indicate that the use of new technologies to assist in rehabilitation processes, such as serious games in virtual reality (VR), have served as adjuncts to therapy and capable of promoting engagement, motivation, and motor activation for these patients. Objective: To investigate the usability of a serious game in VR to help with the stability and balance of the head and trunk of children with CP, focusing on the perception and experience of health professionals. Methods: The collection was carried out with health professionals, and the results were comprehensively evaluated through viability by means of the total score, number of correct answers, number of errors, and level of difficulty during the execution of the game, which were collected from the performance report generated by the application. System satisfaction was also verified by the System Usability Scale (SUS). Results: The mean obtained from the total score of the SUS was 82.10 ± 12.66 points, being considered of high usability for the suggested purpose. The professionals' opinion about the usability of the system did not change due to the performance during the game. Conclusion: The study demonstrated that the developed rehabilitation program has successfully delivered the experience to exercise the head control and trunk balance of subjects with CP.

PMID: 38546746

9. Mortality and Causes of Death in Children With Cerebral Palsy With Scoliosis Treated With and Without Surgery

No authors listed

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No abstract available
Erratum for
Mortality and Causes of Death in Children With Cerebral Palsy With Scoliosis Treated With and Without Surgery.
Ahonen M, Helenius I, Gissler M, Jeglinsky-Kankainen I.
Neurology. 2023 Oct 31;101(18):e1787-e1792. doi: 10.1212/WNL.0000000000207796. Epub 2023 Sep 7.
PMID: 37679048

PMID: 38546221

10. Increased Upper Extremity Muscle Mass in Ambulatory Children with Cerebral Palsy

Taeyoung Song, Jaewon Kim, Dae-Hyun Jang

Life (Basel). 2024 Feb 26;14(3):303. doi: 10.3390/life14030303.

Aim: To compare muscle mass in the upper and lower extremities between ambulatory children with cerebral palsy (CP) and typically developing (TD) children. Materials and methods: A total of 21 children aged 2 to 12 years with CP and a Gross Motor Function Classification System (GMFCS) level of I, II, or III were matched with 21 TD children for age, sex, and body mass index. The lean body mass (LBM) of each extremity was calculated from whole-body dual-energy X-ray absorptiometry. Results: The LBM of the upper extremities was greater in children with CP compared to TD children, and the difference was significant in the GMFCS level II group (1340.6 g vs. 1004.2 g, $p = 0.027$). There was no significant difference in the LBM of the lower extremities between the CP and TD groups ($p = 0.190$). The ratio of lower extremity LBM to total extremity LBM was lower in children with CP, while the ratio of upper extremity LBM to total extremity LBM was higher in children with CP (73.2% vs. 78.5% [$p < 0.001$] and 26.7% vs. 21.5% [$p < 0.001$], respectively). Conclusions: Ambulatory children with CP, especially in the GMFCS level II group, exhibit greater muscle mass in the upper extremities compared to TD children.

PMID: 38541629

11. Sports Activities in Children with Cerebral Palsy: A Narrative Review

Domenico M Romeo, Giulia D'Amario, Giulia Brunozzi, Valentina Napoli, Marianna Villa, Chiara Arpaia, Chiara Velli, Francesca Sini, Claudia Brogna

Review Medicina (Kaunas). 2024 Mar 9;60(3):457. doi: 10.3390/medicina60030457.

Physical exercise is known to have beneficial effects on psychosocial well-being and cognitive performance. Children with cerebral palsy (CP) showed lower levels of physical activity (PA) than healthy children; this fact, in addition to the basic clinical condition, increased the sedentary habit with a psychological impact and motor impairment of these children. Furthermore, children and adolescents with CP are less committed to sports activities than typically developing children of the same age. The aim of the present narrative review was to increase the amount of knowledge regarding the effectiveness and importance of specific and individualized sports in children with CP. A comprehensive search of MED-LINE and EMBASE databases was performed, including specific search terms such as "cerebral palsy" combined with "sport", "physical activity", and the names of different sports. No publication date limits were set. We included studies with an age range of 0-18 years. The main results pointed out that most of the sports improved motor function, quality of life, and coordination in children and adolescents with CP. Physicians, therapists, and parents should become aware of the benefits of sports activities for this population of patients. Specific sports activities could be included as a usual indication in clinical practice in addition to rehabilitation treatment.

PMID: 38541183

12. Is Craniosacral Therapy Effective? A Systematic Review and Meta-Analysis

Luis Ceballos-Laita, Edzard Ernst, Andoni Carrasco-Uribarren, Sara Cabanillas-Barea, Jaime Esteban-Pérez, Sandra Jiménez-Del-Barrio

Review Healthcare (Basel). 2024 Mar 18;12(6):679. doi: 10.3390/healthcare12060679.

Objectives: The aim of this study was to evaluate the clinical effectiveness of craniosacral therapy (CST) in the management of any conditions. Methods: Two independent reviewers searched the PubMed, Physiotherapy Evidence Database, Cochrane Library, Web of Science, and Osteopathic Medicine Digital Library databases in August 2023, and extracted data from randomized controlled trials (RCT) evaluating the clinical effectiveness of CST. The PEDro scale and Cochrane Risk of Bias 2 tool were used to assess the potential risk of bias in the included studies. The certainty of the evidence of each outcome variable was determined using GRADEpro. Quantitative synthesis was carried out with RevMan 5.4 software using random effect models. Data synthesis: Fifteen RCTs were included in the qualitative and seven in the quantitative synthesis. For

musculoskeletal disorders, the qualitative and quantitative synthesis suggested that CST produces no statistically significant or clinically relevant changes in pain and/or disability/impact in patients with headache disorders, neck pain, low back pain, pelvic girdle pain, or fibromyalgia. For non-musculoskeletal disorders, the qualitative and quantitative synthesis showed that CST was not effective for managing infant colic, preterm infants, cerebral palsy, or visual function deficits. Conclusions: The qualitative and quantitative synthesis of the evidence suggest that CST produces no benefits in any of the musculoskeletal or non-musculoskeletal conditions assessed. Two RCTs suggested statistically significant benefits of CST in children. However, both studies are seriously flawed, and their findings are thus likely to be false positive.

PMID: 38540643

13. Timely Surgical Intervention Leads to Better Sustained Coverage after Reconstructive Hip Surgery in Patients with Cerebral Palsy

Renée Anne van Stralen, Dagmar Raymond Jacques Kempink, Alexandra Frederika Titulaer, Denise Eygendaal, Max Reijman, Jaap Johannes Tolk

Children (Basel). 2024 Feb 21;11(3):272. doi: 10.3390/children11030272.

Background: In up to 45-90% of non-ambulatory patients with cerebral palsy (CP), progressive hip migration can be observed. The goal of this study was to determine whether the implementation of a national hip surveillance guideline affected the outcome of hip reconstructions. Methods: We reviewed 48 primary hip reconstructions at a median follow-up of 4.4 years. Surgical outcome was evaluated based on complication rates and radiographic evaluation postoperatively and at follow-up. Radiographic measurements included the migration percentage (MP), head-shaft angle and acetabular index. The impact of preoperative MP, postoperative MP, tone management, Gross Motor Function Classification System (GMFCS) classification and age on MP at follow-up were examined using a mixed model analysis. Results: A decrease in preoperative MP was noted, from a median of 75.0% (2014) to 39.0% (2020). Lower preoperative MP showed a significant correlation to lower MP postoperatively ($p = 0.012$). Postoperative MP was a significant independent predictor of a lower MP at follow-up ($p = 0.002$). Conclusions: This study shows an improvement in the timing of hip reconstruction in patients with CP after implementation of the hip surveillance guideline. A reduction in preoperative MP resulted in improved postoperative outcomes. A lower postoperative MP was the most important predictor for sustained containment of the hip.

PMID: 38539307

14. Subventricular zone stem cell niche injury is associated with intestinal perforation in preterm infants and predicts future motor impairment

Adrian A Epstein, Sara N Janos, Luca Menozzi, Kelly Pegram, Vaibhav Jain, Logan C Bisset, Joseph T Davis, Samantha Morrison, Aswathy Shailaja, Yingqiu Guo, Agnes S Chao, Khadar Abdi, Blaire Rikard, Junjie Yao, Simon G Gregory, Kimberley Fisher, Rick Pittman, Al Erkanli, Kathryn E Gustafson, Caroline W T Carrico, William F Malcolm, Terrie E Inder, C Michael Cotten, Trevor D Burt, Mari L Shinohara, Charles M Maxfield, Eric J Benner

Cell Stem Cell. 2024 Mar 22:S1934-5909(24)00082-1. doi: 10.1016/j.stem.2024.03.001. Online ahead of print.

Brain injury is highly associated with preterm birth. Complications of prematurity, including spontaneous or necrotizing enterocolitis (NEC)-associated intestinal perforations, are linked to lifelong neurologic impairment, yet the mechanisms are poorly understood. Early diagnosis of preterm brain injuries remains a significant challenge. Here, we identified subventricular zone echogenicity (SVE) on cranial ultrasound in preterm infants following intestinal perforations. The development of SVE was significantly associated with motor impairment at 2 years. SVE was replicated in a neonatal mouse model of intestinal perforation. Examination of the murine echogenic subventricular zone (SVZ) revealed NLRP3-inflammasome assembly in multiciliated FoxJ1+ ependymal cells and a loss of the ependymal border in this postnatal stem cell niche. These data suggest a mechanism of preterm brain injury localized to the SVZ that has not been adequately considered. Ultrasound detection of SVE may serve as an early biomarker for neurodevelopmental impairment after inflammatory disease in preterm infants.

PMID: 38537631

15. Applying the IEEE BRAIN neuroethics framework to intra-cortical brain-computer interfaces

Joana Soldado-Magraner, Alberto Antonietti, Jennifer French, Nathan Higgins, Michael J Young, Denis Larrivee, Rebecca Monteleone

J Neural Eng. 2024 Mar 27. doi: 10.1088/1741-2552/ad3852. Online ahead of print.

Brain-computer interfaces (BCIs) are neuroprosthetic devices that allow for direct interaction between brains and machines. These types of neurotechnologies have recently experienced a strong drive in research and development, given, in part, that

they promise to restore motor and communication abilities in individuals experiencing severe paralysis. While a rich literature analyzes the ethical, legal, and sociocultural implications (ELSCI) of these novel neurotechnologies, engineers, clinicians and BCI practitioners often do not have enough exposure to these topics. Here, we present the IEEE Neuroethics Framework, an international, multiyear, iterative initiative aimed at developing a robust, accessible set of considerations for diverse stakeholders. Using the framework, we provide practical examples of ELSCI considerations for BCI neurotechnologies. We focus on invasive technologies, and in particular, devices that are implanted intra-cortically for medical research applications. We demonstrate the utility of our framework in exposing a wide range of implications across different intra-cortical BCI technology modalities and conclude with recommendations on how to utilize this knowledge in the development and application of ethical guidelines for BCI neurotechnologies.

PMID: 38537269

16. Translation and measurement properties of the Portuguese-Brazil version of the Hammersmith Infant Neurological Examination (HINE-Br) [Abstract in English, Portuguese]

Michelle Alexandrina Dos Santos Furtado, Hércules Ribeiro Leite, Matheus Rocha Pereira Klettenberg, Victor Alves Rodrigues, Lisiane Seguti Ferreira, Melina Rodero Marques, Isadora de Oliveira Cavalcante, Tamires Saboia Santos, Tathiana Ghisi de Souza, Ayrles Silva Gonçalves Barbosa Mendonça, Ana Cristina Resende Camargos, Kênnea Martins Almeida Ayupe

Rev Paul Pediatr. 2024 Mar 25:42:e2023105. doi: 10.1590/1984-0462/2024/42/2023105. eCollection 2024.

Objective: The current study aimed to translate the Hammersmith Infant Neurological Examination (HINE) into Brazilian Portuguese and analyze the reliability of the translated version for a population of Brazilian infants. Methods: This was a methodological study, approved by the Ethics Committee, carried out between June 2020 and May 2021. HINE is a standardized clinical neurological examination used for the early detection of cerebral palsy. The quantitative section, "neurological examination", contains 26 items scored from 0 to 3 points, divided into five categories: cranial nerve function, posture, movements, muscle tone and reflexes, and reactions. The HINE translation followed four steps: translation, synthesis, back-translation, and evaluation by an expert committee. To verify the reliability of the HINE-Br (Portuguese-Brazil version) two independent examiners evaluated 43 infants, between 3 and 22 months of age. Internal consistency was verified by Cronbach's Alpha coefficient and interrater reliability by the intraclass correlation coefficient (ICC). Results: The translated version was similar to the original version and a few semantic and idiomatic adjustments were necessary. Appropriate internal consistency (Alpha=0.91) was found for the 26 items of the HINE-Br, as well as strong interrater reliability for the total score (ICC2.1=0.95), and also for the five categories (ICC2.1=0.83-0.95). Conclusions: The HINE-Br presents adequate rates of internal consistency and interrater reliability, and can be used for the evaluation of children at risk for cerebral palsy, between 3 and 24 months of age, by pediatricians and pediatric physical therapists.

PMID: 38537034

17. The state of the art in therapeutic administration of botulinum toxin in children with cerebral palsy: an integrative review [Abstract in English, Portuguese]

Sandro Rachevsky Dorf, Adriana Rodrigues Fonseca, Flávio Roberto Sztajnbok, Thiffany Rodrigues Delfino de Oliveira, Linamara Rizzo Basttistella

Review Rev Paul Pediatr. 2024 Mar 25:42:e2023093. doi: 10.1590/1984-0462/2024/42/2023093. eCollection 2024.

Objective: To describe the current state of the art in the therapeutic administration of botulinum toxin with indications, efficacy, and safety profile for children and adolescents with cerebral palsy. Data source: An integrative review was conducted. The MEDLINE/PubMed database was searched twice within the last decade using distinct terms, and only studies written in the English language were included. The study population was limited to those aged 0-18 years. Articles that were duplicates or lacked sufficient methodology information were excluded. Data synthesis: We found 256 articles, of which 105 were included. Among the included studies, most were conducted in developed countries. Botulinum toxin demonstrated good safety and efficacy in reducing spasticity, particularly when administered by a multidisciplinary rehabilitation team. It is primarily utilized to improve gait and upper limb function, facilitate hygiene care, reduce pain, prevent musculoskeletal deformities, and even decrease sialorrhea in patients without a functional prognosis for walking. Conclusions: The administration of botulinum toxin is safe and efficacious, especially when combined with a multi-professional rehabilitation team approach, which increases the probability of functional improvement. It can also be beneficial for patients with significant functional impairments to help with daily care tasks, such as hygiene, dressing, and reducing sialorrhea. Pediatricians must be familiar with this treatment and its indications to attend to and refer patients promptly when necessary, and to exploit their neuroplasticity. Further research on this topic is required in developing countries.

PMID: 38537033

18. Prevalence of Sensory Processing Deficits in Children with Spastic Cerebral Palsy - An Indian Caregiver's Perspective

Sapna Dhiman, Ramesh K Goyal, Aakash Mahesan, Puneeta Ajmera, G Shankar Ganesh, Sheffali Gulati

Indian J Pediatr. 2024 Mar 27. doi: 10.1007/s12098-024-05111-3. Online ahead of print.

This study aims to analyze the prevalence and patterns of sensory processing deficits (SPD) in Indian children with spastic cerebral palsy (CP) using child sensory profile-2 (CSP-2) caregiver questionnaire. The authors surveyed 230 caregivers of children aged 3 to 14 y with spastic CP, using CSP-2. The difference in prevalence and distribution of SPDs among the CP subtypes and Gross Motor Function Classification System (GMFCS) levels was done. Overall prevalence of "Definite" (>2 SD) SPDs was 83%. Forty-seven percent had definite SPDs in more than one sensory subsection. Prevalence of definite SPDs was similar among the spastic CP subtypes. "Conduct" domain had more affection among hemiplegics and quadriplegics. "Avoiding" pattern was observed more in quadriplegics and "Seeking" pattern was observed less in diplegics. Severe GMFCS levels had more definite sensory processing deficits. SPDs are highly prevalent in children with spastic CP with unique patterns of affection among the spastic CP subtypes.

PMID: 38536651

19. The impact of low-energy, partially hydrolysed enteral formula on gastrointestinal symptoms and weight in children with neurological impairment: a multicentre retrospective study

Graeme O'Connor, Martha Van Der Linde, Zoltan Hartfiel Capriles

J Hum Nutr Diet. 2024 Mar 27. doi: 10.1111/jhn.13305. Online ahead of print.

Background: Neurological impairment (NI) relates to disorders of the central nervous system. The specific aetiology of NI varies but includes genetic, congenital abnormalities or brain injury. In children with severe NI, feeding impairments can lead to undernutrition, and some children require a feeding tube. Although tube feeding improves overall nutritional status, it has also been associated with excess body fat. Commercially available enteral formulas that are low in energy, hydrolysed and nutritionally adequate for protein and micronutrients are available to mitigate gastrointestinal symptoms and obesity. Methods: This is a retrospective multicentre study of children who attended NI clinics between January 2022 and July 2023. Data were collected before and 1 month after receiving a low-energy, partially hydrolysed enteral formula (0.6 kcal/mL) on demographic data (age, sex, ethnicity and NI diagnosis), anthropometric measurements (weight, height, weight-for-age Z-score, height-for-age Z-score, body mass index [BMI] Z-score) and feed regimen (feed volume, total fluids and type of formula/supplements). Results: Dietitians collected data on 28 children, the median age was 7 years (interquartile range [IQR] 3, 8). The most frequently recorded NI was cerebral palsy, in 13 of 28 children (48%). Before the formula switch, the most frequently reported gastrointestinal symptom was constipation, in 13 of 28 children. Within 1 month of switching to a low-energy, hydrolysed formula, 10 of the 13 (77%) children reported an improvement in constipation. Before the formula switch, all 28 children were experiencing excessive weight gain. After the formula was switched to low-energy, hydrolysed formula, dietitians reported that 20 of the 28 (76%) children's weight either stabilised or reduced after 1 month. There was no statistically significant difference in weight-for-age Z-score or BMI Z-scores postswitch of formula (p-value 0.1 and 0.09, respectively). Fibre intake increased significantly from 3.3 to 8.1 g/day (p-value < 0.01) after formula switch. The number of children whose feed regimens were simplified after switching to a low-energy, partially hydrolysed formula was 24 of 28 (91%). Conclusions: Children with an NI who have gastrointestinal symptoms may benefit from a low-energy, hydrolysed enteral formula to maximise feed tolerance and promote healthy weight gain. In addition, changing to a low-energy, hydrolysed formula may simplify feed regimens by eliminating the need for additional electrolytes, multivitamins and fluid boluses. Healthcare professionals should be knowledgeable about the effectiveness and availability of a low-energy, hydrolysed formula.

PMID: 38536127

20. The Effect of a New Generation of Ankle Foot Orthoses on Sloped Walking in Children with Hemiplegia Using the Gait Real Time Analysis Interactive Lab (GRAIL)

Federica Camuncoli, Giorgia Malerba, Emilia Biffi, Eleonora Diella, Eugenio Di Stanislao, Guerrino Rosellini, Daniele Panzeri, Luigi Piccinini, Manuela Galli

Bioengineering (Basel). 2024 Mar 16;11(3):280. doi: 10.3390/bioengineering11030280.

Cerebral palsy poses challenges in walking, necessitating ankle foot orthoses (AFOs) for stability. Gait analysis, particularly on slopes, is crucial for effective AFO assessment. The study aimed to compare the performance of commercially available AFOs with a new sports-specific AFO in children with hemiplegic cerebral palsy and to assess the effects of varying slopes on gait. Eighteen participants, aged 6-11, with hemiplegia, underwent gait analysis using GRAIL technology. Two AFO types were tested on slopes (uphill +10 deg, downhill -5 deg, level-ground). Kinematic, kinetic, and spatiotemporal parameters were

analyzed. The new AFO contributed to significant changes in ankle dorsi-plantar-flexion, foot progression, and trunk and hip rotation during downhill walking. Additionally, the new AFO had varied effects on spatiotemporal gait parameters, with an increased stride length during downhill walking. Slope variations significantly influenced the kinematics and kinetics. This study provides valuable insights into AFO effectiveness and the impact of slopes on gait in hemiplegic cerebral palsy. The findings underscore the need for personalized interventions, considering environmental factors, and enhancing clinical and research approaches for improving mobility in cerebral palsy.

PMID: 38534554

21. Towards an AI-driven soft toy for automatically detecting and classifying infant-toy interactions using optical force sensors

Rithwik Udayagiri, Jessica Yin, Xinyao Cai, William Townsend, Varun Trivedi, Rohan Shende, O Francis Sowande, Laura A Prosser, James H Pikul, Michelle J Johnson

Front Robot AI. 2024 Mar 12:11:1325296. doi: 10.3389/frobt.2024.1325296. eCollection 2024.

Introduction: It is crucial to identify neurodevelopmental disorders in infants early on for timely intervention to improve their long-term outcomes. Combining natural play with quantitative measurements of developmental milestones can be an effective way to swiftly and efficiently detect infants who are at risk of neurodevelopmental delays. Clinical studies have established differences in toy interaction behaviors between full-term infants and pre-term infants who are at risk for cerebral palsy and other developmental disorders. Methods: The proposed toy aims to improve the quantitative assessment of infant-toy interactions and fully automate the process of detecting those infants at risk of developing motor delays. This paper describes the design and development of a toy that uniquely utilizes a collection of soft lossy force sensors which are developed using optical fibers to gather play interaction data from infants laying supine in a gym. An example interaction database was created by having 15 adults complete a total of 2480 interactions with the toy consisting of 620 touches, 620 punches-"kick substitute," 620 weak grasps and 620 strong grasps. Results: The data is analyzed for patterns of interaction with the toy face using a machine learning model developed to classify the four interactions present in the database. Results indicate that the configuration of 6 soft force sensors on the face created unique activation patterns. Discussion: The machine learning algorithm was able to identify the distinct action types from the data, suggesting the potential usability of the toy. Next steps involve sensorizing the entire toy and testing with infants.

PMID: 38533525

22. A Case Report of Pediatric Rehabilitation for Hypoxic Ischemic Encephalopathy Associated With Global Developmental Delay

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Case Reports Cureus. 2024 Feb 25;16(2):e54851. doi: 10.7759/cureus.54851. eCollection 2024 Feb.

Hypoxic ischemic encephalopathy (HIE) is a critical condition affecting neonates due to oxygen deprivation and insufficient flow of blood to the brain. It is associated with high neonatal mortality and the risk of developmental psychomotor disorders, including cerebral palsy. The global epidemiology of HIE reveals significant disparities, with more advanced healthcare systems reporting lower incidence rates. The aim of the study is to contribute to the understanding of effective rehabilitation strategies for children with HIE and global developmental delay (GDD), with the goal of improving outcomes and quality of life for these individuals. This case report focuses on an 11-month-old male child with a history of perinatal HIE, highlighting the developmental challenges and interventions undertaken. The child showed delayed gross and fine motor development, sensory awareness deficits, and postural coordination issues. A comprehensive physiotherapy intervention plan was implemented, resulting in significant improvements in post-treatment outcome measures. This case highlights the importance of early and holistic physiotherapy interventions in addressing HIE patients' developmental delays and improving their quality of life.

PMID: 38533149

23. Preterm birth increases cerebral palsy hazards in children of mothers with chronic hypertension in pregnancy

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Pediatr Neonatol. 2024 Mar 24:S1875-9572(24)00040-8. doi: 10.1016/j.pedneo.2023.10.009. Online ahead of print.

Background: Children of mothers with chronic-hypertension in pregnancy have high rates of preterm-birth (<37 weeks of gestation) and small-for-gestational-age (SGA), both of which are risk factors of cerebral palsy (CP). This study investigated the cumulative risks of CP in children exposed to maternal chronic-hypertension vs. other types of hypertensive-disorders-of-

pregnancy (HDP), and whether preterm-birth and SGA potentiate the antenatal impact of chronic-hypertension to increase CP hazards. Methods: This population-based cohort study enrolled 1,417,373 mother-child pairs with singleton live births between 2004 and 2011 from the Taiwan Maternal and Child Health Database. A total of 19,457 pairs with HDP were identified and propensity-score-matched with 97,285 normotensive controls. Children were followed up for CP outcome until age 6-13 years. HDP were classified into chronic-hypertension, gestational-hypertension, preeclampsia, and preeclampsia-with-chronic-hypertension. Using the normotensive group as the reference, the associations between chronic-hypertension and CP hazard were assessed with adjusted hazard ratios (HR) and 95% confidence intervals (CI) in Cox proportional hazards regression models, and the effects of preterm-birth and SGA on the associations were examined. Results: The HDP group had higher rates of CP (0.8%) than the normotensive group (0.5%), particularly the subgroup of preeclampsia-with-chronic-hypertension (1.0%), followed by preeclampsia (0.9%), chronic-hypertension (0.7%) and gestational-hypertension (0.6%). Preterm-birth, but not SGA, exerted moderating effects to increase CP risks in children exposed to maternal chronic-hypertension. Before adjustments, chronic-hypertension alone had no substantial contribution to CP hazard (HR 1.35, 95% CI 1.00-1.83), while preeclampsia alone (1.64, 1.28-2.11) or with superimposed-chronic-hypertension (1.83, 1.16-2.89) had significant effects. After including preterm-birth in the multivariable model, the CP hazard for chronic-hypertension alone rather than other types of HDP was raised and became significant (1.56, 1.15-2.12), and the significance remained after stepwise adjustments in the final model (1.74, 1.16-2.60). Conclusions: Preterm-birth might potentiate CP hazards in children of mothers with chronic-hypertension in pregnancy.

PMID: 38531715

24. Reconsidering the Gold Standard for the Assessment of Spastic Equinus Foot

Axel Horsch, Saskia Kleiber, Maher Ghandour, Julian Deisenhofer, Matthias Klotz, Cornelia Putz

J Am Acad Orthop Surg Glob Res Rev. 2024 Mar 25;8(4):e24.00039. doi: 10.5435/JAAOSGlobal-D-24-00039. eCollection 2024 Apr 1.

Introduction: To determine whether differences exist in the measured range of motion (ROM) by the goniometer, equinometer, and 3-dimensional (3D) gait analysis in different settings (under general anesthesia (GA) or in the clinic) among patients with cerebral palsy. Methods: A prospective comparative cohort study was conducted at our orthopaedics center, where 15 patients with diplegic cerebral palsy (30 limbs) were evaluated, all of whom had Gross Motor Function Classification System (GMFCS) level I and II. ROM was measured by (1) goniometer under GA (benchmark), (2) goniometer analysis during clinical examination, (3) equinometer under GA, (4) equinometer in the clinic, and (5) 3D gait analysis. ROM was measured during both knee flexion and extension. Subgroup analysis based on the GMFCS level was performed. Results: Nine patients were male with GMFCS level I and a mean age of 14.3 (SD=7.2) years. Statistically significant differences were noted between all studied measurement techniques in terms of ROM, dorsiflexion, and plantarflexion during both knee flexion and extension. The GMFCS level was an effect modifier of ROM measurements. Discussion: The ROM parameters during both knee flexion and extension differed from one measurement device/technique to another. The GMFCS level played a notable effect-modifying role on the ROM parameters.

PMID: 38530946

25. Variables included in cerebral palsy registries globally: A scoping review

Thembi J Katangwe, Mariana Kruger, Takondwa Chimowa, Innocent Maposa, Ronald Van Toorn, Regan Solomons, Kirsten A Donald

Review Dev Med Child Neurol. 2024 Mar 26. doi: 10.1111/dmcn.15908. Online ahead of print.

Aim: To identify cerebral palsy (CP) variables collected in CP registries from high-income countries (HICs) and low- and middle-income countries (LMICs) to assist with the development of a regional CP registry relevant to the African region. Method: A systematic search of online databases to identify peer-reviewed publications and grey literature about CP risk-factor variables, using Ovid MEDLINE, Embase Ovid, CINAHL, and Google Scholar. Results: A total of 197 studies published from global CP registries between 1990 and 2023 were identified. CP registries both from HICs and from LMICs included variables on prenatal CP risk factors. LMIC registries focused more on socioeconomic factors (the physical structure of the family home [21.1%, n = 8, in LMICs vs 1.7%, n = 2, in HICs]). Prenatal modifiable and non-modifiable risk factors were emphasized in HICs. LMIC registries included more postnatal CP risk-factor variables than HIC registries, including history of postnatal jaundice (15.8%, n = 6, in LMICs vs 6.9%, n = 8, in HICs) and postnatal head trauma (10.5%, n = 4, in LMICs vs 5.2%, n = 6, in HICs). Interpretation: CP registries are currently more available in HICs than in LMICs. Differences in CP risk factors account for most of the differences in variables included in HICs and LMICs. Comparing variables used by CP registries in HICs and LMICs suggests the importance of understanding contextually relevant factors for regional registry design.

PMID: 38530807

26. A systematic review of goal attainment scaling implementation practices by caregivers in randomized controlled trials

Kulpreet Cheema, Taylor Dunn, Chere Chapman, Kenneth Rockwood, Susan E Howlett, Gunes Sevinc

Review J Patient Rep Outcomes. 2024 Mar 26;8(1):37. doi: 10.1186/s41687-024-00716-w.

Background: Goal attainment scaling (GAS), an established individualized, patient-centred outcome measure, is used to capture the patient's voice. Although first introduced ~60 years ago, there are few published guidelines for implementing GAS, and almost none for its use when caregivers GAS is implemented with caregiver input. We conducted a systematic review of studies that implemented GAS with caregiver input; and examined variations in GAS implementation, analysis, and reporting. Methods: Literature was retrieved from Medline, Embase, Cochrane, PsycInfo and CINAHL databases. We included randomized controlled trials (published between 1968 and November 2022) that used GAS as an outcome measure and involved caregiver input during goal setting. Results: Of the 2610 studies imported for screening, 21 met the inclusion criteria. Most studies employed GAS as a primary outcome. The majority (76%) had children as study participants. The most common disorders represented were cerebral palsy, developmental disorders, and dementia/Alzheimer's disease. The traditional five-point GAS scale, with levels from -2 to +2, was most often implemented, with -1 level typically being the baseline. However, most studies omitted essential GAS details from their reports including the number of goals set, number of attainment levels and whether any training was given to GAS facilitators. Conclusions: GAS with caregiver input has been used in a limited number of randomized controlled trials, primarily in pediatric patients and adults with dementia. There is a variability in GAS implementation and many crucial details related to the specifics of GAS implementation are omitted from reports, which may limit reproducibility. Here we propose catalog that may be utilized when reporting research results pertaining to GAS with caregivers to enhance the application of this patient-centered outcome measure.

PMID: 38530578

27. Functional outcomes following surgery for spastic hip adductor muscles in ambulatory and non-ambulatory adults

Daphnée Brun, Olivier Hamel, Emmeline Montané, Marino Scandella, Evelyne Castel-Lacanal, Xavier De Boissezon, Marque Philippe, Gasq David, Camille Cormier

Observational Study J Rehabil Med. 2024 Mar 22:56:jrm18356. doi: 10.2340/jrm.v56.18356.

Objective: To evaluate functional outcomes of surgery of spastic hip adductor muscles (obturator neurotomy with or without adductor longus tenotomy) in ambulatory and non-ambulatory patients, using preoperatively defined personalized goals. Design: Retrospective observational descriptive study. Patients: Twenty-three patients with adductor spasticity who underwent obturator neurotomy between May 2016 and May 2021 at the Clinique des Cèdres, Cornebarrieu, France, were included. Methods: Postoperative functional results were evaluated in accordance with the Goal Attainment Scaling method. Patients were considered "responders" if their score was ≥ 0. Secondary outcomes included spasticity, strength, hip range of motion and change in ambulatory capacity. When data were available, a comparison of pre- and postoperative 3-dimensional instrumented gait analysis was also performed. Results: Among the 23 patients only 3 were non-walkers. Seventeen/22 patients achieved their main goal and 14/23 patients achieved all their goals. Results were broadly similar for both walking goals (inter-knee contact, inter-feet contact, fluidity, walking perimeter, toe drag) and non-walking goals (intimacy, transfer, pain, posture, dressing). Conclusion: Surgery of spastic hip adductor muscles results in functional improvement in ambulation, hygiene, dressing and posture and can be offered to patients with troublesome adductor overactivity. The use of a motor nerve block is recommended to define relevant goals before the surgery.

PMID: 38528325

28. A systematic review of the efficacy of group social skills interventions on social functioning and social participation in children with acquired brain injury or cerebral palsy

Bianca A D Thompson, Rose Gilmore, Jacqui Barfoot, Leanne Sakzewski

Review Child Care Health Dev. 2024 Mar;50(2):e13242. doi: 10.1111/cch.13242.

Aim: The aim of this study was to evaluate the efficacy of Group social skills interventions (GSSIs) versus any comparator on social functioning in children aged 5-12 years with acquired brain injury or cerebral palsy. Background: GSSIs are an evidence-based approach to foster social skills development in children with autism spectrum disorder. Currently, limited literature exploring GSSIs in children with acquired brain injury and cerebral palsy is available. Results: MEDLINE, SCOPUS, Embase, CINAHL, Cochrane Library, PsycINFO, clinicaltrials.gov, ICTRP and ProQuest Dissertations and Theses were systematically searched. Study screening, risk-of-bias, Grading of Recommendations Assessment, Development and Evaluation and data extraction were performed in duplicate. Six studies were included in the narrative synthesis (one randomised controlled trial and five nonrandomised studies). Results indicate that GSSIs may increase children's social skills as measured on the Social Skills Rating System and Social Skills Questionnaire. Very low certainty evidence was found for improvements in social

functioning and competence. Conclusions: There is low certainty evidence that participation in GSSI may lead to gains in social functioning for children with acquired brain injury or cerebral palsy. Given the certainty of the evidence, these results must be interpreted with caution. Only one randomised controlled trial of GSSIs for children with acquired brain injury was identified, underscoring the need for additional high-quality studies.

PMID: 38528324

29. Effectiveness of Wii-Fit Combined with Conventional Exercises on the Functional Mobility and Balance of Children with Cerebral Palsy and Their Typically Growing Peers

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Games Health J. 2024 Mar 25. doi: 10.1089/g4h.2023.0113. Online ahead of print.

Nintendo Wii Fit is an accessible, affordable, and productive inclusion into rehabilitation programs for children with cerebral palsy (CP) as a physical activity intervention; however, to our knowledge, there are no comparative studies 8 investigating the effects on the functional mobility and balance of children with CP compared to typically growing (TG) children. We evaluated the effects of Nintendo Wii Fit video exercises on static and dynamic balance, functional capacity, and walking endurance in children with CP compared to their TG peers. Children with CP and their TG peers were trained with Nintendo Wii Fit Balance Board games and conventional exercises (40 minutes each) for 16 weeks, twice a week. Their static and dynamic balance, functional capacity, and walking endurance were evaluated at the beginning and end of the study. The improvement achieved within the groups in all parameters, as well as between the groups, was significant, except for the dynamic balance and walking endurance. Standing Nintendo Wii Fit exercises combined with conventional exercises can be included as axial exercises in the physiotherapy program for children with CP as an enjoyable physical activity. TG children may also benefit, increasing their functional mobility and walking endurance in a fun way.

PMID: 38527255

30. Effectiveness of assisted standing on bone mineral density in children with cerebral palsy. A systematic review [Abstract in English, Spanish] [Article in English, Spanish]

Fernando Valenzuela-Aedo, Camila Reyes-Moreno, Teresa Balboa-Castillo

Arch Argent Pediatr. 2024 Apr 4:e202310251. doi: 10.5546/aap.2023-10251.eng. Online ahead of print.

Cerebral palsy is associated with complications such as low bone mineral density, which is more severe in patients with greater motor involvement. Assisted standing helps to prevent or delay this complication; however, its effect is controversial because the type of stander, the type of standing (dynamic or static), and its dosage are not clear. The objective of this study was to determine the effectiveness of assisted standing on bone mineral density in children with cerebral palsy. A systematic review was carried out in compliance with the PRISMA guidelines, using 5 databases. The results were presented using tables, a risk of bias analysis, and a narrative synthesis. Four studies met the inclusion criteria. Assisted standing generates positive changes in bone mineral density, but further research is required, with studies that have greater methodological rigor, longer follow-up periods, and a larger number of patients.

PMID: 38527242

31. Identification of Neural and Non-Neural Origins of Joint Hyper-Resistance Based on a Novel Neuromechanical Model

Jente Willaert, Kaat Desloovere, Anja Van Campenhout, Lena H Ting, Friedl De Groote

IEEE Trans Neural Syst Rehabil Eng. 2024:32:1435-1444. doi: 10.1109/TNSRE.2024.3381739. Epub 2024 Apr 1.

Joint hyper-resistance is a common symptom in neurological disorders. It has both neural and non-neural origins, but it has been challenging to distinguish different origins based on clinical tests alone. Combining instrumented tests with parameter identification based on a neuromechanical model may allow us to dissociate the different origins of joint hyper-resistance in individual patients. However, this requires that the model captures the underlying mechanisms. Here, we propose a neuromechanical model that, in contrast to previously proposed models, accounts for muscle short-range stiffness (SRS) and its interaction with muscle tone and reflex activity. We collected knee angle trajectories during the pendulum test in 15 children with cerebral palsy (CP) and 5 typically developing children. We did the test in two conditions - hold and pre-movement - that have been shown to alter knee movement. We modeled the lower leg as an inverted pendulum actuated by two antagonistic Hill -type muscles extended with SRS. Reflex activity was modeled as delayed, linear feedback from muscle force. We estimated neural and non-neural parameters by optimizing the fit between simulated and measured knee angle trajectories during the hold condition. The model could fit a wide range of knee angle trajectories in the hold condition. The model with personalized

parameters predicted the effect of pre-movement demonstrating that the model captured the underlying mechanism and subject-specific deficits. Our model may help with the identification of neural and non-neural origins of joint hyper-resistance and thereby opens perspectives for improved diagnosis and treatment selection in children with spastic CP, but such applications require further studies to establish the method's reliability.

PMID: 38526884

32. Hospital-based surveillance of children with cerebral palsy in Suriname: The Suriname cerebral palsy register

Marlies H P Declerck, Israt Jahan, Neirude P A Lissone, Fenna Walhain, Ruby Chin A Fat, Marianne Fleurkens, Sarfaraz H J Muradin, Rhea Cruden, Els Ortibus, Nadia Badawi, Gulam Khandaker

Dev Med Child Neurol. 2024 Mar 25. doi: 10.1111/dmcn.15897. Online ahead of print.

Aim: To describe the aetiological risk factors, clinical characteristics, access to rehabilitation, and educational status of children with cerebral palsy (CP) in Suriname. Method: Hospital-based surveillance of children with CP aged younger than 18 years was conducted at the Academic Hospital Paramaribo, Suriname (known as the Suriname CP Register [SUR-CPR]). Data were collected on sociodemographic characteristics, aetiological risk factors, clinical characteristics, rehabilitation, and educational status. Registry data on aetiological risk factors were compared with available national prevalence rates in Suriname. Descriptive statistics were reported. Results: Between August 2018 and March 2020, 82 children with CP (mean [SD] age 5 years 10 months [3 years 10 months]) attending the Academic Hospital Paramaribo were registered in the SUR-CPR. The mean (SD) age at diagnosis was 5 years 5 months (4 years 1 month). Spastic CP was predominant in 90.8% of children and 58.8% were classified in Gross Motor Function Classification System levels III to V. Overall, 43.9% had preterm birth compared with 13.9% reported nationally ($p < 0.001$) and 61.6% had birth-related complications compared with 15% reported nationally ($p < 0.001$). Additionally, 39.1% had birth asphyxia and 23.2% had early feeding difficulties. Sixty-two percent were admitted to the neonatal intensive care unit, 54.0% of whom required ventilation. Most children (82.5%) had CP acquired pre- or perinatally and 17.5% had CP acquired postneonatally. Seventeen percent had never received any rehabilitation services, and 31.9% of the school-aged children were not enrolled in any education system. Interpretation: The high burden of known aetiological risk factors, delayed diagnosis, and severe functional impairment among children with CP registered at the Academic Hospital Paramaribo is concerning. Public health interventions targeting early diagnosis and early intervention could improve the functional outcome of children with CP in Suriname.

PMID: 38525657

33. Effectiveness of sensory integration therapy in children, focusing on Korean children: A systematic review and meta-analysis

Seri Oh, Jong-Sik Jang, A-Ra Jeon, Geonwoo Kim, Mihwa Kwon, Bahoe Cho, Narae Lee

World J Clin Cases. 2024 Mar 6;12(7):1260-1271. doi: 10.12998/wjcc.v12.i7.1260.

Background: Sensory integration intervention is highly related to the child's effective interaction with the environment and the child's development. Currently, various sensory integration interventions are being applied, but research methodological problems are arising due to unsystematic protocols. This study aims to present the optimal intervention protocol by presenting scientific standards for sensory integration intervention through meta-analysis. Aim: To prove the effectiveness of sensory integration therapy, examine the latest trend of sensory integration studies in Korea, and provide clinical evidence for sensory integration therapies. Methods: The database of Korean search engines, including RISS, KISS, and DBpia, was used to search for related literature published from 2001 to October 2020. The keywords, "Children", "Sensory integration", "Integrated sensory", "Sensory-motor", and "Sensory stimulation" were used in this search. Then, a meta-analysis was conducted on 24 selected studiesRISS, KISS, and DBpia, was used to search for related literature published from 2001 to October 2020. The keywords, "Children", "Sensory integration", "Integrated sensory", "Sensory-motor", and "Sensory stimulation" were used in this search. Then, a meta-analysis was conducted on 24 selected studies. Results: Sensory integration intervention has been proven effective in children with cerebral palsy, autism spectrum disorder, attention deficit/hyperactivity disorder, developmental disorder, and intellectual disability in relation to the diagnosis of children. Regarding sensory integration therapies, 1:1 individual treatment with a therapist or a therapy session lasting for 40 min was most effective. In terms of dependent variables, sensory integration therapy effectively promoted social skills, adaptive behavior, sensory processing, and gross motor and fine motor skills. Conclusion: The results of this study may be used as therapeutic evidence for sensory integration intervention in the clinical field of occupational therapy for children, and can help to present standards for sensory integration intervention protocols.

PMID: 38524513

34. Using the gross motor function measure evolution ratio to compare different dosage of hyperbaric treatment with conventional therapies in children with cerebral palsy - could it end the controversy?

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Front Neurol. 2024 Mar 8:15:1347361. doi: 10.3389/fneur.2024.1347361. eCollection 2024.

The Gross Motor Function Measure is used in most studies measuring gross motor function in children with cerebral palsy. In many studies, including those evaluating the effect of hyperbaric treatment, the Gross Motor Function Measure variations were potentially misinterpreted because of the lack of control groups. The Gross Motor Function Measure Evolution Ratio (GMFMER) uses historical data from the Gross Motor Function Classification System curves and allows to re-analyze previous published studies which used the Gross Motor Function Measure by considering the natural expected evolution of the Gross Motor Function Measure. As the GMFMER is defined by the ratio between the recorded Gross Motor Function Measure score increase and the expected increase attributed to natural evolution during the duration of the study (natural evolution yields a GMFMER of 1), it becomes easy to assess and compare the efficacy of different treatments. Objective: The objective of this study is to revisit studies done with different dosage of hyperbaric treatment and to compare the GMFMER measured in these studies with those assessing the effects of various recommended treatments in children with cerebral palsy. Methods: PubMed Searches were conducted to included studies that used the Gross Motor Function Measure to evaluate the effect of physical therapy, selective dorsal rhizotomy, botulinum toxin injection, hippotherapy, stem cell, or hyperbaric treatment. The GMFMER were computed for each group of the included studies. Results: Forty-four studies were included, counting 4 studies evaluating the effects of various dosage of hyperbaric treatment in children with cerebral palsy. Since some studies had several arms, the GMFMER has been computed for 69 groups. The average GMFMER for the groups receiving less than 2 h/week of physical therapy was 2.5 ± 1.8 whereas in context of very intensive physical therapy it increased to 10.3 ± 6.1. The GMFMER of stem cell, selective dorsal rhizotomy, hippotherapy, and botulinum toxin treatment was, 6.0 ± 5.9, 6.5 ± 2.0, 13.3 ± 0.6, and 5.0 ± 2.9, respectively. The GMFMER of the groups of children receiving hyperbaric treatment were 28.1 ± 13.0 for hyperbaric oxygen therapy and 29.8 ± 6.8 for hyperbaric air. Conclusion: The analysis of the included studies with the GMFMER showed that hyperbaric treatment can result in progress of gross motor function more than other recognized treatments in children with cerebral palsy.

PMID: 38523613

35. Experiences of young adults with cerebral palsy in pediatric care transitioning to adult care

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Dev Med Child Neurol. 2024 Mar 24. doi: 10.1111/dmcn.15907. Online ahead of print.

Aim: To increase understanding regarding the experiences and values of young adults with cerebral palsy (CP), and their caregivers, regarding pediatric rehabilitation-related care, including perceived barriers and potential facilitators to transition to adult care. Method: This was a qualitative descriptive study that used 20 semi-structured interviews (13 caregivers and seven patient-caregiver dyads). Results: We identified four major themes: (1) the value and security of long-term relationships; (2) feeling 'rudderless' navigating the logistics of transition; (3) differences in pediatric versus adult models of care; and (4) perceived lack of provider expertise and comfort in adult care settings. Young adults with CP who had not yet transitioned to adult rehabilitation care and their caregivers placed high value on provider relationships and expertise, advanced planning, communication, and coordination of care. Interpretation: Identified barriers and potential facilitators to the transition to adult rehabilitation care reflected the uncertainty that accompanies leaving an established healthcare relationship. Challenges related to the logistics of this transition, differences in models of care, and perceived lack of provider comfort and expertise in adult care settings were also noted. Our findings could be used to develop and study patient-centered and family-centered transition processes for individuals with CP to promote age-appropriate and developmentally appropriate lifespan care.

PMID: 38523396

36. Predictive value of the General Movements Assessment and Standardized Infant NeuroDevelopmental Assessment in infants at high risk of neurodevelopmental disorders

Mijna Hadders-Algra, Uta Tacke, Joachim Pietz, André Rupp, Heike Philippi

Dev Med Child Neurol. 2024 Mar 24. doi: 10.1111/dmcn.15901. Online ahead of print.

Aim: To compare the predictive values of the General Movements Assessment (GMA) and the Standardized Infant NeuroDevelopmental Assessment (SINDA) neurological scale for atypical neurodevelopmental outcome in 3-month-old at-risk infants. Method: A total of 109 infants (gestational age 30 weeks; range: 24-41; 52 males) attending a non-academic outpatient clinic were assessed with the GMA and the SINDA at 3 (2-4) months corrected age. The GMA pays attention to the complexity of general movements and presence of fidgety movements. Atypical neurodevelopmental outcome at 24 months corrected age (and older) implied cerebral palsy (CP) or a Bayley Mental Development Index or Bayley Psychomotor Development Index

lower than 70. Results: At 24 months corrected (and older) age, 16 children had an atypical outcome, including 14 children with CP. Regarding markedly reduced general movement complexity in combination with absent or sporadic fidgety movements, the GMA predicted an atypical outcome with specificity, positive, and negative predictive values greater than 0.900, and sensitivity of 0.687 (95% confidence interval [CI] = 0.460-0.915). SINDA predicted an atypical outcome with sensitivity, specificity, and negative predictive value greater than 0.900 and a positive predictive value of 0.652 (95% CI = 0.457-0.847). Regarding absent fidgety movements only or markedly reduced general movement complexity, the GMA predicted the outcome less well than both general movement criteria. Interpretation: The SINDA and GMA both predict neurodevelopmental outcome well, but SINDA is easier to learn than the GMA; being a non-video-based assessment, it allows caregiver feedback during the consultation whereas the GMA usually does not.

PMID: 38523353