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.Development of handedness and other lateralized functions during infancy and early childhood

George F Michel, Iryna Babik, Eliza L Nelson, Claudio L Ferre, Julie M Campbell, Emily C Marcinowski

Review Handb Clin Neurol . 2025:208:181-194. doi: 10.1016/B978-0-443-15646-5.00003-8.

Abstract
Using a historical or "development from" approach to study the development of hand-use preferences in infants and children, we show how various sensorimotor experiential events shape the cascade from initial to subsequent hand-use preferences. That cascade represents, creates, and shapes the lateralized asymmetry of neural circuits in the cerebral hemispheres. The control of the preferred hand requires neural circuits in the contralateral hemisphere that are capable of processing the organization of finely timed, sequentially organized movements and detecting haptic information derived from high-frequency transitions in the stimulus. We propose that the lateralized differences in these neural circuits underlie processes contributing to the development of other forms of hemispheric specialization of function. We show how the development of hand-use preferences contributes to the development of language skills, tool use, spatial skills, and other cognitive abilities during infancy and early childhood. Such evidence supports the proposal of Michael Corballis that the phylogeny of human language emerged during the evolution of hominins from the co-option of those neural circuits employed in the expression of manual skills involved in tool use, tool manufacture, and communication. Finally, we summarize evidence from children with cerebral palsy, which shows that their difficulties with sensorimotor processing, visuomotor coordination, anticipatory motor planning, and other cognitive abilities may stem from disturbances in the development of their hand-use preferences and hence the functional specialization of their hemispheres.
PMID: 40074396

2.General Movements Assessment and Hammersmith Infant Neurological Examination for early diagnosis of cerebral palsy in infants born at term treated with therapeutic hypothermia

No authors listed

Dev Med Child Neurol . 2025 Mar 13. doi: 10.1111/dmcn.16298. Online ahead of print.

No abstract available
PMID: 40082739

3.Low multiscale entropy of ankle joint position during toe gait in children with cerebral palsy is related to contracture development

Tony Biakceunung Rungling, Thomas Sinkjær, Jens Bo Nielsen, Jakob Lorentzen, Maria Willerslev-Olsen, Rasmus Feld Frisk

Clin Biomech (Bristol) . 2025 Mar 11:124:106490. doi: 10.1016/j.clinbiomech.2025.106490. Online ahead of print.

Background: Toe walking in children with cerebral palsy is typically less stable and less energy-efficient than plantigrade walking in typically developing children. We hypothesized that children with cerebral palsy may, nevertheless, show more stable toe walking due to the development of contractures compared to age-matched typically developing children.
Methods: Multiscale entropy of the vertical position of the ankle joint was used to measure ankle joint stability during the stance phase of walking. Kinematic data were obtained from 37 children with spastic cerebral palsy and habitual toe walking, who walked on a treadmill at their preferred speed (1.3 ± 0.5 km/h for cerebral palsy children and 1.5 ± 0.4 km/h for typically developing children). Recordings from 21 age-matched typically developing children were used for comparison. Typically developing children walked both normally (plantigrade) and on toes.
Findings: Multiscale entropy was significantly higher during toe walking than plantigrade walking in typically developing children ($P < 0.001$). For children under 6 years, multiscale entropy was higher in cerebral palsy children than in typically developing children. For children over 6 years, the opposite was observed. In children with cerebral palsy, multiscale entropy decreased with reduced passive range of motion in the ankle joint ($P < 0.001$).
Interpretation: These findings suggest that contractures in children with cerebral palsy stabilize the ankle during toe walking. Younger children may show greater stability due to early contracture development, while advanced contractures in older children may reduce stability.
PMID: 40086127

4.Medication and Therapy Profiles for Pain and Symptom Management Among Adults With Cerebral Palsy

Mark D Peterson, Michael O'Leary, Kathryn Ashbaugh, Heidi Haapala, Mary Schmidt, Neil Kamdar, Edward A Hurvitz

Mayo Clin Proc Innov Qual Outcomes . 2025 Feb 19;9(2):100597. doi: 10.1016/j.mayocpiqo.2025.100597. eCollection 2025 Apr.

Objective: To examine the most common patterns of pain and symptom management strategies among adults living with cerebral palsy (CP), and to determine if there are differences by pain phenotype or co-occurring neurodevelopmental disorders.
Patients and methods: Federally insured beneficiaries were included if they had an ICD-9-CM/ICD-10-CM diagnosis code for CP (N=41,595). The study took place from January 10, 2024, to December 15, 2024. Medication and therapy prescription estimates for pain and CP symptom management were examined for the entire cohort, and between individuals with and without neurodevelopmental disorders and across pain phenotypes.
Results: The most common pharmaceutical/nontherapy-based pain and symptom management interventions included high frequency prescriptions for antiepileptics (58%), antidepressants (49%), benzodiazepines (43%), nonsteroidal anti-inflammatories (43%), nonperioperative opioids (42%), antipsychotics (33%), muscle relaxants (31%), irritable bowel syndrome-specific drugs (20%), clonidine (12%), anticholinergics (11%), and botulinum toxin A injections (6%). Physical and occupational therapy were prescribed for 41% of the study cohort. Significant differences in treatment patterns were found for individuals with co-occurring neurodevelopmental disorders, and across pain phenotypes. Notably, for individuals with a mixed pain phenotype, nearly 80% were prescribed nonperioperative opioids.
Conclusion: Adults with CP have a high prescription prevalence of nonperioperative opioids and common nonopioid pain and symptom management.
PMID: 40061300

5.Sleep and physical activity: the experiences of adults with cerebral palsy and recommendations for clinical practice

Ilse Margot van Rijssen, Jan Willem Gorter, Johanna Maria Augusta Visser-Meily, Marion Sommers-Spijkerman, Manin Konijnenbelt, Marieke van Driel, Olaf Verschuren

Disabil Rehabil . 2025 Mar 14:1-9. doi: 10.1080/09638288.2025.2477828. Online ahead of print.

Purpose: Adults with cerebral palsy (CP) face challenges maintaining physical activity and good sleep. This study explores their experiences and describes factors influencing sleep and physical activity.
Methods: We conducted semi-structured interviews with fourteen adults aged 23 to 58, of whom thirteen were ambulant. Participants were recruited via the Dutch patient organization for individuals with CP. Data were analyzed using inductive qualitative content analysis.
Results: Three main themes emerged: balancing energy, rest and activity, and separate themes on sleep and physical activity. Balancing energy, rest and activity included subthemes of managing personal resources, interaction between sleep and physical activity, and presence of appropriate support and resources. Maintaining a healthy 24-h balance was crucial, yet participants often struggled achieving this balance and finding appropriate support. Experiences with sleep and physical activity were categorized into mental, physical, and environmental subthemes, which are closely interconnected.
Conclusions: People with CP have difficulties with sleep, physical activity, and maintaining a healthy 24-h balance. Despite their motivation to maintain well-being, they often lack adequate support. Addressing these issues holistically can improve care and support for adults with CP. Youth rehabilitation services play a critical role in preparing adolescents with CP for adulthood by fostering self-management skills.
Plain language summary
Rehabilitation services should provide proactive education and guidance on sleep and physical activity to adolescents with cerebral palsy to better prepare them for aging-related changes.Healthcare professionals should recognize and address cerebral palsy-specific challenges related to sleep and physical activity, such as pain, spasms, sensitivity to stimuli, and fatigue.Improving sleep education for medical trainees and drawing on rehabilitation strategies from other populations can enhance care for adults with cerebral palsy.
PMID: 40084897

6.Predictors of respiratory and oral health for children and young adults with cerebral palsy

Diane Sellers

Dev Med Child Neurol . 2025 Mar 14. doi: 10.1111/dmcn.16307. Online ahead of print.

No abstract available
PMID: 40084390

7.Augmenting rehabilitation robotics with spinal cord neuromodulation: A proof of concept

Nicolas Hankov, Miroslav Caban, Robin Demesmaeker, Margaux Roulet, Salif Komi, Michele Xiloyannis, Anne Gehrig, Camille Varescon, Martina Rebeka Spiess, Serena Maggioni, Chiara Basla, Gleb Koginov, Florian Haufe, Marina D'Ercole, Cathal Harte, Sergio D Hernandez-Charpak, Aurelie Paley, Manon Tschopp, Natacha Herrmann, Nadine Intering, Edeny Baaklini, Francesco Acquati, Charlotte Jacquet, Anne Watrin, Jimmy Ravier, Frédéric Merlos, Grégoire Eberlé, Katrien Van den Keybus, Hendrik Lambert, Henri Lorach, Rik Buschman, Nicholas Buse, Timothy Denison, Dino De Bon, Jaime E Duarte, Robert Riener, Auke Ijspeert, Fabien Wagner, Sebastian Tobler, Léonie Asboth, Joachim von Zitzewitz, Jocelyne Bloch, Grégoire Courtine

Sci Robot. 2025 Mar 12;10(100):eadn5564. doi: 10.1126/scirobotics.adn5564. Epub 2025 Mar 12.

Abstract
Rehabilitation robotics aims to promote activity-dependent reorganization of the nervous system. However, people with paralysis cannot generate sufficient activity during robot-assisted rehabilitation and, consequently, do not benefit from these therapies. Here, we developed an implantable spinal cord neuroprosthesis operating in a closed loop to promote robust activity during walking and cycling assisted by robotic devices. This neuroprosthesis is device agnostic and designed for seamless implementation by nonexpert users. Preliminary evaluations in participants with paralysis showed that the neuroprosthesis enabled well-organized patterns of muscle activity during robot-assisted walking and cycling. A proof-of-concept study suggested that robot-assisted rehabilitation augmented by the neuroprosthesis promoted sustained neurological improvements. Moreover, the neuroprosthesis augmented recreational walking and cycling activities outdoors. Future clinical trials will have to confirm these findings in a broader population.

PMID: 40073082

8.ChMER: an exoskeleton robot with active body weight support walker based on compliant actuation for children with cerebral palsy

Yuantao Ding, Zhengtao Wang, Peizhong Yang, Suiran Yu

Front Bioeng Biotechnol . 2025 Feb 27:13:1551039. doi: 10.3389/fbioe.2025.1551039. eCollection 2025.

Introduction: Lower limb exoskeleton robots for young children with cerebral palsy (CP) are crucial to support earlier rehabilitation that is more beneficial than later. For safety reasons, pediatric exoskeletons are usually equipped with body weight support (BWS) devices to help young patients maintain balance. However, existing pediatric exoskeletons tend to use stiff joint actuation and passive BWS with limited compliance.
Method: This paper proposes a novel mobile exoskeleton robot for young children (3- ∼ 6-years-old) with CP based on intrinsically compliant actuation. A compact kinematic chain that integrates an exoskeleton, an active BWS system, and a walker is proposed. Furthermore, with the actuation design optimization of the kinematic chain, the robot can walk alone stably in passive rehabilitation and provide high compliance in active rehabilitation. The exoskeleton adopts actuation similar to the quasi-direct drive paradigm to acquire high mechanical compliance and uses a secondary planetary reducer to ensure high output torque. Assistive torque control is achieved through proprioceptive sensing instead of torque sensors. The BWS system uses a series elastic actuator to accurately generate the weight support force and significantly reduce the fluctuation of the support force compared to the passive BWS.
Results and discussion: Finally, control frameworks for passive and active rehabilitation are implemented to validate the robot performance. The experimental results demonstrate that our robot can support safe and compliant rehabilitation.
PMID: 40084132

9.Combat sports in virtual reality for rehabilitation and disability adaptation: a mini-review

Yike Li, Chun Jiang, Hansen Li, Yuqin Su, Mengyao Li, Yang Cao, Guodong Zhang

Review Front Public Health . 2025 Feb 27:13:1557338. doi: 10.3389/fpubh.2025.1557338. eCollection 2025.

Abstract
This review examines the existing literature regarding the utilization of combat sports in virtual reality (VR) for disease rehabilitation and adaptive physical activity. A total of 18 studies were obtained from the Web of Science and Scopus databases. The results suggest that Boxing, the most studied combat sport in VR systems, has been primarily used to improve motor function and quality of life in patients with neurological conditions such as cerebral palsy, Parkinson's disease, and stroke. Furthermore, VR combat sports have been shown to increase energy expenditure and physical activity intensity in individuals with disabilities, proving effective in maintaining overall physical health. Notably, VR boxing produces higher energy expenditure than other activities (e.g., tennis), with heart rate (HR) and oxygen consumption (VO2) during boxing sessions consistently exceeding those observed in tennis. Overall, research in this field remains limited and further explorations are warranted.
PMID: 40084202

10.Rehabilitative game-based system for enhancing physical and cognitive abilities of neurological disorders

Neven Saleh, Ahmed M Salaheldin, Maged Badawi, Ahmed El-Bialy

Cogn Neurodyn . 2025 Dec;19(1):48. doi: 10.1007/s11571-025-10229-x. Epub 2025 Mar 10.

Abstract
Neurological disorders affect the nervous system and can impair physical, cognitive, or emotional functions. They often result in challenges such as movement difficulties and the inability to perform daily activities. Common conditions include stroke, traumatic brain injury, and cerebral palsy. Physical therapy is a common approach to managing these disorders. Recently, virtual reality (VR), a technology that creates interactive, simulated environments, has been used in rehabilitation. This study presents a rehabilitative game-based system to improve patients' movements and cognitive abilities. Six games were designed using the Unity platform, namely, "Piano," "Connect," "Drag & Drop," "Little Intelligent," "Memory," and "Hack & Slash." The Oculus Quest 2 VR headset was used to simulate the virtual environment for gaming. A mobile application called "Recover Me" was created to facilitate communication between patients and physiotherapists. A score index was generated for each patient, indicating the performance. It enables monitoring and assessment of the patients, leading to customizing the treatment plan based on progress. The study proposed simulating monitoring and evaluation of the patients by training an artificial neural network model to predict scores for the developed games and consequently indicate the patient's actual status. A dataset of 50 patients with different injuries was used. Results indicate patient satisfaction with gaming and enjoyment. Moreover, a regression analysis was performed to detect the progress level of each patient, indicating that 60% of the tested patients had improved. A low-cost VR game-based system has proven effective in rehabilitating neurological disorders.
PMID: 40070674

11.Comparing cerebral palsy costs: Private healthcare vs medico-legal claims in South Africa

Gregory Whittaker

Med Leg J . 2025 Mar 13:258172241287654. doi: 10.1177/00258172241287654. Online ahead of print.

Abstract
This study compares the costs of cerebral palsy healthcare in South Africa's private healthcare system with the lump sum compensation typically awarded in medico-legal claims. The analysis reveals that private healthcare costs for cerebral palsy, particularly within high-coverage benefit options, are significantly lower than the capitalised values awarded by South African courts. This suggests that the projections used in medico-legal claims may overestimate the true financial requirements for cerebral palsy care. The study advocates for evidence-based methodologies in medical expert witness assessments to ensure accurate and fair cost estimations, reducing discrepancies between private healthcare costs and medico-legal compensation.
PMID: 40079655

12.Survey on demand for smart home technology as assistive technology for people with physical disabilities in Korea

Kwangtae Mun, Jongbae Kim

Disabil Rehabil Assist Technol . 2025 Mar 11:1-10. doi: 10.1080/17483107.2025.2475144. Online ahead of print.

Purpose: This study investigated the awareness, preferences, and demand for smart home technology among individuals with physical disabilities.
Methods: A total of 73 participants with various physical disabilities, including spinal cord injury (SCI), cerebrovascular accident (CVA), and cerebral palsy (CP), were surveyed. Data were collected through structured interviews and questionnaires, focusing on participants' awareness of smart home technologies, their preferred control interfaces, and the barriers they face in daily living activities. Statistical analysis was conducted to identify significant differences based on diagnosis, hand functionality, and walking ability.
Findings: The study revealed that although overall awareness of smart home technology was low, there was a high preference for specific devices such as smart speakers, TVs, and air conditioners. Preferences for control interfaces varied significantly by disability type: SCI participants favored smart speakers, CVA participants preferred remote controls, and CP participants opted for smartphones and tablets. Additionally, hand functionality and walking ability significantly impacted participants' ability to perform indoor activities of daily living (ADLs), highlighting the need for tailored smart home solutions.
Conclusions: The study underscores the importance of tailored smart home solutions that consider the specific needs and preferences of individuals with physical disabilities. This finding calls for a more empathetic and understanding approach to designing and implementing assistive technologies. It also emphasizes the crucial role of ongoing education and promotion in improving the adoption and utilization of these technologies.
Plain language summary
Customized Smart Home Solutions Rehabilitation professionals should advocate for and assist in developing customized smart home solutions tailored to the specific needs and preferences of individuals with physical disabilities. This ensures technology aligns with the user's functional abilities and controls interface preferences, enhancing usability and effectiveness.User Education and Training Continuous education and training programs are essential to increase the acceptance and effective use of smart home technologies among people with disabilities. Rehabilitation specialists should develop and deliver personalized training materials that address diverse technology literacy levels and individual preferences, helping users overcome initial adoption barriers and encouraging ongoing use of smart home devices.Collaboration with Technology Developers Rehabilitation professionals should collaborate with smart home technology developers to ensure that the needs and preferences of people with disabilities are considered during the design and development stages. This collaboration can lead to more intuitive, accessible, and user-friendly smart home solutions, enhancing independence and quality of life for individuals with disabilities.
PMID: 40067951

13.Childhood disabilities, household poverty, and inequality: A population-based case-control study in rural Bangladesh

Israt Jahan, Tasneem Karim, Risad Sultana, Genevieve Perrins, Mahmudul Hassan Al Imam, Mohammad Muhit, Nadia Badawi, Gulam Khandaker

Dev Med Child Neurol . 2025 Mar 10. doi: 10.1111/dmcn.16272. Online ahead of print.

Aim: To explore the relationship between household poverty, inequality, and disability among children in rural Bangladesh.
Method: This was a matched case-control study in Shahjadpur, northern Sirajganj, Bangladesh. Children aged younger than 18 years with disabilities (i.e.
Cases: those with cerebral palsy, spina bifida, hydrocephalus, muscular dystrophy, spinal cord injury, amputation, club foot, cleft lip or palate, trauma or burn-related injury or impairment, congenital deformity, genetic condition, and visual, hearing, and speech impairments) and age-, sex-, and location-matched children without disabilities (i.e. controls) were recruited. Cases were identified using the key informant method. Household poverty likelihood and socioeconomic status (SES) were assessed using a validated poverty scorecard. Descriptive and inferential analyses were completed.
Results: Between October 2017 and February 2018, 1274 cases and 1303 controls were recruited (median age at assessment 9 years 10 months [interquartile range 6 years 0 months-13 years 7 months] and 9 years 10 months [5 years 8 months-12 years 0 months] respectively). The household poverty likelihood was 7% higher among cases than controls ($p < 0.001$). Parental employment, family income, and school enrolment rate were significantly lower among cases than controls especially in the families with low SES. Both underweight and stunting were significantly higher among cases than controls ($p < 0.001$ for both). Receipt of rehabilitation services and health-care seeking from formal sectors were significantly lower among cases from families with low SES than high SES (60% vs. 71%, $p = 0.03$; 10% vs. 33%, $p < 0.001$ respectively).
Interpretation: Our findings are crucial to develop interventions and reduce the inequalities between children with and without disabilities in low-resource settings such as Bangladesh as highlighted in the global agenda of the Sustainable Development Goals.

PMID: 40059507

14.The state of evidence on the health outcomes and support needs of family caregivers of children with Cerebral Palsy in Sub-Saharan Africa: a scoping review

Melkitu Melak, Afolasade Fakolade, Solomon Mekonnen, Adhanom Baraki, Amanda Ross-White, Beata Batorowicz
Review Disabil Rehabil . 2025 Mar 7:1-16. doi: 10.1080/09638288.2025.2472984. Online ahead of print.

Purpose: In Sub-Saharan Africa (SSA), caregivers of children with Cerebral Palsy (CP) face multidimensional challenges. However, there is a lack of comprehensive review of the available research on the health outcomes and support needs of family caregivers of children with CP.This scoping review aimed to identify the breadth and nature of research evidence on the health outcomes and support needs of family caregivers of children with CP in SSA.
Materials and methods: This scoping review was conducted following the JBI methodology. Original studies written in English were included. Medline, Embase, CINAHL, PsycINFO, Web of Science, Scopus, Global Health, Cochrane, East African Medical Journal, and Africa Online Journals were searched. Data was analyzed descriptively.
Results: A total of 34 research articles were included, of which 64.7% (n = 22) were conducted in Ghana and 47% (n = 16) were qualitative studies. Caregivers had physical and psychological morbidities with financial, emotional, informational, and physical support needs.
Conclusion: Available research evidence indicated that caregiving contributed to negative health outcomes, with financial support being a pressing need. Future research should investigate the positive outcomes and inherent resources available to family caregivers of children with CP in SSA to inform the development of strength-based interventions..
Plain language summary
Caregiving for children with Cerebral Palsy (CP) was found to have adverse outcomes on the health of family caregivers of children with CP in Sub-Saharan Africa.Stigma, lack of assistive devices and transportation, inaccessible healthcare services and lack of accessible housing negatively influenced the health of family caregivers.To help alleviate the economic burden of caregiving, rehabilitation services could support family caregivers through home-based micro-enterprises that will generate income, caregiver and disability benefits, and assistance for essential therapies.Policymakers could prioritize the development of supportive national strategies and services to address the emotional, informational, and physical support needs of caregivers.
PMID: 40055874

15.Social development of girls with a physical disability during adolescence: Parent perspectives

Courtney S Streur, Jodi M Kreschmer, Mary E Crumbley, Jacqueline M Kaufman, Daniela A Wittmann, John F Bridges, Claire Z Kalpakjian

Rehabil Psychol . 2025 Mar 13. doi: 10.1037/rep0000610. Online ahead of print.

Purpose/objective: This study aims to investigate the parents' perspectives of the social experiences of their daughters with a physical disability during adolescence.
Research method/design: Parents of girls with a physical disability aged 7-26 were recruited through a combination of convenience, purposive, and snowball sampling. Semistructured interviews were conducted with respect to the experience of adolescence for their daughters. An interpretive phenomenological analysis was performed by three members of the research team with lived and clinical experience to identify superordinate and subordinate themes describing mother's perceptions of their daughter's social experiences during adolescence.
Results: Interviews were conducted with 21 mothers and mother-like figures of daughters (Mdnage = 11) with spina bifida (10), cerebral palsy (nine), spinal cord injury (one), and another physical disability (one). We identified six superordinate themes, each defined by several experiences. These include amplification of differences during puberty (increasing differences and self-consciousness regarding differences), barriers to peer friendships (lack of opportunities, difficulties relating to peers with disabilities, difficulties relating to peers without disabilities, and lack of comfort with peers), facilitators of peer relationships (family support, school environment, and social skills), romantic relationship interest (perceived age-appropriate interest, perceived immature interest, and lack of interest), romantic relationship opportunities (lack of opportunities, relationship experiences, and parental support), and stability of parent-child relationships (dependence on mothers, impact of disability, and desire for independence).
Conclusions/implications: Mothers perceived their daughters with a physical disability experience increased disability awareness and variable challenges with peer relationships during adolescence. Regardless of the disability characteristics, mothers felt their daughters struggled to fully relate to peers both with and without disabilities. (PsycInfo Database Record (c) 2025 APA, all rights reserved).
PMID: 40080606

16.Chinese herbal medicine for the treatment of children with cerebral palsy: a meta-analysis of randomized controlled trials with core herbs exploration

Ying-Yu Huang, Ya-Yun Cheng, Hsing-Yu Chen, Ren-Huei Fu, Yi-Jung Chang, Tsung-Hsien Yang

Front Pharmacol . 2025 Feb 26:16:1500095. doi: 10.3389/fphar.2025.1500095. eCollection 2025.

Introduction: Chinese herbal medicine (CHM) taken orally is frequently utilized to enhance functional ability and independence in cerebral palsy (CP); nonetheless, there is a lack of current evidence regarding the efficacy of oral CHM in treating CP. Additionally, the general complexities of CHM prescriptions often obscure the underlying mechanisms. Our study aims to assess the efficacy of oral CHM in treating CP, a meta-analysis will be conducted on randomized clinical trials (RCTs).
Materials and methods: We searched Cochrane Library, PubMed, Embase, Scopus, PubMed Central, ClinicalTrials.gov, and China National Knowledge Infrastructure (CNKI), from 1990 to 2022. The primary outcome was the improvement in Effectiveness rate (ER). The secondary outcome was the improvement of motor function (GMFM). Subgroup analysis and trial sequential analysis (TSA) were conducted to confirm results consistency. Core CHMs were investigated through system pharmacology analysis.
Results: Seventeen RCTs were analyzed, in which CHMs with Standard treatment (ST) were compared to ST alone. All participants were aged <11 years. More participants in the CHM group achieved prominent improvement in ER (RR: 1.21, 95% CI: 1.13-1.30, p-value < 0.001, I2 = 32%) and higher GMFM improvement (SMD: 1.49; 95% CI: 1.33-1.65, p-value < 0.001, I2 = 92%). TSA also showed similar results with proper statistical power. Core CHMs, such as Glycyrrhiza uralensis Fisch. Ex DC., Poria cocos (Schw.) Wolf, Paeonia lactiflora Pall., processed Rehmannia glutinosa (Gaertn.) DC., Astragalus mongholicus Bunge, and Angelica sinensis (Oliv.) Diels, exerted effects on immune modulation and metabolism systems. The subgroup analysis showed participants using core CHMs or longer CHM treatment duration, and studies enrolling CP with spastic or mixed type, or mild-to-moderate severity had better outcomes in CHM groups with less heterogeneity.
Conclusion: CHMs may have a positive impact on managing pediatric CP; however, the potential bias in study design should be improved.
Systematic review registration: Identifier CRD42023424754.
PMID: 40078275

17.Maternal Obesity and Neurodevelopment of the Offspring

Anna Eleftheriades, Sevasti Koulouraki, Antonios Belegrinos, Makarios Eleftheriades, Panagiota Pervanidou

Review Nutrients . 2025 Mar 2;17(5):891. doi: 10.3390/nu17050891.

Background: An increasing amount of evidence, derived from both human epidemiological studies and animal research, suggests that exposure to maternal obesity in utero is linked to adverse neurodevelopmental outcomes in the offspring. These can include attention deficit hyperactivity disorder, autism spectrum disorders, intellectual disability, and cerebral palsy.
Methods: A thorough search in Medline/PubMed and Google Scholar databases was performed by two independent reviewers in order to investigate the link between the exposure to maternal obesity and neurodevelopmental outcomes in the offspring. A list of keywords, including maternal obesity, maternal overweight, maternal diet, neurodevelopment, and neuropsychiatric disorders, was used in the search algorithm.
Results: The existing evidence regarding the potential mechanisms through which maternal obesity may impact offspring neurodevelopment and programming, such as inflammation, hormone dysregulation, alterations to the microbiome, and epigenetics, as well as evidence from animal studies, was summarized in this narrative review.
Conclusions: Maternal obesity seems to be overall associated with various neuropsychiatric and neurodevelopmental disorders. However, more robust data from future studies are needed to establish this association, which will take into account the role of potential confounders such as genetic factors and gene-environment interactions.
PMID: 40077761

18.Exploring the Characteristics and Utilization of General Practice Healthcare by Adults With Cerebral Palsy: A Systematic Review

Prue Morgan, Asfarina Zanudin

Review J Prim Care Community Health . 2025 Jan-Dec:16:21501319251320160. doi: 10.1177/21501319251320160. Epub 2025 Mar 12.

Background: Individuals with cerebral palsy (CP) experience acute and chronic health issues requiring lifespan primary care. This review aimed to investigate characteristics and utilization of general practitioner (GP) access by adults with CP. Secondary aims included exploring reasons prompting access, identifying interventions provided, and personal features affecting access.
Methods: Using systematic review methodology, 5 databases were searched using keywords relating to adults, CP, and primary care, relating to quantitative studies (January 2000-July 2024). Data was extracted, collated, and analyzed descriptively, with additional meta-analyses to estimate proportion of GP visits.
Results: Fifteen studies were included describing GP access by 6231 adults with CP. The proportion annually accessing a GP was 78% (95% CI = 69%-85%). The frequency of GP access ranged from 1.76 to 11.7 visits per year, increased with advancing age and disability severity. Comorbid intellectual disability and pain also increased GP attendance. Limited data was available reporting healthcare needs prompting GP access, and no interventions were described.
Conclusions: Advancing age, greater disability severity, comorbid intellectual disability, and pain may prompt increased GP access by adults with CP. Identification of reasons for seeking primary care, and interventions provided are required through data linkage studies to enhance lifespan care.
PMID: 40071833

19.Development and evaluation of an interactive home therapy technology for children with neuromotor disorders: exemplification of a design thinking approach

Marina Petrevska, F Virginia Wright, Selvi Sert, Elaine Biddiss

Disabil Rehabil . 2025 Mar 10:1-21. doi: 10.1080/09638288.2025.2462770. Online ahead of print.

Purpose: To describe the process of developing an interactive home therapy technology and evaluate its usability with children.
Materials and methods: Design thinking guided our technology development with knowledge holders. User- and theory-informed design needs were defined by empathizing with users through observation, interviews and literature review. Solutions were ideated through sketches that led to prototypes. Informal testing with knowledge holders was conducted before formal usability testing with 7 school-aged children (5 neurotypical, 2 with cerebral palsy). Children practiced exercises using the technology before completing a study-specific survey (5-point Likert scales and open-ended questions) that was analyzed using descriptive statistics and content analysis.
Results: Bootle Boot Camp, an interactive therapy game that enables clinicians to prescribe customized home exercise programs, was created. Through exercise videos, motion tracking, multimodal feedback that fades to summary, self-controlled form (i.e., star ratings) based on a child's performance, rewards and training resources, the game aims to promote safe and high-quality exercise according to design needs. Children found feedback helpful (mean 3.7/5) and audio cues easy to understand (mean 4.6/5). Users' recommendations to improve audio feedback delivery guided game refinements.
Conclusions: Application of the design thinking methodology supported robust end-user involvement that facilitated development of a user-friendly technology.
Plain language summary
Several interactive technologies have been used to support home movement practice for children with neuromotor disorders, however few are theory-driven, and most are unable to provide individualized feedback to facilitate safe and high-quality movement performance.Many gamification elements can be integrated into interactive therapy technologies to support user- and theory-informed needs.Involvement of knowledge holders is fundamental to optimizing potential end-user acceptance and to ensure technologies best meet the needs of the clinicians, clients and families that use them.
PMID: 40065546

20.Sampling representational plasticity of simple imagined movements across days enables long-term neuroprosthetic control

Nikhilesh Natraj, Sarah Seko, Reza Abiri, Runfeng Miao, Hongyi Yan, Yasmin Graham, Adelyn Tu-Chan, Edward F Chang, Karunesh Ganguly

Cell . 2025 Mar 6;188(5):1208-1225.e32. doi: 10.1016/j.cell.2025.02.001.

Abstract
The nervous system needs to balance the stability of neural representations with plasticity. It is unclear what the representational stability of simple well-rehearsed actions is, particularly in humans, and their adaptability to new contexts. Using an electrocorticography brain-computer interface (BCI) in tetraplegic participants, we found that the low-dimensional manifold and relative representational distances for a repertoire of simple imagined movements were remarkably stable. The manifold's absolute location, however, demonstrated constrained day-to-day drift. Strikingly, neural statistics, especially variance, could be flexibly regulated to increase representational distances during BCI control without somatotopic changes. Discernability strengthened with practice and was BCI-specific, demonstrating contextual specificity. Sampling representational plasticity and drift across days subsequently uncovered a meta-representational structure with generalizable decision boundaries for the repertoire; this allowed long-term neuroprosthetic control of a robotic arm and hand for reaching and grasping. Our study offers insights into mesoscale representational statistics that also enable long-term complex neuroprosthetic control.
PMID: 40054446