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Interventions and Management

1. PROPENSIX: pressure garment therapy using compressive dynamic Lycra® sleeve to improve bi-manual performance in unilateral cerebral palsy: a multicenter randomized controlled trial protocol

A Gerard, M Toussaint-Thorin, Y Mohammad, G Letellier, S Fritot, S Masson, A Duhamel, C Donskoff, Y Zagame, L Beghin, L Gottrand

Trials. 2022 Feb 5;23(1):117. doi: 10.1186/s13063-022-06041-1.

Background: Upper limb impairment affects activity and participation in children with unilateral cerebral palsy (UCP). Pressure garment therapy (PGT) using compressive dynamic Lycra® garments is an innovative intervention proposed for the management of cerebral palsy consequences. The PROPENSIX study aims to evaluate the efficacy of a therapy using a Lycra® sleeve as compared to a placebo sleeve to improve bi-manual performance measured by the Assisting Hand Assessment (AHA) in children with unilateral cerebral palsy. **Methods:** The PROPENSIX trial is a multicenter, prospective, placebo-controlled, double-blinded, randomized study. One hundred children with UCP, aged from 5 to 10, are randomly assigned as soon as they are recruited in a 1:1 ratio to perform usual daily activities, especially activities involving bimanual performances, with Lycra® sleeve or placebo sleeve during 6 months. The primary endpoint is the change in bimanual performance from inclusion to 6 months, evaluated by AHA. The secondary endpoints evaluate changes from inclusion to 6 months in other dimensions of the International Classification of Functioning (ICF), upper limb movement capacity assessed by Quality of Upper Extremity Skill Test (QUEST), and health-related quality of life evaluated by Pediatric Quality of Life Inventory 3.0 Cerebral Palsy Module (PedsQLTM 3.0 CP Module) and in body structures and functions domain assessed by neuro-orthopedic examination and somatosensory evoked potentials (SEP). **Discussion:** The PROPENSIX study is the largest randomized controlled trial (RCT) aiming to evaluate the efficacy of a PGT using compressive dynamic Lycra® sleeve in UCP. Enhancement of children's bimanual performance at the end of the 6 months wear of the Lycra® sleeve should improve evidence regarding this type of treatment and expand discussion about their recommendation in clinical practice. Data from secondary outcomes assessments should bring interesting arguments to discuss the Lycra® sleeve action on mobility, tonus, and sensory impairments in children with unilateral cerebral palsy. Trial registration: ClinicalTrials.gov NCT02086214 . Retrospectively registered on March 13, 2014 TRIAL STATUS: Study start date: December 2012. Recruitment status: completed. Primary completion date: April 2021. Estimated study completion date: December 2022. Protocol version 10 (date: February 2018).

PMID: [35123557](https://pubmed.ncbi.nlm.nih.gov/35123557/)

2. Comparison of outcome between operative treatment and constraint-induced movement therapy for forearm and wrist deformities in cerebral palsy. A randomized controlled trial

T Tawonsawatruk, S Prusmetikul, T Kanchanathepsak, T Patathong, K Klaewkasikum, P Woratanarat, M Panuwannakorn, S Vongpipatana

Hand Surg Rehabil. 2022 Feb 3;S2468-1229(22)00062-7. doi: 10.1016/j.hansur.2021.12.012. Online ahead of print.

Several treatment strategies for upper extremity deformities in cerebral palsy have been studied for their effectiveness in terms of function and quality of life. There are a few comparative studies between nonoperative and operative management for upper extremity deformities. This study aimed to compare the outcomes between conservative methods using constraint-induced movement therapy (CIMT) and operative methods using pronator teres rerouting, flexor carpi ulnaris transfer to extensor carpi radialis brevis (FCU transfer to ECRB) and fractional lengthening in cerebral palsy patients with forearm pronation and wrist flexion contracture. A total of 19 participants aged 7-15 years were randomized to either CIMT or surgery. The primary endpoint was changes in Shriners Hospital Upper Extremity Evaluation (SHUEE) functional score. Secondary endpoints comprised range of motion, Volkmann's angle, and the Pediatric Outcomes Data Collection Instrument (PODCI). At 1-year follow-up, there was no significant difference between the nonoperative and operative groups in any SHUEE dimensions, range of motion or PODCI. However, there was significant improvement in Volkmann's angle in the operative group compared to the CIMT group: CIMT = 11.11 ± 9.92 , surgery = -13.00 ± 4.72 ; $p = 0.04$ (95% CI = 1.68-46.54). Operative treatment provided more improvement in wrist posture, represented by Volkmann's angle, in cerebral palsy patients. However, SHUEE, range of motions and PODCI were comparable between the CIMT and operative groups.

PMID: [35124285](#)

3. Clinical Issues in Indication, Correction, and Outcomes of the Surgery for Neuromuscular Scoliosis: Narrative Review in Pedicle Screw Era

Hak Sun Kim, Ji Won Kwon, Kun-Bo Park

Neurospine. 2022 Jan 29. doi: 10.14245/ns.2143246.623. Online ahead of print.

Surgical treatment for neuromuscular scoliosis has evolved with pedicle screw instrumentation and the improvement of perioperative management. We aimed to review recent papers related to posterior surgical correction with a pedicle screw system for neuromuscular scoliosis, particularly cerebral palsy and muscular dystrophy, in terms of indication, correction method, and outcomes. The most remarkable change was the posterior-only operation with all pedicle screw fixations. With this change, operation time, blood loss, and postoperative complications decreased. Furthermore, spinal osteotomy could be performed with the pedicle screw system for severe scoliosis. S2-alar-iliac screws demonstrated favorable outcomes in terms of stability and complication, but a question remains about saving the mobile segment for sitting balance, interaction between the hip and spine, effect to the sagittal balance, and proximal junctional problem. The quality of life improvement was more definite in patients with cerebral palsy. The improvement of respiratory function in Duchenne muscular dystrophy was not certain, although an increase of spinal height, thoracic cavity size, and absolute forced vital capacity have been reported. Further prospective studies or randomized clinical trials are needed to evaluate the long-term outcomes of lumbosacral fixation, preservation of the lumbosacral joint, or functional improvement considering the different etiology.

PMID: [35130428](#)

4. Deep Brain Stimulation in childhood-onset dystonia due to brain pathology. A long-term study

Romina Mandarano, Alberto Danieli, Elisa Petacchi, Chiara Di Pede, Massimo Mondani, Maria Teresa Armellin, Dina Facchin, Andrea Martinuzzi

Eur J Paediatr Neurol. 2022 Feb 1;37:62-67. doi: 10.1016/j.ejpn.2022.01.014. Online ahead of print.

Background: Pallidal Deep Brain Stimulation (DBS) is an established treatment option for isolated, inherited or idiopathic dystonia, however data on its safety and efficacy in other forms of dystonia are more limited. Objectives: Retrospective analysis of motor and non-motor outcomes in pediatric onset refractory dystonia due to static or progressive brain disorders in a cohort of patients with a DBS treatment duration ≥ 12 months. Methods: Multidisciplinary assessments including standardised scales/tests of motor function, pain, quality of life, cognition and language were carried out before implantation and longitudinally afterwards. Results: 9 patients were included, 7 had cerebral palsy. Mean age at implantation was $209 \text{ months} \pm 156$, mean treatment duration 84 ± 37 months. DBS was well tolerated and positively affected both motor and non-motor functions. In particular, statistically significant improvements were documented in Burke-Fahn-Marsden Scale scores (-19.9% $p = 0.01031$) at 12 months and in long-term quality of life ($+28.6\%$, $p = 0.0292$). Conclusions: DBS may be a useful treatment option in generalized dystonia associated with brain pathology. Even when the motor benefits are limited, improvements in

quality of life and non-motor functions, or the possible prevention of serious dystonia-related complications, may have a significant impact on overall clinical status.

PMID: [35124541](#)

5. Letter to the Editor and reply concerning: Hip development after surgery to prevent hip dislocation in cerebral palsy: a longitudinal register study of 252 children

Terje Terjesen, Philippe Wagner, Gunnar Hägglund

Acta Orthop. 2022 Feb 4;93:294-295. doi: 10.2340/17453674.2022.2030.

No abstract available

PMID: [35129202](#)

6. Long-term Outcomes of Talonavicular Arthrodesis for the Treatment of Planovalgus Foot in Children With Cerebral Palsy

Ana Ramírez-Barragán, María Galán-Olleros, Raquel Maroto, Rosa M Egea-Gámez, Ignacio Martínez-Caballero

J Pediatr Orthop. 2022 Feb 8. doi: 10.1097/BPO.0000000000002081. Online ahead of print.

Background: Planovalgus foot (PVF) in cerebral palsy (CP) tends toward progression and rigidity in adolescence, especially in patients with greater functional impairment. Deformity at the talonavicular joint justifies the use of talonavicular arthrodesis as a corrective surgical technique. This study aims to assess patient or caregiver functional satisfaction and radiographic outcomes of talonavicular arthrodesis for PVF in CP patients with assisted ambulation in the long-term. **Methods:** Retrospective comparative study of level III and level IV pediatric CP patients who underwent talonavicular arthrodesis for PVF between 1999 and 2010 as part of multilevel surgery and with a minimum follow-up of 10 years. Radiologic correction at 10 years was compared with preintervention values, and functional impact at 10 years was measured by the foot function index (FFI); correlation between radiologic measurements and FFI were obtained, and complications were recorded. **Results:** Forty-nine PVFs in 25 patients with CP (72% level III and 28% level IV) were included; 52% were male. The patients had a median age of 12 years at the time of surgery (range: 11 to 15) and 23 years at the time of the study (21 to 26). Significant ($P<0.01$) pre-post radiologic improvements were obtained in Meary angle ($37.86\pm 10.7/8.37\pm 5.5$ degrees), calcaneal pitch ($3.20\pm 8.1/13.22\pm 5.6$ degrees), lateral talocalcaneus angle ($42.18\pm 12.1/25.29\pm 2.9$ degrees), Moreau-Costa-Bartani angle ($167.04\pm 8/146.12\pm 7.1$ degrees), talus-first metatarsal angle ($27.92\pm 13.9/9.69\pm 4.4$ degrees), anteroposterior talocalcaneal angle ($37.61\pm 7.4/22.61\pm 2.4$ degrees), and talus coverage angle ($37.04\pm 11.11/2.45\pm 2.5$ degrees). At 10 years postoperatively, functional outcome measured with the FFI was satisfactory ($33.9\pm 15.2\%$) and the mean maximum pain was 3.04; 56% of cases had mild pain. All patients were able to wear an ankle-foot orthosis and 8 no longer needed the device. A significant correlation was found between the talofirst metatarsal angle and the FFI ($P=0.024$). There were 8% of cases with screw protrusion and 14% presented pseudarthrosis, most of them asymptomatic. **Conclusions:** The adequate functional outcome, as well as the persistence of long-term radiologic correction and acceptable number of complications, enables us to recommend talonavicular arthrodesis as an alternative treatment to consider in level III and level IV CP patients with PVF.

PMID: [35132016](#)

7. Genu Valgum After Distal Femur Extension Osteotomy in Children With Cerebral Palsy

Yen-Lyin Liou, Wei-Chun Lee, Hsuan-Kai Kao, Wen-E Yang, Chia-Hsieh Chang

J Pediatr Orthop. 2022 Feb 8. doi: 10.1097/BPO.0000000000002076. Online ahead of print.

Background: Distal femur extension osteotomy (DFEO) is a common treatment for knee flexion contracture and crouch gait in

patients with cerebral palsy (CP), but skeletally immature patients tend to develop genu valgum deformities after DFEO. This study aimed to report the tendency of valgus changes after DFEO and determine the risk factors for subsequent surgery for excessive genu valgum. Methods: This retrospective case-control study included 25 children with CP who underwent DFEO in 44 limbs for knee flexion contractures ≥ 15 degrees at a mean age of 11.0 years. Radiologic measurements included the anatomic lateral distal femoral angle (aLDFA), anatomic tibiofemoral angle (aTFA), medial proximal tibia angle, and plate-condyle angle, postoperatively and at the latest follow-up. Age, sex, preoperative knee flexion contracture angle, Gross Motor Function Classification System level, and radiographic measurements were compared between children with and without subsequent guided growth for genu valgum. Results: A significant valgus change was observed at the distal femur in the first postoperative year (aLDFA from 83.6 to 80.1 degrees, $P < 0.001$; aTFA from 176.1 to 172.5 degrees, $P < 0.01$; plate-condylar angle from 5.3 to 9.5 degrees, $P < 0.001$). Valgus changes occurred in 36 of the 44 limbs (82%) by an average of -4.6 degrees in the aLDFA, and subsequent guided growth was performed in 5 patients (20%). Guided growth for genu valgum was associated with a greater postoperative valgus angle (aLDFA: 78.0 vs. 84.9 degrees, $P < 0.01$) but not with age, Gross Motor Function Classification System level, or preoperative flexion contracture. Conclusions: Distal metaphyseal osteotomies and distally placed angled plates near the physis are associated with valgus changes following growth. We recommend making a slight varus alignment during DFEO to compensate for subsequent valgus changes.

PMID: [35132017](#)

8. Risk factors associated to musculoskeletal pathologies in athletes with cavus foot through baropodometric studies

S L Orozco-Villaseñor, J J Mayo goitia-Vázquez, I Miguel-Andrés, K D De la Cruz-Alvarado, R Villanueva-Salas

Acta Ortop Mex. Jul-Aug 2021;35(4):317-321.

Introduction: The cavus foot is a musculoskeletal pathology with an increase of the medial arch of the concavity of the foot. The etiology of the cavus foot is still enigmatic, it is related with neurologic conditions, Charcot-Marie-Tooth disease, Friedreich's ataxia, and cerebral palsy. The aim of this research was to analyze the plantar pressure distribution of the feet on young athletes with cavus foot. Material and methods: Eighty-three young athletes between nine and 20 years old, that presented cavus feet pathology were recruited. The mass and height average were 56.9 ± 12.36 kg and 1.61 ± 0.10 m respectively. Plantar pressure distribution of the feet was recorded during static conditions. The hindfoot and forefoot pressure were compared in each foot. Results: The plantar pressure distribution were categorized in three groups. In the first group the participants presented higher pressure in the hindfoot than forefoot, in the second group, the athletes showed similar pressure in the posterior and anterior region of the feet and in the last one, the subjects revealed higher pressure in the forefoot. To be considered in one of the three groups, the difference of pressure between the posterior and anterior part of the foot was established at 16%. Conclusion: Many musculoskeletal disorders in the human body are biomechanical in origin and related with foot anatomy. The cavus foot is a pathology with high prevalence in athletes and it is related with the mechanical forces over the feet during dynamic conditions.

PMID: [35139589](#)

9. To What Degree Does Limb Spasticity Affect Motor Performance in Para-Footballers With Cerebral Palsy?

Alba Roldan, Matías Henríquez, Aitor Iturricastillo, Daniel Castillo, Javier Yanci, Raul Reina

Front Physiol. 2022 Jan 24;12:807853. doi: 10.3389/fphys.2021.807853. eCollection 2021.

Spasticity is considered a contributor to hypertonia, frequently presented in people with cerebral palsy (CP), affecting muscle function and motor activities. In CP football, the classification system determines that this impairment is eligible for competitive para-sports due to the impact on activity limitation and sports performance. However, the relationship between this feature (i.e., spastic hypertonia) and performance determinants has not been explored yet. This study aimed to assess the association of clinical spasticity measurements with the performance of sport-specific tests used for classification purposes. Sixty-nine international footballers with CP voluntarily participated in this study. The Australian Spasticity Assessment Scale was used to measure spasticity in lower limbs muscle groups and activity limitation tests were conducted considering dynamic balance, coordination, vertical and horizontal jumps, acceleration, and change of direction ability. Low-to-moderate negative significant associations were found between the hip spasticity and measures of dynamic balance and dominant unipedal horizontal jump capacity. Additionally, moderate associations were reported between the knee spasticity and the non-dominant unipedal horizontal jump capacity and the change of direction actions with the ball. The ankle spasticity score reported small to moderate associations with the change of direction assessment without the ball and bipedal and dominant unipedal horizontal

jump capability. Finally, the total spasticity score only presented a significant association with horizontal jump performance. This is a novel study that provides evidence of the associations between an eligible neural impairment and relevant specific measures of activity limitation tests. These results suggest that the amount of spasticity according to each evaluated joint muscle group of the lower limbs presents a low-to-moderate significant relationship with determined measures of dynamic balance, coordination, horizontal jump, acceleration, and change of direction ability with and without the ball in international-level CP footballers. Further studies are necessary to elucidate the real contribution of neural and non-neural impairments related to hypertonia on fundamental sport-specific motor skills of para-footballers with CP.

PMID: [35140631](#)

10. Effects of voluntary exercise on muscle structure and function in cerebral palsy

Noelle G Moreau, Richard L Lieber

Review Dev Med Child Neurol. 2022 Feb 10. doi: 10.1111/dmcn.15173. Online ahead of print.

Skeletal muscles are required for functional movement and force production. While it is clear that cerebral palsy (CP) results in loss of muscle strength and bodily function, and that much of this loss is caused by injury to the central nervous system, muscle is a very plastic tissue that is also dramatically affected. In many studies, it is assumed that voluntary exercise will cause the muscle to respond in the same way that typically developing muscle does, but there are scarce data demonstrating that this is true. The purpose of this review is to briefly describe muscle architectural adaptation to various forms of exercise with specific reference to voluntary exercise performed in children with CP. Exercise itself is not generic but can vary by intensity, duration, and the exact nature of the muscle length change and velocity imposed during the exercise. Our goal is to stimulate discussion in this area by pointing out salient experimental variables and, ultimately, to improve activity and participation in children with CP.

PMID: [35142371](#)

11. Validation of actigraphy for sleep measurement in children with cerebral palsy

Bing Xue, Amy Licis, Jill Boyd, Catherine R Hoyt, Yo-El S Ju

Sleep Med. 2022 Jan 7;90:65-73. doi: 10.1016/j.sleep.2021.12.016. Online ahead of print.

Objectives: Sleep issues are common in children with cerebral palsy (CP), although there are challenges in obtaining objective data about their sleep patterns. Actigraphs measure movement to quantify sleep but their accuracy in children with CP is unknown. Our goals were to validate actigraphy for sleep assessment in children with CP and to study their sleep patterns in a cross-sectional cohort study. **Methods:** We recruited children with (N = 13) and without (N = 13) CP aged 2-17 years (mean age 9 y 11mo [SD 4 y 10mo] range 4-17 y; 17 males, 9 females; 54% spastic quadriplegic, 23% spastic diplegic, 15% spastic hemiplegic, 8% unclassified CP). We obtained wrist and forehead actigraphy with concurrent polysomnography for one night, and home wrist actigraphy for one week. We developed actigraphy algorithms and evaluated their accuracy (agreement with polysomnography-determined sleep versus wake staging), sensitivity (sleep detection), and specificity (wake detection). **Results:** Our actigraphy algorithms had median 72-80% accuracy, 87-91% sensitivity, and 60-71% specificity in children with CP and 86-89% accuracy, 88-92% sensitivity, and 70-75% specificity in children without CP, with similar accuracies in wrist and forehead locations. Our algorithms had increased specificity and accuracy compared to existing algorithms, facilitating detection of sleep disruption. Children with CP showed lower sleep efficiency and duration than children without CP. **Conclusions:** Actigraphy is a valid tool for sleep assessment in children with CP. Children with CP have worse sleep efficiency and duration.

PMID: [35123148](#)

12. Oral health in cerebral palsy: What makes propolis so special?

Fulvio A Scorza, Denise C Abranches, Antonio-Carlos G de Almeida, Carla A Scorza, Josef Finsterer

Spec Care Dentist. 2022 Feb 5. doi: 10.1111/scd.12700. Online ahead of print.

No abstract available

PMID: [35122669](#)

13. Oral health-related quality of life in children and adolescents with cerebral palsy: paired cross-sectional study

T de Castelo Branco Araújo, B R Nogueira, R F Mendes, R R P Júnior

Eur Arch Paediatr Dent. 2022 Feb 6. doi: 10.1007/s40368-022-00694-x. Online ahead of print.

Objectives: To evaluate the impact of oral health conditions on the Oral Health-Related Quality of Life (OHRQoL) in children and adolescents with Cerebral Palsy (CP) and compare with children and adolescents without CP.

Methods: This was a paired cross-sectional study, consisting of 121 children and adolescents with CP and 121 without CP, aged 6 to 14 years. Caregivers filled a socioeconomic-demographic and the Parental-Caregiver Perceptions Questionnaire (P-CPQ). Physical examination of the oral cavity assessed the dental caries experience, need for treatment, consequences of untreated dental caries, presence of dental trauma, bruxism and malocclusion. A descriptive analysis and Kruskal-Wallis and Mann-Whitney tests ($p < 0.05$) were performed. Variables with p values ≤ 0.20 in the bivariate analysis were included in the adjusted model analysis. Variables with a p value < 0.05 remained in the final Poisson Regression model. Results: Caries experience had a negative impact on the quality of life of both groups, with and without CP. Presence of gastroesophageal reflux and difficulty to opening the mouth also had a negative impact on the OHRQoL of the group with CP. Conclusion: Children and adolescents with CP suffered a greater negative impact on OHRQoL than individuals without CP. Difficulty in opening the mouth and the presence of GER had a negative effect on the quality of life of individuals with CP, while dental caries had a negative impact on the OHRQoL of children and adolescents of both groups.

PMID: [35124753](#)

14. Prevalence of depression and quality of life in primary caregiver of children with cerebral palsy

Swapnil P Sonune, Anil K Gaur, Anuradha Shenoy

J Family Med Prim Care. 2021 Nov;10(11):4205-4211. doi: 10.4103/jfmpc.jfmpc_70_21. Epub 2021 Nov 29.

Objective: Study the correlation of depression and quality of life (QoL) in primary caregivers (mothers) of children with cerebral palsy (CP). Methods: An observational cross-sectional study was conducted on a total of 203 primary caregivers (mothers) of children with CP. The depression and QoL in the caregivers were assessed using the Montgomery and Asberg Depression Rating Scale and World Health Organization Quality of Life Instrument (WHOQOL-BREF) (physical, psychological, social and environmental domains), respectively. The child's gross motor function level was determined using the Gross Motor Functional Classification System-Expanded and Revised (GMFCS-ER). The association of depression and QoL in mothers to functional limitation in children were assessed. For statistical methods, $P < 0.05$ was considered significant. Results: The severity of the depression showed a statistically significant negative correlation with the physical domain ($r = -0.498$, $P < 0.0001$), psychological domains ($r = -0.486$, $P < 0.0001$), social relationships ($r = -0.165$, $P = 0.019$) and environmental domains ($r = -0.195$, $P = 0.005$). The mean QoL domains scores showed a decreasing trend with increasing motor dysfunction of the child, with a statistical association for physical ($r = -0.327$, $P < 0.0001$) and psychological domains ($r = -0.440$, $P < 0.0001$). Out of all the baseline demographic factors, the child's age was a significant risk factor affecting the mother's QoL ($P = 0.041$). Conclusion: CP, being a debilitating disease, requires around-the-clock caregiving for the child. However, caregiving causes a significant impact on the QoL with increasing severity of depression among the mothers.

PMID: [35136790](#)

15. Development and initial validation of a scale for the situational recognition of the basic psychological needs

Panagiotis Varsamis, Georgios Katsanis, Eleni Iosifidou

Heliyon. 2022 Jan 21;8(1):e08786. doi: 10.1016/j.heliyon.2022.e08786. eCollection 2022 Jan.

Centered on the Basic Psychological Needs Theory, recent theoretical underpinnings were used and initial empirical processes were initiated to conceptualize, develop and validate a new questionnaire about how teachers shape instructional goals. In a first exploratory study, 188 university graduates and 211 in-service teachers from both the general and special education domains were recruited to recognize the basic psychological needs of an adolescent with physical and mild cognitive disability presented in a short video vignette. In the second confirmatory study, the sample consisted of 239 in-service teachers. According to the results, the new instrument demonstrated acceptable psychometric qualities. For instance, the goodness-of-fit indices CFI and NNFI were both good (1.00) in the confirmatory factor analysis. In both studies, the recognition of the basic psychological needs was involved in a series of statistically significant correlations with participants' intrinsic life goals ($R \geq .34$), state empathy ($R \geq .38$) and intrinsic instructional goals ($R \geq .51$). This preliminary research suggested that participants integrated the new concept in their intrinsic motivational style. Overall, the results highlight the importance of recognizing the basic psychological needs by including this construct both in research and practice.

PMID: [35128095](#)**16. Relationship between cerebral palsy severity and cognition, aids and education**

Monika Jaster, Joanna Schneider, Charlotte Metz, Elisabeth Walch, Angela M Kaindl

Minerva Pediatr (Torino). 2022 Feb 10. doi: 10.23736/S2724-5276.22.06357-1. Online ahead of print.

Background: Cerebral palsy (CP) refers to a non-progressive permanent lesion of the developing brain, which can manifest with motor function disability and various comorbidities and complications. However, there is little data on the correlation between motor and mental function in CP, as cognitive assessments are rarely the main focus of studies on children with CP. Methods: We studied a large cohort of 381 children and adolescents with CP. We analyzed the relationship between severity of CP and the presence of developmental disturbances (motor, motor-linguistic, global) including cognition, the number of aids and education. Results: We found a strong correlation between the severity of CP according to the Gross Motor Function Classification System (GMFCS) and developmental disturbances. In line with this finding, the number of aids per individual also correlated significantly with CP severity and the extent of developmental disturbance. Going beyond the number of aids most patients already received special education in kindergarten. Later, the type of schooling correlated significantly with severity of CP and developmental disturbance. While developmental disturbance and cognition correlated, this was not the case for CP severity and cognition. The latter indicates a wide range in individual manifestation and resources. Conclusions: Our data underline that cognition does not necessarily correlate with CP severity. Thus, in addition to the evaluation and treatment of motor deficits, cognitive assessment should be offered early-on to improve patient-centered counselling and support with respect to appropriate education.

PMID: [35142453](#)**17. High-risk neighborhoods and neurodevelopmental outcomes in infants born preterm**

Ogochukwu Y Nwanne, Michelle L Rogers, Elisabeth C McGowan, Richard Tucker, Raul Smego, Patrick M Vivier, Betty Vohr

J Pediatr. 2022 Feb 1;S0022-3476(22)00073-7. doi: 10.1016/j.jpeds.2022.01.042. Online ahead of print.

Objective: To study the association between neighborhood risk and moderate to severe neurodevelopmental impairment (NDI) at 22-26 months corrected age in children born at <34 weeks of gestation. We hypothesized that infants born preterm living in high-risk neighborhoods would have a greater risk of NDI, cognitive, motor, and language delay. Study design: We studied a retrospective cohort of 1291 infants born preterm from 2005-2016, excluding infants with congenital anomalies. NDI was defined as any one of the following: a Bayley Scales of Infant and Toddler Development-III Cognitive or Motor composite score <85, bilateral blindness, bilateral hearing impairment, or moderate-severe cerebral palsy. Maternal addresses were geocoded to identify census block groups and create high versus low neighborhood risk groups. Bivariate and regression

analyses were run to assess the impact of neighborhood risk on outcomes. Results: Infants from high-risk (N=538, 42%) and low-risk (N=753, 58%) neighborhoods were compared. In bivariate analyses, the risk of NDI, cognitive, motor, and language delay was greater in high-risk neighborhoods. In adjusted regression models, the risk of NDI (OR:1.43, CI:1.04, 1.98), cognitive (OR:1.62, CI:1.15, 2.28), and language (OR:1.58, CI:1.15, 2.16) delay was greater in high-risk neighborhoods. Breastmilk at discharge was more common in low-risk neighborhoods and was protective of NDI in regression analysis. Conclusion: High neighborhood risk provides an independent contribution to preterm adverse NDI, cognitive, and language outcomes. In addition, breast milk at discharge was protective. Knowledge of neighborhood risk may inform the targeted implementation of programs for socially disadvantaged infants.

PMID: [35120984](#)

18. Long-term neurodevelopmental outcome of neonates born at term with perinatal haemorrhagic stroke: A population-based study

Eszter Vojcek, Rózsa Gráf, Anna M László, Gyula Gyebnar, Istvan Seri

Dev Med Child Neurol. 2022 Feb 9. doi: 10.1111/dmcn.15149. Online ahead of print.

Aim: To assess the long-term neurodevelopmental outcome of neonates born at term diagnosed with perinatal haemorrhagic stroke (PHS) and investigate the associations among brain territorial involvement, clinical risk factors, and neurodevelopmental outcomes. **Method:** We conducted a population-based study enrolling 55 neonates born at term with PHS confirmed by magnetic resonance imaging born between 2007 and 2017. Long-term neurodevelopmental outcome was assessed using the Bayley Scales of Infant Development, Second Edition, the Brunet-Lézine test, and the Stanford-Binet Intelligence Scales, Fifth Edition. **Results:** Follow-up was available in 50 (91%) of the infants, at a median age of 60 months (interquartile range 35-88). Forty per cent of the infants developed according to population norms, and developmental disabilities were diagnosed less frequently among neonates with frontal lobe PHS. In a multivariable model, parietal lobe PHS increased the risk for cerebral palsy (odds ratio [OR] 6.7; 95% confidence interval [CI] 1.1-41.4) and cognitive impairment (OR: 23.6; 95% CI: 2.9-194.9), while the involvement of the thalamus and/or basal ganglia was associated with epilepsy (OR: 7.0; 95% CI: 1.3-37.7). Seizures on admission were associated with epilepsy (OR: 10.8; 95% CI: 1.8-64.3). Patients with PHS affecting multiple lobes had poor prognosis. **Interpretation:** Parietal lobe haemorrhage, the involvement of the thalamus/basal ganglia, PHS affecting multiple lobes, and seizures were independent predictors of chronic neurodevelopmental sequelae, suggesting that the stroke territorial involvement and clinical risk factors influence the outcome of PHS.

PMID: [35137402](#)

19. Diagnosis of Malnutrition in Children and Adolescents with Identified Developmental Disabilities (IDD) Using Subjective Global Nutrition Assessment (SGNA)

Shu Hwa Ong, Seong Ting Chen

J Trop Pediatr. 2022 Jan 7;68(1):fmac007. doi: 10.1093/tropej/fmac007.

Background: Children with identified developmental disabilities (IDD) experience a higher risk of growth retardation. Anthropometric indicator is one common objective measurement used to determine malnutrition in those children. A comprehensive nutritional assessment tool should be introduced to offer a more robust approach in understanding their nutritional problems. **Objective:** To determine the use of Subjective Global Nutrition Assessment (SGNA) as a nutrition assessment tool for children with IDD in comparison to the anthropometric indicators. **Methods:** This cross-sectional study was conducted in local community settings. IDD included in this study were autism spectrum disorder (ASD), Down syndrome (DS) and cerebral palsy (CP). SGNA and anthropometry measurements including weight, height, mid-upper arm circumference and triceps skinfolds were performed on 93 children with IDD (40 ASD, 26 DS and 27 CP) aged 5-18 years. Cohen's Kappa, sensitivity, specificity and its 95% confidence interval were calculated between SGNA and anthropometric indicators for the agreement in determining malnutrition status of the children. **Results:** SGNA identified a lower prevalence of malnutrition in children with IDD in comparison to the use of anthropometric indicators. SGNA obtained a moderate-to-fair agreement (above 80% agreement, except height-for-age parameter) and sensitivity (25.71-59.09%) against the use of a single anthropometric indicator in identifying the malnutrition status of the children. **Conclusions:** The use of SGNA as an adjunct to body mass index -for-age as an anthropometric measurement for diagnosing malnutrition in children and adolescents with IDD is recommended.

PMID: [35134248](#)

20. Cerebral palsy and sex differences in children: A narrative review of the literature

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In the last years, new evidence has increased the attention on sex differences in the development of children with cerebral palsy (CP). Males seem to present with a higher risk for severe motor impairment and in the response to surgical and rehabilitative interventions. The published data confirmed a higher incidence of CP in males than in females. The aim of this literature review was to evaluate the impact of the sex on the most important areas that characterized CP: motor function, comorbidities (pain, cognitive impairment, communications skills, epilepsy, sleep, and behavior), and the different kind of interventions.

PMID: [35138019](#)

21. Allosteric, and how to define and measure signal transduction

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Here we ask: What is productive signaling? How to define it, how to measure it, and most of all, what are the parameters that determine it? Further, what determines the strength of signaling from an upstream to a downstream node in a specific cell? These questions have either not been considered or not entirely resolved. The requirements for the signal to propagate downstream to activate (repress) transcription have not been considered either. Yet, the questions are pivotal to clarify, especially in diseases such as cancer where determination of signal propagation can point to cell proliferation and to emerging drug resistance, and to neurodevelopmental disorders, such as RASopathy, autism, attention-deficit/hyperactivity disorder (ADHD), and cerebral palsy. Here we propose a framework for signal transduction from an upstream to a downstream node addressing these questions. Defining cellular processes, experimentally measuring them, and devising powerful computational AI-powered algorithms that exploit the measurements, are essential for quantitative science.

PMID: [35121384](#)

22. Emerging neuroprotective interventions in periventricular leukomalacia: A systematic review of preclinical studies

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Introduction: Periventricular leukomalacia (PVL) is a result of various antenatal, intrapartum, or postnatal insults to the developing brain and is an important harbinger of cerebral palsy in preterm neonates. There is no proven therapy for PVL. This calls for appraisal of targeted therapies that have been investigated in animal models to evaluate their relevance in clinical research context. **Areas covered:** This systematic review identifies interventions that were evaluated in preclinical studies for neuroprotective efficacy against PVL. We identified 142 studies evaluating various interventions in PVL animal models. (Search method is detailed in section 2). **Expert opinion:** Interventions that have yielded significant results in preclinical research, and that have been evaluated in a limited number of clinical trials include stem cells, erythropoietin, and melatonin. Many other therapeutic modalities evaluated in preclinical studies have been identified, but more data on their neuroprotective potential in PVL must be garnered before they can be considered for clinical trials. Because most of the tested interventions had only a partial efficacy, a combination of interventions that could be synergistic should be investigated in future preclinical studies. Furthermore, since the nature and pattern of perinatal insults to preterm brain predisposing it to PVL are substantially variable, individualised approaches for the choice of appropriate neuroprotective interventions tailored to different sub-groups of preterm neonates should be explored.

PMID: [35143732](#)

23. Consumer involvement in research - parent perceptions of partnership in cerebral palsy research: a qualitative study

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Purpose: Identify perceptions of parents and caregivers of children with cerebral palsy about being consumer research partners and identify strategies to inform involvement of parents in cerebral palsy research. Materials and methods: Twenty-two parents in New South Wales and Victoria (Australia) participated in this qualitative study. Seven interviews and three focus groups were completed. Interpretive description guided data analysis. Methodological rigor was enhanced through involving two consumer investigators in the research team, member checking, and multiple researchers completing data analysis and theme generation. Results: Participants identified a range of factors that may influence their involvement in research partner roles. Main topics emerging from the data included "Research Is Better with Parents" and "Parents Benefit from Being Research Partners." A third, "Parents as Research Partners," contained the themes "Flexible Involvement," "Starting Partnerships," and "Building and Sustaining Partnerships." Conclusion: This study has provided a rich insight into how parents perceive and describe engaging as research partners. Parent-identified guidance will inform future partnerships aiming to enhance the quality of cerebral palsy research and outcomes for people with cerebral palsy and their families. The involvement of consumer investigators in this study was considered valuable for enhancing the quality and applicability of the research. IMPLICATIONS FOR REHABILITATION Parents believed that parent partnership in research has benefits for the research and for the consumers involved. Parents provided guidance about the importance of starting, building and sustaining relationships in involving parents as research partners. Understanding the parent context, investing in relationships and acknowledgement of, and recognition for, contributions were considered important for building and sustaining effective partnerships. Flexible approaches to supporting parents as research partners was considered necessary for effective partnership.

PMID: [35133223](#)