Cerebral palsy research news

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Interventions and Management

1.Strength and dexterity of less affected hand of children with unilateral cerebral palsy: a comparison study with normal peers

Mahmoud A Hassan, Emam H Elnegmy, Amira M El-Tohamy, Amira M Abd-Elmonem

Acta Neurol Belg 2024 Nov 14. doi: 10.1007/s13760-024-02683-x. Online ahead of print.

Background/aim: A key aspect of hand function is dexterity, which is described as fine voluntary movements used to manipulate small objects during a specific task. The contralateral hand in children with unilateral cerebral palsy (U-CP); is commonly referred to as a "good" and "unimpaired" hand, while others have noted that it has subtle limitations. Therefore, this study aimed to assess and compare between the strength and dexterity of less-affected hand of children with U-CP and the dominant hand of normal peers.
Methods: A sample of 120 volunteer children from both sexes and age ranged from 6 to 10 years participated in this study. Out of the 120 children, sixty were normal typically developing (TD) and sixty children with U-CP. Assessment of fine motor dexterity and grip and pinch strength were carried out by the Functional dexterity test (FDT) and Pneumatic squeeze Blub Dynamometer respectively.
Results: The results showed that there was a significant lower in pinch and grip strength ($p < 0.01$) and significant higher FDT scores of children with U-CP compared with that of TD children ($p = 0.001$). Moreover, there was a significant higher functional levels in TD children compared with that of children with U-CP ($p < 0.001$) with no significant difference between groups in penalty distribution ($p > 0.05$).
Conclusion: Children with U-CP underperformed with their less-affected hand than the dominant hand of TD age matched peers. Future researches on bilateral hand function may be used to determine the best rehabilitation interventions.

PMID: 39543019

2. Hip surveillance in cerebral palsy: Review of clinical practice in a tertiary children's hospital using electronic health record linkage

Alexandra Sorhage, Ngaire Susan Stott

J Paediatr Child Health 2024 Nov 13. doi: 10.1111/jpc.16721. Online ahead of print.

Background: Children with cerebral palsy (CP) can develop neuromuscular hip dysplasia (NHD) and radiographic surveillance is recommended, guided by gross motor function classification system (GMFCS) level. This study evaluated the clinical practice of hip surveillance for NHD in a children's hospital and risk factors for abnormal first and subsequent X-rays.
Method: Health data were extracted for 159 participants with CP, 98 male, 52 GMFCS level IV or V (birth years 2008-2018) and linked to electronic radiology datasets.
Results: The median age at diagnosis of CP was 18 months (1-96 months). Thirty-eight participants had X-rays prior to diagnosis and 10 (6%) had no X-ray. Seventy-nine of 111 children classified as GMFCS levels II to V (71%) met both 2008

and 2020 Australian Hip Surveillance Guidelines (AHSG) having the first hip X-ray by 24 months of age. Sixteen participants (11%) had abnormal first hip X-ray (subluxation or migration percentage >30% in 14; MP 90%-100% or dislocation in 2). Univariate analyses showed NHD (MP > 30%) or dislocation at first X-ray was associated with GMFCS IV or V (OR = 6.98 (2.12-22.94), P = 0.001); >4 months between diagnosis and first hip X-ray (OR = 5.60 (1.52-20.59), P < 0.0009) and more common in NZ Māori children than non-Māori children (OR = 3.71 (1.25-11.01), P = 0.012).
Conclusion: Surveillance for NHD did not follow guidelines in almost a third of children, with delays in screening associated with greater risk of NHD at first X-ray. Inequities found for Indigenous NZ Māori children with CP require further investigation and stakeholder consultation.

PMID: 39535320

3. Muscle spindle receptors and their impact on Parkinson´s disease and Cerebral Palsy subjects

Else Marie Bartels, Adrian Harrison

J Muscle Res Cell Motil 2024 Nov 14. doi: 10.1007/s10974-024-09682-8. Online ahead of print.

Abstract
In some neurological conditions, like Parkinson's disease (PD) and Cerebral Palsy (CP), as well as with ageing, muscle spindles have been mentioned as participating in the pathological response of observed muscles. The aim of this review has therefore been to examine what is known about muscle spindle receptors, their function and how they are involved in regulating precise muscle movement in relation to these two conditions. Data from acoustic myography (AMG) studies with healthy controls (HC), CP and PD subjects have been re-examined with a view to identifying possible effects of changes in muscle movement which could be related to muscle spindle receptor function. Studies of muscle spindles have shown that during shortening and lengthening contractions the fusimotor system is activated differently with different discharge frequencies and sensitivities. With increasing age comes a loss of precise proprioception, something that coincides with a change in the AMG E-score towards lower values, indicating a reduced level of coordination and efficiency of muscle use. With PD and CP there is likewise a documented decrease in proprioception, also showing lower E-values than age-matched HC subjects. We conclude that the decrease in proprioception observed in these subjects must be partly due to a change in the muscle spindle / C-centre feedback system.

PMID: 39541089

4. Motor training for young children with cerebral palsy: A single-blind randomized controlled trial

No authors listed

Dev Med Child Neurol 2024 Nov 16. doi: 10.1111/dmcn.16192. Online ahead of print

No abstract available

PMID: 39548765

5. Comparison of Percutaneous Versus Open Hamstring Lengthening in Patients of Spastic Diplegic Cerebral Palsy - A Randomized Controlled Trial

Syed Faisal Afaque, Ajai Singh, Vikas Verma, Suresh Chand, Udit Agrawal, Anil Kumar Gupta

J Orthop Case Rep 2024 Nov;14(11):263-267. doi: 10.13107/jocr.2024.v14.i11.4988.

Introduction: Cerebral palsy (CP) often manifests with crouch gait due to hamstring spasticity, necessitating surgical intervention like hamstring lengthening surgery. Percutaneous techniques are emerging as an alternative to traditional open approaches in orthopedic surgeries. Objectives: This randomized controlled trial aimed to compare the outcomes of percutaneous hamstring lengthening (pHSL) versus open hamstring lengthening (oHSL) in pediatric patients with spastic diplegic CP, focusing on improvements in gait and knee function.
Materials and methods: One hundred children diagnosed with spastic diplegic CP were randomized into pHSL (n = 50) and oHSL (n = 50) groups. Surgical procedures were performed using single-event multilevel surgery techniques. Pre-operative and post-operative assessments included range of motion, popliteal angle, gross motor function classification system (GMFCS) score, and gait analysis (functional independence measure [FIM], observational gait scale [OGS], physician gait scale). Statistical analyses were conducted using Statistical Packages for the Social Sciences v25.

Results: Both pHSL and oHSL groups showed significant improvements in popliteal angle and GMFCS scores postoperatively ($P < 0.001$ within each group). However, there were no significant differences between the groups in terms of these outcomes ($P > 0.05$). FIM, OGS, and physician gait scale also showed comparable improvements between groups ($P > 0.05$).
Conclusion: pHSL is as effective as oHSL in improving gait and knee function in pediatric patients with spastic diplegic CP. The percutaneous approach offers a safe and efficient alternative to traditional open surgery, potentially minimizing muscle damage and promoting quicker recovery.

PMID: 39524285

6. Factor analysis of the Gait Outcomes Assessment List's goal questions: A new method to measure goal prioritization in ambulatory individuals with cerebral palsy

No authors listed

Dev Med Child Neurol 2024 Nov 16. doi: 10.1111/dmcn.16191. Online ahead of print.
No abstract available

PMID: 39548766

7. A life course perspective on mental disorders and psychopharmacologic drug use among persons living with cerebral palsy

Anna Linder, Johan Jarl, Kristina Tedroff Eur

J Paediatr Neurol 2024 Nov 4:53:144-154. doi: 10.1016/j.ejpn.2024.11.001. Online ahead of print.

Abstract
In this study, we investigated the prevalence of mental disorders and the use of psychopharmacologic drugs among individuals with cerebral palsy (CP). We studied how the association between CP and mental illness develops over the life course (between ages 5 and 65 years), and how it varies across disability specific factors (intellectual disability, gross motor function and communicative ability). We used logistic regression models on a longitudinal matched case-control data material on all persons with CP in Sweden linked to several administrative registers including, the national patient registers and the pharmaceutical registers. Our results showed that the probability of being diagnosed with mental disorders and being dispensed psychopharmacologic drug was significantly higher among persons with CP compared to persons without CP across the different outcomes [OR = 1.52-4.7]. For some mental and neurodevelopmental disorders including sleep disorders, autism, and ADHD, and for the use of anxiolytics and sedatives, there was a sizeable gap already in childhood. However, the excess burden of mental illness appeared to grow over the life course, indicating that adults with CP may be a particularly disadvantaged group. Diagnosis for mental disorders and dispensation for psychopharmacologic drugs were not consistent with respect to disability specific factors, especially communicative and intellectual function, which indicates the need for systematic approaches in the mental health care of individuals with CP.

PMID: 39514945

8. [Effects of Jin's three-needles therapy combined with low-frequency repetitive transcranial magnetic stimulation on sleep disorders and EEG in children with spastic cerebral palsy]

Shixian Liu, Meijun Zhu, Yun Li

Randomized Controlled Trial Zhongguo Zhen Jiu 2024 Nov 12;44(11):1267-72. doi: 10.13703/j.0255-2930.20231219-k0004.

Abstract in English, Chinese

Objective: To investigate the effects of Jin's three-needles therapy combined with low-frequency repetitive transcranial magnetic stimulation (rTMS) on sleep disorders and EEG activity in children with spastic cerebral palsy (CP).
Methods: By using stratified randomization method, 100 children of spastic CP with sleep disorders were randomly assigned to a control group and an observation group, with 50 cases in each group. The patients in the control group were treated with medication, comprehensive rehabilitation training, and low-frequency rTMS, while the patients in the observation group were treated with Jin's three-needles therapy in addition to the interventions given to the control group. Acupoints selected included temporal three needles, brain three needles, intelligence three needles, four spirits needles, and bilateral Ganshu (BL 18), Shenshu (BL 23), Shenmai (BL 62), and Zhaohai (KI 6). Treatment was given once daily, five times a week, for 12 weeks. The

Pittsburgh sleep quality index (PSQI) and children's sleep habits questionnaire (CSHQ) scores, modified Ashworth grade, Peabody developmental motor scales-2 (PDMS-2) score, and relative power values of δ, θ, β1, and β2 frequency bands in EEG were observed before and after treatment in both groups. Treatment safety was also evaluated.
Results: Compared before treatment, PSQI and CSHQ scores were decreased in both groups after treatment (P<0.05), with lower scores in the observation group than the control group (P<0.05). The modified Ashworth grade showed improvement (P<0.05), with better results in the observation group (P<0.05). PDMS-2 scores were increased in all dimensions (P<0.05), with higher scores in the observation group (P<0.05). Relative power values of δ and θ frequency bands in EEG were decreased (P<0.05), with lower values in the observation group (P<0.05), while relative power values of β1 and β2 frequency bands were increased (P<0.05), with higher values in the observation group (P<0.05). Children in both groups did not occurred obvious adverse reactions.
Conclusion: Jin's three-needles therapy combined with low-frequency rTMS can effectively improve sleep disorders, spasticity and motor function, regulate EEG activity in children with spastic CP and sleep disorder, and have good safety.

PMID: 39532443

9. Visual inspection time as an accessible measure of processing speed: A validation study in children with cerebral palsy

Jacqueline N Kaufman, Marie Van Tubbergen, Jacobus Donders, Seth Warschausky

J Int Neuropsychol Soc 2024 Nov 13:1-7. doi: 10.1017/S1355617724000389. Online ahead of print.

Objective: This study examined the validity of a visual inspection time (IT) task as a measure of processing speed (PS) in a sample of children with and without cerebral palsy (CP). IT tasks measure visualization speed without focusing on the motor response time to indicate decision making about the properties of those stimuli.
Methods: Participants were 113 children ages 8-16, including 45 with congenital CP, and 68 typically developing peers. Measures were a standard visual IT task that required dual key responding and a modified version using an assistive technology button with response option scanning. Performance on these measures was examined against traditional Wechsler PS measures (Coding, Symbol Search).
Results: IT performance shared considerable variance with traditional paper-pencil PS measures for the group with CP, but not necessarily in the typically developing group. Concurrent validity was found for both IT task versions with traditional PS measures in the group with CP. IT classification accuracy for lowered PS showed modest sensitivity and good specificity particularly for the modified IT task.
Conclusions: As measures of PS in children with CP who are unable to validly participate in traditional PS tasks, IT tasks demonstrate adequate concurrent validity and may serve as a beneficial alternative measure of PS in this population.

PMID: 39534906

10. The Case for Parent-Implemented Programs to Mitigate Musculoskeletal Complications in Children With Severe Cerebral Palsy in Resource-Limited Settings

Shayne R van Aswegen, Mark T Richards, Brenda M Morrow

Glob Health Sci Pract 2024 Nov 11. doi: 10.9745/GHSP-D-23-00463. Online ahead of print.
No abstract available

PMID: 39528300

11. Functioning profile and related impairments of children and adolescents with cerebral palsy - PartiCipa Brazil preliminary results

Paula S C Chagas, Alana G Lemos, Kênnea M A Ayupe, Aline M Toledo, Ana Cristina R Camargos, Egmar Longo, Rosane L S Morais, Hércules R Leite, Robert J Palisano, Peter Rosenbaum, Angélica C S F Romeros, Amanda L O Lima, Déborah E Fontes, Elton D D Magalhães, Jaíza M M Silva, Maria Luíza F Alves, Rayane F L Monteiro, Ana Carolina de Campos, Rafaela S Moreira Multicenter Study

BMC Pediatr 2024 Nov 11;24(1):719. doi: 10.1186/s12887-024-05210-2.

Background: Limited information is available about functioning and related impairments of children and adolescents with

Cerebral Palsy (CP) in low- and middle-income countries (LMIC) like Brazil. The aim of this study is to describe the characteristics, functioning, and impairments of Brazilian children and adolescents with CP.
Methods: Cross-sectional preliminary study as part of the PartiCipa Brazil multicentered cohort study. Families of children and adolescents with CP from Brazil, 4 months to 15 years, were enrolled. They responded to an online survey with questions about their child's health condition, impairments, contextual factors, and functioning according to the Gross Motor Function Classification System (GMFCS) and the Manual Ability Classification System (MACS). Data were described as frequencies, percentages, means, and standard deviations, according to age bands.
Results: Of the 404 participants (6.5±3.6 years) enrolled in this preliminary analysis, 54.7% are male, 90.4% under 12 years of age, 77.7% have bilateral CP, 49% in GMFCS levels IV and V, and 50.7% in MACS levels II and V. Most participants are from Southeast (63.4%) and Centre-west (19.5%) of Brazil. Regarding the impairments and functioning limitations: 1 in 2 did not talk; 1 in 2 has epilepsy; 2 of 5 reports pain, 1 of 4 has visual impairments, 3 out of 5 did not feed themselves, 1 out of 20 has a hearing impairment and 1 of 4 did not go to school.
Conclusion: This first preliminar Brazilian study shows a high prevalence of children at MACS levels II and V and GMFCS levels IV and V, representing almost half of the group, indicating more impairments and limitations than children/adolescents from high-income countries. This study provides a preliminary deeper understanding of the key impairments and limitations in activities among children and adolescents with CP from various Brazilian regions.

PMID: 39529069

12. Preterm Brain Injury: Mechanisms and Challenges
Michael J Beacom, Alistair J Gunn, Laura Bennet Review
Annu Rev Physiol 2024 Nov 12. doi: 10.1146/annurev-physiol-022724-104754. Online ahead of print.
Abstract
Preterm fetuses and newborns have a high risk of neural injury and impaired neural maturation, leading to neurodevelopmental disability. Developing effective treatments is rather challenging, as preterm brain injury may occur at any time during pregnancy and postnatally, and many cases involve multiple pathogenic factors. This review examines research on how the preterm fetus responds to hypoxia-ischemia and how brain injury evolves after hypoxia-ischemia, offering windows of opportunity for treatment and insights into the mechanisms of injury during key phases. We highlight research showing that preterm fetuses can survive hypoxia-ischemia and continue development in utero with evolving brain injury. Early detection of fetal brain injury would provide an opportunity for treatments to reduce adverse neurodevelopmental outcomes, including cerebral palsy. However, this requires that we can detect injury using noninvasive methods. We discuss how circadian changes in fetal heart rate variability may offer utility as a biomarker for detecting injury and phases of injury.

PMID: 39532110

13. Approaching the paradoxical relationship between hypertensive disorders of pregnancy and cerebral palsy among infants born very preterm with very low birth weight

Makiko Abe, Hisatomi Arima Editorial

Hypertens Res 2024 Nov 14. doi: 10.1038/s41440-024-02007-9. Online ahead of print.

No abstract available

PMID: 39543425

14. Postnatal depressive symptoms in mothers of infants at high risk of cerebral palsy: the role of delayed infant communicative development

Katrine Røhder, Julie Enkebølle Hansen, Mette Skovgaard Væver

Disabil Rehabil 2024 Nov 11:1-8. doi: 10.1080/09638288.2024.2425745. Online ahead of print.

Purpose: Recent diagnostic advantages enable detection of cerebral palsy (CP) in infants before five months of age. Parents of children with CP often face mental health problems, but specific knowledge for infancy is needed. In this study, depressive symptoms in mothers of 16-week-old infants and associations with infant development were investigated.
Materials and methods: This cross-sectional study involves 56 families, 22 high-risk and 34 infants without risk of CP. High-risk-CP was identified following international clinical guidelines. We assessed infant cognitive and language development using the Bayley-III and motor development using the Alberta Infant Motor Scale. Maternal depressive symptoms were self-reported using the Edinburgh Postnatal Depression Scale.

Results: Mothers of CP high-risk infants were 15.6 times more likely to experience risk of postnatal depression compared to mothers of infants without risk. Additionally, linear regression analyses showed that having an infant at high-risk of CP (β = .359, p = .006) and delayed language development (β = -0.510, p < .001) were associated with increased maternal depressive symptoms.
Conclusions: We recommend systematic screening of postnatal depressive symptoms following detection of high-risk-CP in infants. Early interventions could include a mother-infant interactional component to support caregivers in interpreting and responding to infant communicative cues.
Plain language summary
Clinicians should pay attention to the high risk of postnatal depression among parents of infants at high risk of cerebral palsy and offer treatment that supports parental well-being and parent sensitivity.Having an infant with delayed language development places parents at greater risk of depression.Early cerebral palsy-specific interventions should include a parent-infant interaction component to support parents in interpreting and responding to infant communicative signals.

PMID: 39526589

15. Cerebral palsy as a childhood-onset neurological disorder caused by both genetic and environmental factors

Nandini G Sandran, Nadia Badawi, Jozef Gecz, Clare L van Eyk

Review Semin Fetal Neonatal Med 2024 Nov 7:101551. doi: 10.1016/j.siny.2024.101551. Online ahead of print.

Abstract

Cerebral palsy (CP) is a clinical term used to describe a spectrum of movement and posture disorders resulting from non-progressive disturbances in the developing fetal brain. The clinical diagnosis of CP does not include pathological or aetiological defining features, therefore both genetic and environmental causal pathways are encompassed under the CP diagnostic umbrella. In this review, we explore several genetic causal pathways, including both monogenic and polygenic risks, and present evidence supporting the multifactorial contributions to CP. Historically, CP has been associated with various risk factors such as pre-term birth, multiple gestation, intrauterine growth restriction (IUGR), maternal infection, and perinatal asphyxia. Thus, we also examine genetic predispositions that may contribute to these risk factors. Understanding the specific aetiology of CP enables more tailored treatments, especially with the increasing potential for early genetic testing.

PMID: 39523172

16. The circular RNA circNFIX regulates MEF2C expression in muscle satellite cells in spastic cerebral palsy

Brigette Romero, Parsa Hoque, Karyn G Robinson, Stephanie K Lee, Tanvi Sinha, Amaresh Panda, Michael W Shrader, Vijay Parashar, Robert E Akins, Mona Batish

J Biol Chem 2024 Nov 12:107987. doi: 10.1016/j.jbc.2024.107987. Online ahead of print

Abstract

Cerebral palsy (CP) is a pediatric onset disorder with poorly understood molecular causes and progression, making early diagnosis difficult. Circular RNAs (circRNAs) are regulatory RNAs that show promise as biomarkers in various diseases but the role of circRNAs in CP is beginning to be understood. This study identified the role of circNFIX in regulating the expression of MEF2C, an important transcription factor for sarcomere development. We found that circNFIX is downregulated in the muscle cells of individuals with CP, and its localization shifts towards the nucleus as visualized using single molecule resolution imaging. The decreased expression of circNFIX, MEF2C, and MEF2C targets persisted throughout myoblasts to myotubes differentiation, and in the skeletal muscle tissue. Bioinformatic and experimental validation confirmed that circNFIX acts as a sponge for miR373-3p, a microRNA that represses MEF2C translation. In normal muscle, circNFIX de-represses MEF2C translation by sponging miR373-3p, allowing for normal sarcomere generation. In CP, reduced circNFIX expression results in loss of miRNA sponging, leading to lower MEF2C expression and downregulation of sarcomere genes, potentially causing shortened and dysfunctional muscle fibers. Knockdown of circNFIX (KD) reduced myogenic capacity of myoblasts to fuse and form myotubes similar to CP cells evident from the lower fusion index in CP and KD as compared to control myotubes. This the first study reporting reduction of MEF2C in CP and single molecule resolution imaging of circNFIX's subcellular distribution and its role in CP, suggesting circNFIX as a potential therapeutic target and biomarker for early CP diagnosis.

PMID: 39542245