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Macquarie Group Foundation Chair of Cerebral Palsy

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Interventions and Management

1. Explicit Motor Imagery for Grasping Actions in Children With Spastic Unilateral Cerebral Palsy.

Errante A, Bozzetti F, Sghedoni S, Bressi B, Costi S, Crisi G, Ferrari A, Fogassi L.

Front Neurol. 2019 Aug 7;10:837. doi: 10.3389/fneur.2019.00837. eCollection 2019.

Background: Motor Imagery (MI) refers to mental simulation of a motor action without producing any overt movement. Previous studies showed that children with Unilateral Cerebral Palsy (UCP) are impaired in implicit MI, as demonstrated by the performance of Hand Laterality Judgment tasks. The aim of this study was to examine the specificity of explicit MI deficits in UCP children. **Methods:** A group of UCP children (n = 10; aged 9-14) performed a mental chronometry task consisting in grasping an object and placing it into a container, or in imagining to perform the same action. As control, a group of typically developing (TD) children, matched by age, performed the same task. Movement durations for executed and imagined trials were recorded. A subgroup of 7 UCP children and 10 TD children also underwent a session of functional MRI to examine the activation of parieto-frontal areas typically associated to MI processes, during the imagination of reaching-grasping actions performed with the paretic hand. **Results:** Behavioral results revealed the existence of a correlation between executed and imagined movement durations both in TD and UCP groups. Moreover, the regression analysis in TD children showed that higher scores in mental chronometry tasks were positively correlated to increased bilateral activation of the intraparietal sulcus (IPS), superior parietal lobule (SPL), and dorsal premotor (PMd) cortex. A similar analysis revealed in the UCP group a positive correlation between a higher score in the mental chronometry task and bilateral activations of IPS, and to activation of contralesional, right PMd, and putamen during imagination of grasping movements. **Conclusions:** These results provide new insights on the relationship between MI capacity and motor deficits in UCP children, suggesting the possibility of the use of explicit MI training to improve patient's upper limb motor functions.

PMID: [31447762](https://pubmed.ncbi.nlm.nih.gov/31447762/)

2. Percutaneous Versus Open Hamstring Lengthening in Spastic Diplegic Cerebral Palsy.

Khaje Mozafari J, Pisoudeh K, Gharanzade K, Abolghasemian M.

Arch Bone Jt Surg. 2019 Jul;7(4):373-378.

BACKGROUND: Open hamstring lengthening (oHSL) is commonly performed to decrease knee contracture and improve gait and posture for children with spastic diplegia. Furthermore, percutaneous hamstring lengthening (pHSL) is also gaining popularity as an alternative to the open approach. This study aimed to compare the results of pHSL versus oHSL and to determine the efficacy and safety of the percutaneous approach. **METHODS:** This retrospective included 54 patients (108 knees) with spastic diplegia operated for flexed knee gait with either open or percutaneous HSL. The mean age of the participants at the time of surgery was 10.3±1.7 years (age range: 5-25 years) for the open and 8.5±1.5 years (age range: 7-23 years) for the percutaneous group. Overall, 29 and 25 children were subjected to oHSL and pHSL, respectively. **RESULTS:**

The mean durations of follow-up were 19.1 months (range: 12-49 months) and 18.3 months (range: 14-45 months) for oHSL and pHSL groups, respectively. In the open group, the mean of preoperative popliteal angle decreased from 64.3 ± 3.6 to 28.4 ± 4.3 ($P < 0.001$), and in the percutaneous group from 63.8 ± 2.7 to 29.5 ± 2.3 ($P < 0.001$). The obtained results revealed no significant differences between the two approaches leading to a similar improvement among the investigated patients ($P = 0.83$). Although the Gross Motor Function Class Score improved significantly within each group ($P < 0.001$); this improvement was insignificant between the groups ($P = 0.88$). The mean of hospital stay for the percutaneous group was 1.6 days (range: 1-3 days) compared to 3.6 days (range: 2-6 days) for the open group, which indicated a significant difference ($P = 0.001$). The mean values of total cost were \$333 and \$473 in the percutaneous group and open group ($P = 0.001$), respectively. There was no significant difference between the groups regarding the complication rate ($P = 0.85$). **CONCLUSION:** Percutaneous HSL is a safe, easy, rapid, and brief procedure that is as effective as the open technique for children with spastic diplegia in a short period of time. However, it is essential to examine the effects of this approach during longer follow-ups to generalize the findings of the current study.

PMID: [31448316](#)

3. What causes increased passive stiffness of plantarflexor muscle-tendon unit in children with spastic cerebral palsy?

Boulard C, Gross R, Gautheron V, Lapole T.

Eur J Appl Physiol. 2019 Aug 30. doi: 10.1007/s00421-019-04208-4. [Epub ahead of print]

PURPOSE: The term 'stiffness' is commonly used in the literature to refer to various components of 'hyperresistance' by which spastic muscles oppose to their passive lengthening, especially in children with cerebral palsy (CP). Originally, stiffness consists of mechanical resistance to passive movement in the absence of any muscle activation. Increased muscle stiffness in CP therefore refers to alterations to the mechanical properties of the tissue. It is closely linked to muscle shortening, yet the two phenomena are not equivalent. Both increased stiffness and shortening are present early in childhood in the plantarflexor muscles of children with spastic CP. **METHODS:** This narrative review provides a comprehensive overview of the literature on passive stiffness of the plantarflexor muscles measured at the joint, muscles, fascicles, and fiber level in children with CP. Articles were searched through the Pub'Med database using the keywords "cerebral palsy" AND "stiffness". **RESULT:** The ambiguous use of the term 'stiffness' has been supported by discrepancies in available results, influenced by heterogeneity in materials, methodologies and characteristics of the participants among studies. Increased stiffness at the joint and muscle belly level may be explained by altered structural properties at the microscopic level. **CONCLUSION:** This thorough investigation of the literature suggests that the pathophysiology and the time course of the development of stiffness and contracture remain to be elucidated. A consideration of both morphological and mechanical measurements in children with CP is important when describing the alterations in their plantarflexors.

PMID: [31468174](#)

4. Detection of pronator muscle overactivity in children with unilateral spastic cerebral palsy: Development of a semi-automatic method using EMG data.

Sarcher A, Brochard S, Perrouin-Verbe B, Raison M, Letellier G, Leboeuf F, Gross R.

Ann Phys Rehabil Med. 2019 Aug 24. pii: S1877-0657(19)30116-2. doi: 10.1016/j.rehab.2019.08.001. [Epub ahead of print]

BACKGROUND: The pronator teres and pronator quadratus muscles are frequently injected with neuromuscular blocking agents to improve supination in children with spastic cerebral palsy and limited active elbow supination. However, determining by simple clinical examination whether these muscles are overactive during active movement is difficult. **OBJECTIVE:** This study aimed to develop a semi-automatic method to detect pronator muscle overactivity by using surface electromyography (EMG) during active supination movements in children with cerebral palsy. **METHODS:** In total, 25 children with unilateral spastic cerebral palsy (10 males; mean [SD] age 10.6 [3.0] years) and 12 typically developing children (7 males; mean age 11.0 [3.0] years) performed pronation-supination movements at 0.50Hz. Kinematic parameters and surface EMG signals were recorded for both pronator muscles. Three experts visually assessed muscle overactivity in the EMG signals of the children with cerebral palsy, in comparison with the reference group. The reliability and discrimination ability of the visual assessments were analysed. Overactivity detection thresholds for the semi-automatic method were adjusted by using the visual assessment by the EMG experts. The positive and negative predictive values of the semi-automatic detection method were calculated. **RESULTS:** Intra-rater reliability of visual assessment by EMG experts was excellent and inter-rater reliability was moderate. For the 25 children with unilateral spastic cerebral palsy, EMG experts could discriminate different profiles of pronator overactivity during active supination: no pronator overactivity, one overactive pronator, or overactivity of both pronators. The positive and negative predictive values were 96% and 91%, respectively, for this semi-automatic detection method. **CONCLUSIONS:** Detection of pronator overactivity by using surface EMG provides an important complement to the clinical

examination. This method can be used clinically, with the condition that clinicians be aware of surface EMG limitations. We believe use of this method can increase the accuracy of treatment for muscle overactivity, resulting in improved motor function and no worsening of paresis.

PMID: [31454560](#)

5. Utilizing three dimensional clinical gait analysis to optimize mobility outcomes in incomplete spinal cord damage.
Murphy AT, Kravtsov S, Sangeux M, Rawicki B, New PW.

Gait Posture. 2019 Aug 5;74:53-59. doi: 10.1016/j.gaitpost.2019.08.001. [Epub ahead of print]

BACKGROUND: Three-dimensional gait analysis (3DGA) has not previously been considered by consensus panels of spinal cord experts for use in studies of patients with spinal cord damage (SCD), yet it is frequently used in other neurological populations, such as stroke and cerebral palsy. **RESEARCH QUESTION:** How does 3DGA impairment based reporting guide individualised clinical decision-making in people with incomplete SCD? **METHODS:** Retrospective open cohort case series recruited 48 adults with incomplete SCD (traumatic or non-traumatic spinal cord dysfunction) referred to the Clinical Gait Analysis Service (CGAS), Melbourne, Australia. Three-dimensional gait data were used to identify gait impairments by the multidisciplinary clinical team. Gait patterns were classified using the plantarflexor-knee extension couple index and the Gait Profile Score (GPS). The reason for referral and the recommendations made post-3DGA were collated in decision trees to extrapolate the potential value of 3DGA in decision making for targeted intervention in this population. **RESULTS:** Participants with SCD generally walked at a reduced gait speed. When grouped by neurological level, the tetraplegia group had a significantly lower GPS, but no specific gait patterns emerged. Participants were primarily referred to the CGAS to direct clinical intervention decisions. The most frequent recommendation following 3DGA was the prescription of an ankle foot orthosis and in some cases, the recommendation was incongruent with the referrer's proposed intervention. **SIGNIFICANCE:** 3DGA can provide specific guidance in management plans for gait of patients with incomplete SCD and may help to avoid inappropriate or unnecessary interventions. This sample of patients referred to the CGAS demonstrates its clinical utility in guiding clinicians in their decision making to target individualised intervention.

PMID: [31446333](#)

6. Resistance Training Combined With Stretching Increases Tendon Stiffness and Is More Effective Than Stretching Alone in Children With Cerebral Palsy: A Randomized Controlled Trial.

Kalkman BM, Holmes G, Bar-On L, Maganaris CN, Barton GJ, Bass A, Wright DM, Walton R, O'Brien TD.

Front Pediatr. 2019 Aug 13;7:333. doi: 10.3389/fped.2019.00333. eCollection 2019.

Aim: Stretching is often used to increase/maintain muscle length and improve joint range of motion (ROM) in children with cerebral palsy (CP). However, outcomes at the muscle (remodeling) and resulting function appear to be highly variable and often unsatisfactory. During passive joint rotation, the Achilles tendon lengthens more than the in-series medial gastrocnemius muscle in children with CP, which might explain the limited effectiveness of stretching interventions. We aimed to ascertain whether increasing tendon stiffness, by performing resistance training, improves the effectiveness of passive stretching, indicated by an increase in medial gastrocnemius fascicle length. **Methods:** Sixteen children with CP (Age median [IQR]: 9.6 [8.6, 10.5]) completed the study. Children were randomly assigned to a combined intervention of stretching and strengthening of the calf muscles (n = 9) or a control (stretching-only) group (n = 7). Medial gastrocnemius fascicle length at a resting ankle angle, lengthening during passive joint rotations, and tendon stiffness were assessed by combining dynamometry and ultrasound imaging. The study was registered on clinicaltrials.gov (NCT02766491). **Results:** Resting fascicle length and tendon stiffness increased more in the intervention group compared to the control group (median [95% CI] increase fascicle length: 2.2 [1.3, 4.3] mm; stiffness: 13.6 [9.9, 17.7] N/mm) Maximum dorsiflexion angle increased equally in both groups. **Conclusion:** This study provides proof of principle that a combined resistance and stretching intervention can increase tendon stiffness and muscle fascicle length in children with CP. This demonstrates that remodeling of muscle structure is possible with non-invasive interventions in spastic CP.

PMID: [31456995](#)

7. Effectiveness of electrical stimulation after administration of botulinum toxin in children with spastic diplegic cerebral palsy: A prospective, randomized clinical study.

Yiğitoğlu P, Kozanoğlu E.

Turk J Phys Med Rehabil. 2019 Feb 4;65(1):16-23. doi: 10.5606/tftrd.2019.2236. eCollection 2019 Mar.

OBJECTIVES: The aim of the study was to investigate the effectiveness of electrical stimulation to agonist muscles after injection of Botulinum toxin A (BTX-A) in children with spastic diplegic cerebral palsy (SDCP). **PATIENTS AND METHODS:** Between October 2009 and October 2010, 38 patients with SDCP (19 males, 19 females; mean age 6.3 years; range, 4 to 10 years) were included. The patients were able to walk independently or with minimal assistance by foot equine and had spasticity in the calf muscles between Grades 1+ and 3 according to the Modified Ashworth Scale (MAS). The patients received either BTX-A injection + electrical stimulation (Group 1, n=19) or BTX-A injection alone (Group 2, n=19). All patients were evaluated using the MAS, Penn Spasm Frequency Scale (PSFS), Gross Motor Function Measure-88 (GMFM-88) (Dimensions D and E), and walking velocity. **RESULTS:** A decrease in spasticity was evident for the right, left, and bilateral lower extremities for both groups ($p<0.05$). There were no statistically significant differences in the MAS, PSFS, GMFM-88 (Dimensions D and E), and walking velocity between the groups. **CONCLUSION:** Our study results showed that both patient groups benefited from the treatment and the administration of electrical stimulation to the gastrocnemius motor points produced no additional benefit for patients with SDCP.

PMID: [31453540](#)

8. Botulinum toxin-induced facial asymmetry in a patient with cerebral palsy.

Acer S, Ünlü E, Karaahmet ÖZ, Gürçay E, Umay E, Çakıcı A.

Turk J Phys Med Rehabil. 2017 Aug 15;63(3):281-282. doi: 10.5606/tftrd.2017.1187. eCollection 2017 Jun.

PMID: [31453467](#)

9. The current role of Astym therapy in the treatment of musculoskeletal disorders.

Rodriguez-Merchan EC, De La Corte-Rodriguez H, Roman-Belmonte JM.

Postgrad Med. 2019 Aug 28:1-6. doi: 10.1080/00325481.2019.1654836. [Epub ahead of print]

Background: In general, chronic problems of soft tissues (muscles, tendons, ligaments) are due to scarring or degeneration. Astym therapy (Performance Dynamics, Inc. Muncie, Indiana) has been reported to address tendinopathy by stimulating regeneration in soft tissues (muscles, tendons, ligaments) and the resorption of unwanted scar tissue that causes pain and limits mobility. **Purpose:** To analyze the effectiveness of Astym therapy in the treatment of musculoskeletal problems **Methods:** A narrative review of the literature on the topic was carried out. A Cochrane Library and PubMed (MEDLINE) search related to the role of Astym therapy was analyzed. The only language searched was English. Scientific meeting abstracts and other sources of evidence were not considered. The main criteria for selection were articles that were focused on the role of Astym therapy. **Results:** Astym therapy seems to be useful for the treatment of chronic ankle sprains, Achilles tendon tendinopathy, hamstring tendinopathy, elbow tendinopathy, and the stiff total knee arthroplasty. Astym therapy also appears to be useful to gain range of motion, muscle strength, and function in patients with cerebral palsy, and after mastectomy. **Conclusions:** Astym therapy seems to activate a regenerative response in degenerative tendinopathy and eliminate or reduce the scar tissue/fibrosis that causes pain and limitation of mobility. Based on the positive findings of the emerging published research further study is warranted to confirm the benefits of Astym therapy on a variety of musculoskeletal disorders.

PMID: [31461382](#)

10. Inhibitory control and temporal perception in cerebral palsy.

Cabezas M, Carriedo N.

Child Neuropsychol. 2019 Aug 26:1-26. doi: 10.1080/09297049.2019.1656712. [Epub ahead of print]

Prepotent response inhibition and temporal perception abilities were explored in a sample of individuals with cerebral palsy relative to typically developing peers. The extent to which inhibitory control difficulties might affect temporal processing was also investigated. For this purpose, two inhibitory control tasks and two duration estimation tasks were given to the groups of cerebral palsy and typically developing children. Results showed inhibition and temporal perception problems in the group with cerebral palsy. A relationship was found between inhibition and temporal estimation performances, which indicates that

inhibitory control contributes, at least partially, to acquisition of the temporal processing ability.

PMID: [31448680](#)

11. Does stabilizing input pressure orthosis vest, lycra-based compression orthosis, improve trunk posture and prevent hip lateralization in children with cerebral palsy?

Giray E, Keniş-Coşkun Ö, Güngör S, Karadağ-Saygı E.

Turk J Phys Med Rehabil. 2017 Dec 15;64(2):100-107. doi: 10.5606/tftrd.2018.1332. eCollection 2018 Jun.

OBJECTIVES: This study aims to investigate whether the use of a lycra-based compression orthosis known as stabilizing input pressure orthosis (SPIO) vest improves trunk posture and hip lateralization in children with cerebral palsy (CP) and to compare the effects of two- and six-hours daily wear of the orthosis. **PATIENTS AND METHODS:** Between December 2013 and July 2015, a total of 24 children with CP (5 boys, 19 girls; mean age 61.1 months; range 35 to 105 months) with impaired trunk control were included in this single-blind, randomized-controlled study. All were randomized to either of the three groups as the control group (received only conventional exercise therapy), the SPIO 2-hour group (worn orthosis two hours during therapy), and the SPIO 6-hour group (worn orthosis four hours in addition to two hours of wear during therapy). The Sitting Assessment Scale (SAS), Cobb angle, kyphotic angle, and Migration Index were used to evaluate the trunk posture and hip lateralization before treatment and at six months after treatment. **RESULTS:** The SAS scores improved compared to baseline in all groups. The Cobb angle and kyphotic angle showed a significant decrease at six months after treatment only in the SPIO groups, while intra-group analysis of the Migration Index did not show a statistically significant difference. Changes in the radiographic assessments were similar among the groups, except for the kyphotic angles. The kyphotic angle showed less change in the control group. Comparison of the SPIO groups showed no significant differences in terms of the variables assessed. **CONCLUSION:** The SPIO vest improves the kyphotic posture, but not scoliosis and hip lateralization in children with CP with impaired trunk control when used in combination with the conventional therapy. Using the SPIO vest for two and six hours also yields similar outcomes.

PMID: [31453498](#)

12. The clinical aspects and effectiveness of suit therapies for cerebral palsy: A systematic review.

Karadağ-Saygı E, Giray E.

Turk J Phys Med Rehabil. 2019 Feb 14;65(1):93-110. doi: 10.5606/tftrd.2019.3431. eCollection 2019 Mar.

OBJECTIVES: The aim of this review to evaluate the clinical aspects and effectiveness of suit therapy for patients with cerebral palsy (CP). **MATERIALS AND METHODS:** A literature search was performed in the PubMed, SCOPUS, Web of Science, and PEDro databases within the period from the establishment of the relevant database to July 2018. The articles were categorized according to their study design. We included studies published in peer-review journals focusing on the efficacy of suit therapies for CP and excluded review articles, duplications, non-related articles. A narrative synthesis approach was used, as it was not possible to classify extracted and analyzed data, and the overall effect size was unable to be calculated. Data regarding study subjects (number, age, CP type, Gross Motor Function Classification System [GMFCS] level), suit type, intervention including dose of suit therapy, outcome measurements, outcomes, adverse effects, and funding were extracted. The method introduced by Furlan, Pennick, Bombardier, and van Tulder was used to evaluate the risk of bias for the assessment of methodological quality of randomized-controlled trials (RCTs). **RESULTS:** A total of 29 studies were included of which 10 were Class I, eight were Class II-III, and 11 were Class IV studies. Studies were heterogenous in design, sample size, study population, and outcomes measured. The methodological quality score of RCTs varied between 4 and 10. The results of the high-quality RCTs showed that wearing the suit along with conventional therapy improved proximal stability, gross motor function, and gait. The Class II-III and IV studies supported the findings of the Class I studies. **CONCLUSION:** The major improvements from the RCTs were seen in proximal stability, gross motor function and gait, although grading was unable to be done due to the heterogeneity of included studies. In order to obtain gains in the function, it is important to carefully consider intended use, patient selection criteria, and suit type.

PMID: [31453550](#)

13. Therapy for children with cerebral palsy: who, what, and how much?

Novak I.

Dev Med Child Neurol. 2019 Aug 28. doi: 10.1111/dmcn.14345. [Epub ahead of print]

PMID: [31463943](#)

14. The effect of aquatic exercise on spasticity, quality of life, and motor function in cerebral palsy.

Adar S, Dündar Ü, Demirdal ÜS, Ulaşlı AM, Toktaş H, Solak Ö.

Turk J Phys Med Rehabil. 2017 Aug 14;63(3):239-248. doi: 10.5606/tftrd.2017.280. eCollection 2017 Jun.

OBJECTIVES: The primary aim of this study was to compare the effects of aquatic exercises and land-based exercises on spasticity, quality of life, and motor function in children with cerebral palsy (CP). The secondary aim was to assess the morphology of spastic muscle using ultrasonography. **PATIENTS AND METHODS:** Thirty-two children (17 boys, 15 girls; mean age 9.7±2.7 years; range 4 to 17 years) with CP were enrolled in this study. The patients were randomly assigned to two groups to receive 30 sessions of an aquatic or a land-based exercise program. The patients were assessed for the impairment level, functional measures, and quality of life before and after therapy. Ultrasonographic assessment of spastic gastrocnemius muscle was also performed. **RESULTS:** Both group showed significant improvements in most functional outcome measures. There were no significant differences in the percentage changes of the scores for functional outcome measures between the two groups. However, aquatic exercise produced a higher improvement in quality of life scores than the land-based exercises. Post-treatment ultrasonographic assessment of spastic gastrocnemius muscle showed a significant improvement in the compressibility ratio in the aquatic exercise group. The modified Ashworth Scale score of spastic gastrocnemius muscle in patients with CP showed a negative and weak-to-moderate correlation with the compressibility ratio based on the ultrasonographic evaluation. **CONCLUSION:** Our study results suggest that the aquatic exercises are as effective as land-based exercises for spasticity management and motor function improvement in children with CP. Aquatic exercise can result in a higher level of improvement in quality of life scores than the land-based exercises. Ultrasonographic muscle compressibility ratio may be used to evaluate muscle elasticity in children with CP.

PMID: [31453460](#)

15. Informal Dance Intervention Improves BMI and Functional Gait in an Adolescent With Cerebral Palsy: A Case Report.

Owens M, Silkwood-Sherer D.

Pediatr Phys Ther. 2019 Aug 28. doi: 10.1097/PEP.0000000000000653. [Epub ahead of print]

PURPOSE: This case study examined the effects of incorporating Informal Dance Intervention into traditional therapy sessions on body mass index and functional walking in an adolescent girl with cerebral palsy. **CASE DESCRIPTION:** A 15-year-old adolescent girl, Gross Motor Function Classification System Level II, participated in Informal Dance Intervention twice weekly in 2, 16 session phases. Sixty-minute sessions focused on waltzing, contra dancing, square dancing, and belly dancing to improve timing, endurance, vestibular functioning, and core strength. **CONCLUSIONS:** Waist circumference decreased, walking speed increased on the 6-Minute Walk Test and Timed Up and Down Stairs, balance confidence increased per the Activities-specific Balance Confidence Scale, and vestibular functioning improved per changes in the Functional Gait Assessment. **RECOMMENDATIONS FOR CLINICAL PRACTICE:** Incorporating Informal Dance Intervention, in conjunction with therapy, may be motivating and improve overall health for adolescents with cerebral palsy to combat their tendency of increased sedentary lifestyle.

PMID: [31469773](#)

16. Preliminary study of the effect of training with a gaming balance board on balance control in children with cerebral palsy: a randomized controlled trial.

Hsieh HC.

Am J Phys Med Rehabil. 2019 Aug 26. doi: 10.1097/PHM.0000000000001300. [Epub ahead of print]

OBJECTIVE: A new protocol based on the use of a gaming balance board for children with cerebral palsy was tested. **DESIGN:** A total of 56 children with cerebral palsy were enrolled and randomly divided into two groups: experimental and control. The children in experimental group underwent 12 weeks of rehabilitation using their foot to play personal computer

games with the proposed balance board, whereas those in the control group played personal computer games with a computer mouse in the standing position. Balance control was assessed before and after the intervention using the Zebris FDM System for measuring the center of pressure. The Pediatric Balance Scale and 2-min walk test were used for evaluating functional balance. RESULTS: In the analysis of covariance, the proposed new balance board used for the personal computer games decreased the postural sway (sway path, $F = 6.95$, $P = .011$; sway area, $F = 11.79$, $P = .001$) and improved the performance of the functional balance tests. CONCLUSION: This study demonstrated the possibility that this new gaming balance board can be used for balance control in children with cerebral palsy.

PMID: [31464757](#)

17. Impact of Long-Term Hippotherapy on the Walking Ability of Children With Cerebral Palsy and Quality of Life of Their Caregivers.

Mutoh T, Mutoh T, Tsubone H, Takada M, Doumura M, Ihara M, Shimomura H, Taki Y, Ihara M.

Front Neurol. 2019 Aug 13;10:834. doi: 10.3389/fneur.2019.00834. eCollection 2019.

Background: Cerebral palsy (CP) is a permanent motor disorder that occurs at birth or during early infancy. Despite advances in fetal and maternal medicine, the incidence of CP remains high. Hippotherapy has gradually been recognized as an excellent rehabilitation tool for children with CP. However, a scientific basis for how it achieves long-term functional improvements or provides additional benefits to patients' caregivers remains unknown. Objectives: We performed a prospective trial to determine how hippotherapy affects the gross motor and gait functions in children with CP and how it may also impact the quality of life (QOL) of patients' caregivers. Methods: In total, 24 children with CP (11 boys, 13 girls; age: 4-14 years; Gross Motor Function Classification System [GMFCS] II-III) underwent a program (30 min/day, once a week) of hippotherapy or day-care recreation (control) over a 1-year intervention and a 3-month follow-up period. Assessment measures used for the children were gait parameters for a 5-m walk test, Gross Motor Function Measure (GMFM)-66, and GMFM dimension-E (GMFM-E). The QOL of the caregivers was estimated using a brief version of the World Health Organization Quality Of Life (WHOQOL-BREF) self-assessment questionnaire. Results: In addition to better GMFM-66 and GMFM-E scores, hippotherapy was associated with increased cadence, step length, and mean acceleration; stabilized horizontal/vertical displacement of patients; and better relationship between the psychological status and QOL of the caregivers than those seen in the control group ($p < 0.05$). Additionally, the initially improved children's step length and their caregivers' psychological QOL domain (particularly in the "positive feeling" facet) tended to be preserved up to the 3-month follow-up. Conclusion: These data suggest that compared with common day-care recreational activities, a 1-year program of once-weekly hippotherapy can improve not only the walking ability of children with CP but also the psychological health and QOL of their caregivers. Clinical Trial Registration:: www.umin.ac.jp/ctr/, identifier: UMIN000022986.

PMID: [31456733](#)

18. The evaluation of opinions of the parents of children with cerebral palsy on exercise therapy applied in Special Education and Rehabilitation Centers in rural areas.

Koçak FA, Koçak Y, Şaş S, Kurt EE, Erdem HR, Tuncay F.

Turk J Phys Med Rehabil. 2018 Nov 2;64(4):369-370. doi: 10.5606/tftrd.2018.2892. eCollection 2018 Dec.

PMID: [31453536](#)

19. Mothers' Perceived Barriers to and Recommendations for Health Care Appointment Keeping for Children Who Have Cerebral Palsy.

Ballantyne M, Liscumb L, Brandon E, Jaffar J, Macdonald A, Beaune L.

Glob Qual Nurs Res. 2019 Aug 14;6:2333393619868979. doi: 10.1177/2333393619868979. eCollection 2019 Jan-Dec.

Children with cerebral palsy (CP) require ongoing rehabilitation services to address complex health care needs. Attendance at appointments ensures continuity of care and improves health and well-being. The study's aim was to gain insight into mothers' perspectives of the factors associated with nonattendance. A qualitative descriptive design was conducted to identify barriers and recommendations for appointment keeping. Semi-structured interviews were conducted with 15 mothers of children with CP. Data underwent inductive qualitative analysis. Mothers provided rich context regarding barriers confronted for

appointment keeping-transportation and travel, competing priorities for the child and family, and health services. Mothers' recommendations for improving the experience of attending appointments included virtual care services, transportation support, multimethod scheduling and appointment reminders, extended service hours, and increased awareness among staff of family barriers to attendance. The results inform services/policy strategies to facilitate appointment keeping, thereby promoting access to ongoing rehabilitation services for children with CP.

PMID: [31453266](#)

20. Multicentre, randomised waitlist control trial investigating a parent-assisted social skills group programme for adolescents with brain injuries: protocol for the friends project.

Gilmore R, Sakzewski L, Ziviani J, McIntyre S, Smithers Sheedy H, Hilton N, Williams T, Quinn K, Sarandrea AM, Laugeson E, Chatfield M.

BMJ Open. 2019 Aug 27;9(8):e029587. doi: 10.1136/bmjopen-2019-029587.

INTRODUCTION: Adolescents with brain injury frequently have difficulties with social competence, which persist into adulthood affecting their participation in daily life. To date, there has been limited research into the efficacy of social competence interventions in this population. Research from the Program for the Education and Enrichment of Relational Skills (PEERS) has demonstrated significant improvements in social competence skills, maintained at 1-year to 5-year follow-up, for adolescents with autism spectrum disorder. PEERS has not yet been tested among adolescents with brain injury. This protocol describes a pragmatic, parallel two-group pre-test post-test randomised waitlist control trial across two sites in Australia, which aims to evaluate the feasibility, acceptability and efficacy of PEERS in adolescents with brain injury compared with usual care. **METHODS AND ANALYSIS:** Forty adolescents with an acquired brain injury or cerebral palsy will be randomly assigned to either the 14-week PEERS group or waitlist care as usual group. The waitlist group will then receive PEERS following the 26-week retention time point. Outcomes will be assessed at baseline, 14 weeks (immediately postintervention) and 26 weeks follow-up (retention). The primary outcomes are self-report and parent report on the Social Skills Improvement System Rating Scales immediately post PEERS at 14 weeks. Secondary outcomes include increased frequency of get-togethers with peers with reduced conflict and increased adolescent self-reported knowledge of social skills. Acceptability and feasibility will be examined through qualitative analysis of focus group data collected after the completion of each group. **ETHICS AND DISSEMINATION:** Ethics approval has been granted by the Medical Research Ethics Committee Children's Health Queensland Hospital and Health Service Human Research Ethics Committee (HREC/17/QRCH/87), The University of Queensland (2017000864) and the Cerebral Palsy Alliance Ethics Committee (20170802/HREC:EC00402). The findings will be disseminated in peer-reviewed journals, by conference presentation and newsletters to consumers. **TRIAL REGISTRATION NUMBER:** ACTRN12617000723381.

PMID: [31462477](#)

21. Maternal and family factors differentiate profiles of psychiatric impairments in very preterm children at age 5-years.

Lean RE, Lessov-Shlaggar CN, Gerstein ED, Smyser TA, Paul RA, Smyser CD, Rogers CE.

J Child Psychol Psychiatry. 2019 Aug 26. doi: 10.1111/jcpp.13116. [Epub ahead of print]

BACKGROUND: Very preterm (VPT; <30 weeks gestation) children are a heterogeneous group, yet the co-occurrence of psychiatric and neurodevelopmental impairments remains unclear. Moreover, the clinical and socio-environmental factors that promote resilient developmental outcomes among VPT children are poorly understood. **METHODS:** One hundred and twenty five children (85 VPT and 40 full-term) underwent neurodevelopmental evaluation at age 5-years. Parents and teachers completed measures of internalizing, externalizing, attention-deficit/hyperactivity (ADHD), and autism symptoms. Psychiatric and neurodevelopmental measures were analyzed using Latent Profile Analysis. Multinomial regression examined the extent that infant, sociodemographic, and family factors, collected prospectively from birth to follow-up, independently differentiated resilient and impaired children. **RESULTS:** Four latent profiles were identified, including a Typically Developing Group which represented 27.1% of the VPT group and 65.0% of the full-term group, an At-Risk Group with mild psychiatric and neurodevelopmental problems (VPT 44.7%, full-term 22.5%), a Psychiatric Group with moderate-to-severe psychiatric ratings (VPT 12.9%, full-term 10.0%), and a school-based Inattentive/Hyperactive Group (VPT 15.3%, full-term 2.5%). Clinical diagnoses were highest among the Psychiatric Group (80%). Factors that differentiated resilient and impaired subgroups of VPT children included prolonged exposure to maternal psychosocial distress ($p \leq .04$), current family dysfunction ($p \leq .05$), and maternal ADHD symptoms ($p \leq .02$), whereas social risk index scores differentiated resilient and impaired full-term children ($p < .03$). **CONCLUSIONS:** Lower levels of maternal distress, family dysfunction, and maternal ADHD symptoms were associated with resilience among VPT children. Maternal distress and family dysfunction are modifiable factors to be

targeted as part of psychiatric interventions embedded in the long-term care of VPT children.

PMID: [31449335](#)

22. Relationships Between Early Neonatal Nutrition and Neurodevelopment at School Age in Children Born Very Preterm.

Tottman AC, Alsweiler JM, Bloomfield FH, Gamble GD, Jiang Y, Leung M, Poppe T, Thompson B, Wouldes TA, Harding JE; PIANO study group.

J Pediatr Gastroenterol Nutr. 2019 Aug 22. doi: 10.1097/MPG.0000000000002471. [Epub ahead of print]

OBJECTIVES: To determine whether a new nutrition protocol designed to increase early protein intakes while reducing fluid volume in infants born very preterm was associated with altered neurodevelopment and growth in childhood. **METHODS:** A retrospective, observational cohort study of children born <30 weeks' gestation or <1,500 grams and admitted to the neonatal unit, National Women's Hospital, Auckland, NZ, before and after a change in nutrition protocol. The primary outcome was neurodevelopmental impairment at 7 years (any of Wechsler Intelligence Scale for Children full scale IQ<85, Movement Assessment Battery for Children-2 total score ≤5 centile, cerebral palsy, blind or deaf requiring aids). Outcomes were compared between groups and for the overall cohort using generalised linear regression, adjusted for sex and birth weight z-score. **RESULTS:** Of 201 eligible children, 128 (64%) were assessed (55/89 (62%) exposed to the old nutrition protocol, 73/112 (65%) to the new protocol). Children who experienced the new protocol received more protein, less energy and less carbohydrate in postnatal days 1-7. Neurodevelopmental impairment was similar at 7 years (30/73 (41%) vs 25/55 (45%), adjusted odds ratio (AOR) (95% confidence interval) 0.78 (0.35-1.70), P=0.55), as was the incidence of cerebral palsy (AOR 7.36 (0.88-61.40), P=0.07). Growth and body composition were also similar between groups. An extra one g.kg parenteral protein intake in postnatal days 1-7 was associated with a 27% increased odds of cerebral palsy (AOR 1.27 (1.03-1.57), P=0.006). **CONCLUSIONS:** Higher early protein intakes do not change overall rates of neurodevelopmental impairment or growth at 7 years. Further research is needed to determine the effects of higher early parenteral protein intake on motor development.

PMID: [31449172](#)

23. Pain evaluation in a sample of Turkish children with cerebral palsy and its association with dependency level, verbal abilities, and the quality of life of patients and sociodemographic status, depression, and quality of life of their caregivers.

Giray E, Şimşek Hİ, Aydoğduoğlu M, Kangal AÇ, Çelik A, Kurt C, Karadağ Saygı E.

Turk J Phys Med Rehabil. 2018 Feb 23;64(3):222-229. doi: 10.5606/tftrd.2018.1871. eCollection 2018 Sep.

OBJECTIVES: This study aims to evaluate pain in children with cerebral palsy (CP), to investigate its association with dependency level, verbal abilities, and the quality of life (QoL) of children and sociodemographic status, depression levels, and QoL of their caregivers. **PATIENTS AND METHODS:** Between February 2016 and April 2016, a total of 85 children (56 males, 29 females; mean age 7.1±2.5 years; range, 4 to 12 years) with CP were included. Their sociodemographic data, gross motor functional levels, verbal abilities (verbal and non-verbal) were evaluated. The children were categorized as independent (Gross Motor Function Classification System [GMFCS] 1), partially dependent (GMFCS 2,3), and totally dependent (GMFCS 4,5). The Non-Communicating Children's Pain Checklist - Revised (NCCPC-R), the Caregiver Priorities & Child Health Index of Life with Disabilities (CPCHILD), the Nottingham Health Profile (NHP), and the Beck Depression Inventory (BDI) were used for the evaluation. **RESULTS:** A total of 50 (58.8%) of the children were verbal, while 35 (41.2%) were non-verbal. Of the patients, 47.1% were totally dependent, 37.6% were partially dependent, and 15.3% were independent. Pain was less frequent in the independent group, compared to the partially and totally dependent groups (p=0.04; p=0.013). There were no statistically significant difference in perceived pain according to the CPCHILD and NCCPC-R scores, when low and high socioeconomic status were compared (p>0.05). The QoL scores of children who were totally dependent and non-verbal were statistically significantly lower than those of the other children (p=0.0001, p=0.0001). A statistically significantly negative correlation between increased totally dependent children's QoL scores and decreased QoL scores of the caregivers was observed (r=-0.429 p=0.006). The children with pain had a decreased QoL (p=0.03). The QoL of caregivers decreased and the depression scores of caregivers increased, as the pain scores of the children increased (r=0.291, p=0.007; r=-0.455, p=0.0001). **CONCLUSION:** Our study results show that pain is more frequent in children with CP who are dependent and non-verbal, and it negatively affects the QoL of both caregivers and children. Evaluation of pain and the identification of CP patients who are at high risk of experiencing pain is worthwhile, as these individuals have difficulty in verbalizing pain due to their cognitive problems, although they are at risk of experiencing pain due to chronic physical problems, such as spasticity and contracture, as well as interventions for complicated medical problems.

PMID: [31453515](#)

24. Individualised developmental care for babies and parents in the NICU: Evidence-based best practice guideline recommendations.

Griffiths N, Spence K, Loughran-Fowlds A, Westrup B.

Early Hum Dev. 2019 Aug 21:104840. doi: 10.1016/j.earlhumdev.2019.104840. [Epub ahead of print]

Advances in neonatal care have improved survival of premature and critically ill infants; and while rates of some long-term neurodevelopmental problems in survivors have improved, such as cerebral palsy, there are others such as learning and behavioural difficulties that have not. The goal of improving long term neurodevelopmental morbidity has led to an increased focus on improving developmental care not only in neonatal long term follow-up clinics but within the NICU itself to capture the period of earliest brain neuroplasticity. The application of a systematic approach to improve practice is considered the most effective strategy for implementing neuroprotective developmentally supportive care. The content of this paper incorporates evidence-based systematic reviews to guide clinicians in the application of developmentally supportive interventions.

PMID: [31445697](#)

25. Predicting developmental outcomes in preterm infants: A simple white matter injury imaging rule.

Cayam-Rand D, Guo T, Grunau RE, Benavente-Fernández I, Synnes A, Chau V, Branson H, Latal B, McQuillen P, Miller SP.

Neurology. 2019 Aug 29. pii: 10.1212/WNL.0000000000008172. doi: 10.1212/WNL.0000000000008172. [Epub ahead of print]

OBJECTIVE: To develop a simple imaging rule to predict neurodevelopmental outcomes at 4.5 years in a cohort of preterm neonates with white matter injury (WMI) based on lesion location and examine whether clinical variables enhance prediction. **METHODS:** Sixty-eight preterm neonates born 24-32 weeks' gestation (median 27.7 weeks) were diagnosed with WMI on early brain MRI scans (median 32.3 weeks). 3D T1-weighted images of 60 neonates with 4.5-year outcomes were reformatted and aligned to the posterior commissure-eye plane and WMI was classified by location: anterior or posterior-only to the midventricle line on the reformatted axial plane. Adverse outcomes at 4.5 years were defined as Wechsler Preschool and Primary Scale of Intelligence full-scale IQ <85, cerebral palsy, or Movement Assessment Battery for Children, second edition percentile <5. The prediction of adverse outcome by WMI location, intraventricular hemorrhage (IVH), bronchopulmonary dysplasia (BPD), and retinopathy of prematurity (ROP) was assessed using multivariable logistic regression. **RESULTS:** Six children had adverse cognitive outcomes and 17 had adverse motor outcomes. WMI location predicted cognitive outcomes in 90% (area under receiver operating characteristic curve [AUC] 0.80) and motor outcomes in 85% (AUC 0.75). Adding IVH, BPD, and ROP to the model enhances the predictive strength for cognitive and motor outcomes (AUC 0.83 and 0.88, respectively). Rule performance was confirmed in an independent cohort of children with WMI. **CONCLUSIONS:** WMI on early MRI can be classified by location to predict preschool age outcomes in children born preterm. The predictive value of this WMI classification is enhanced by considering clinical factors apparent by term-equivalent age.

PMID: [31467250](#)

26. Use of the General Movements Assessment for the Early Detection of Cerebral Palsy in Infants with Congenital Anomalies Requiring Surgery.

Crowle C, Loughran Fowlds A, Novak I, Badawi N.

J Clin Med. 2019 Aug 22;8(9). pii: E1286. doi: 10.3390/jcm8091286.

The general movements (GMs) assessment is recognised as one of the most important tools in the early detection of cerebral palsy (CP). However, there remains a paucity of data on its application to infants with congenital anomalies requiring surgery. This was a prospective study of 202 infants (mean gestation 38 weeks, SD 2.2) who had undergone major surgery for congenital anomalies in the neonatal period. Infants were assessed at three months of age (mean 12 weeks, SD 1.6) and GMs videos were independently rated by three clinicians, two blinded to clinical details. Developmental follow-up was at three years of age. Of the twenty-five infants (9%) rated as having an absence of fidgety movements, 22 were seen at 3 years, and 17 had an abnormal outcome: 11 with CP, and 6 with a developmental disability. Infants with absent fidgety movements were 21.5 (95% CI 7.3-63.8) times more likely to have an abnormal outcome including CP. None of the infants with normal fidgety movements had a diagnosis of CP and 86% were assessed to be developing normally. The GMs assessment has predictive value for cerebral palsy and neurodevelopment for infants with congenital anomalies, and should be incorporated into routine follow-up to facilitate early referral.

PMID: [31443576](#)

27. Perinatal carotid artery ischemic stroke: Report of two cases.

Suppiej A, Toffoli E, Festa I, Cervesi C, Cappellari A, Manara R, Magarotto M, Cainelli E.

J Neonatal Perinatal Med. 2019 Aug 19. doi: 10.3233/NPM-1816. [Epub ahead of print]

The mechanisms of perinatal stroke are poorly understood but preclinical studies point to the crucial role of perinatal inflammation. Carotid artery occlusion represents a very rare and severe cause of perinatal stroke. We describe two cases diagnosed with extensive ischemic stroke due to carotid artery occlusion. In both cases, we demonstrated placental vasculopathy. High levels of C-reactive protein in mother and/or neonates suggested inflammatory mechanism as a potential trigger. Both cases underwent hypothermic treatment without complications because of initial diagnosis of perinatal asphyxia. The prognosis at the time of the last follow up was severe including cerebral palsy, epilepsy and cognitive impairment. Our cases contribute to the actual debate on pathogenic mechanisms and treatment options for this rare condition.

PMID: [31450516](#)**28. Multicystic encephalomalacia and gastrointestinal injury following single fetal death in first trimester and subsequent fetofetal transfusion syndrome in a monochorionic triplet pregnancy: a case report.**

So PL, Li KW, Yeung TW, Sin WK.

BMC Pregnancy Childbirth. 2019 Aug 27;19(1):311. doi: 10.1186/s12884-019-2459-4.

BACKGROUND: Monochorionic multifetal pregnancies are at increased risk of adverse perinatal outcome because of placental vascular anastomoses. We present a case of multicystic encephalomalacia and gastrointestinal injury in two surviving fetuses following single fetal death in first trimester and subsequent fetofetal transfusion syndrome in a monochorionic triplet pregnancy. **CASE PRESENTATION:** A 31-year-old nulliparous woman had a spontaneous monochorionic triamniotic triplet pregnancy. Three live fetuses with single placenta were seen at 8-week ultrasound scan. One fetus demised at 11 weeks and 3 days of gestation. Dilated echogenic bowel and ascites were found in one surviving fetus at 23 weeks of gestation. At 28 weeks of gestation, the pregnancy was complicated by fetofetal transfusion syndrome in which discordant amniotic fluid volumes were found. Two days later, emergency Caesarean section was performed because of worsening of fetal Doppler and biophysical profile. One baby was found to have jejunal atresia requiring surgery at 4 days old. He had periventricular leukomalacia and intracranial haemorrhage, but subsequent normal neurological development. Another baby had gastric perforation requiring surgery at 2 days old. He was confirmed to have multicystic encephalomalacia by cranial ultrasound and magnetic resonance imaging. He suffered from developmental delay, epilepsy and cerebral palsy. **CONCLUSION:** This case alerts the obstetricians the possible hypoxic-ischemic injury to the survivors of monochorionic triplet pregnancy after the co-triplet death in the first trimester and fetofetal transfusion syndrome. Antenatal assessment and postnatal follow-up are important for these high-risk multiple pregnancies.

PMID: [31455300](#)**29. Full-thickness burns due to contact with gastric acid.**

Fenwick R, Price R.

Emerg Nurse. 2019 Jul 10;27(4):17-19. doi: 10.7748/en.2019.e1941.

This article describes the case of a 33-year-old man with cerebral palsy who sustained a full-thickness burn to his thorax as a result of lying in gastric acid that had leaked from a damaged percutaneous endoscopic gastrostomy feeding tube. The patient required referral to a tertiary burns centre for specialist management. The article highlights the potential harm caused by gastric acid and why some patients may be particularly vulnerable to such injuries.

PMID: [31468846](#)**30. A Case-Control Study of Essential and Toxic Trace Elements and Minerals in Hair of 0-4-Year-Old Children with Cerebral Palsy.**

Tinkov AA, Ajsuvakova OP, Skalny AV.

Biol Trace Elem Res. 2019 Aug 29. doi: 10.1007/s12011-019-01876-3. [Epub ahead of print]

The objective of the present study was to assess hair essential and toxic trace elements and minerals in children with cerebral palsy in relation to age of the examinees. A total of 70 children with cerebral palsy and 70 healthy controls aged 0-4 years old were enrolled in the present study. The examined children were also divided into two age groups of those younger and older than 2 years old. Hair trace element content was assessed using ICP-MS at NexION 300D (PerkinElmer, USA). The obtained data demonstrate that hair boron was more than 2-fold lower in CP children as compared with the control group. At the same time, hair Na, Se, and V levels were 21%, 12%, and 20% lower when compared with healthy controls, respectively. It is also notable that a 9% and 28% decrease in hair Fe and Li levels respectively were nearly significant. The observed alterations were more profound in a younger group of patients. No significant group difference in hair toxic metal and metalloid levels was observed between the general cohorts of children with and without CP. In regression models, only hair Al and Ca contents were significantly associated with the presence of cerebral palsy, whereas hair Mg, Na, Ni, and Se levels were characterized as significant negative predictors. The observed alteration in trace element metabolism may also provide an additional link between cerebral palsy, psychomotor delay, and certain diseases, including diabetes, epilepsy, and osteoporosis. However, further studies using other substrates (blood, urine) or biomarkers are required.

PMID: [31468294](#)

31. A Premie Outcome That Is Truly Inspiring.

Discenza D.

Neonatal Netw. 2019 Mar 1;38(2):113-115. doi: 10.1891/0730-0832.38.2.113. Epub 2019 Mar 6.

An expected complex outcome of a premature infant need not be assumed completely life limiting. Take Erik Zimmerman, an adult born early 40+ years ago that did end up with cerebral palsy. Yet he chose the gifts that the diagnosis provides and proves many people wrong in terms of what he can and cannot do. The result is a wonderful interview with an inspiring individual and tips for neonatal nurses that will inform them in the NICU as they carry forward wisdom to new families facing the same challenges.

PMID: [31470376](#)

32. Early Gross Motor Development Among Brazilian Children with Microcephaly Born Right After Zika Virus Infection Outbreak.

A Ventura P, C Lage ML, L de Carvalho A, S Fernandes A, B Taguchi T, Nascimento-Carvalho CM.

J Dev Behav Pediatr. 2019 Aug 22. doi: 10.1097/DBP.0000000000000722. [Epub ahead of print]

OBJECTIVE: To assess the gross motor development of children with presumed congenital Zika virus (ZIKV) infection over the first 2 years of their lives. **METHODS:** Seventy-seven children were assessed at the median ages of 11, 18, and 24 months, using the evaluative instrument Gross Motor Function Measure (GMFM-66). At the third assessment, the children with diagnoses of cerebral palsy (CP) were classified by severity through the Gross Motor Function Classification System (GMFCS) and stratified by topography indicating the predominantly affected limbs. With these instruments in combination and using the motor development curves as reference, the rate of development and functional ability were estimated. **RESULTS:** At 2 years of age, all children had the diagnosis of CP. Seventy-four (96.1%) presented gross motor skills similar to those of children aged 4 months or younger, according to the World Health Organization's standard. The GMFM-66 median score among the 73 (94.8%) children with quadriplegia and GMFCS level V showed significant change between 11 and 18 months ($p < 0.001$) and between 11 and 24 months ($p < 0.001$). No significant difference ($p = 0.076$) was found between 18 and 24 months. **CONCLUSION:** Despite showing some gross motor progress during the initial 18 months of life, these children with presumed congenital ZIKV infection and CP experienced severe motor impairment by 2 years of age. According to the motor development curves, these children with quadriplegia have probably already reached about 90% of their motor development potential.

PMID: [31453893](#)

33. Noncommunicable disease among adults with cerebral palsy: A matched cohort study.

Ryan JM, Peterson MD, Matthews A, Ryan N, Smith KJ, O'Connell NE, Liverani S, Anokye N, Victor C, Allen E.

Neurology. 2019 Aug 28. pii: 10.1212/WNL.0000000000008199. doi: 10.1212/WNL.0000000000008199. [Epub ahead of print]

OBJECTIVE: To compare the incidence of noncommunicable diseases between adults with and without cerebral palsy (CP). **METHODS:** A cohort study was conducted using primary care data from the Clinical Practice Research Datalink. Cox models, stratified by matched set and adjusted for potential confounders, were fitted to compare the risk of any noncommunicable disease, cancer, cardiovascular disease, type 2 diabetes mellitus, and respiratory disease between adults with and without CP. **RESULTS:** The analysis included 1,705 adults with CP and 5,115 age-, sex-, and general practice-matched adults without CP. There was evidence from adjusted analyses that adults with CP had 75% increased risk of developing any noncommunicable disease compared to adults without CP (hazard ratio [HR] 1.75, 95% confidence interval [CI] 1.58-1.94). Specifically, they had increased risk of cardiovascular disease (HR 1.76, 95% CI 1.48-2.11) and respiratory disease (HR 2.61, 95% CI 2.14-3.19). There was no evidence of increased risk of cancer or type 2 diabetes mellitus. **CONCLUSIONS:** Adults with CP had increased risk of noncommunicable disease, specifically cardiovascular and respiratory disease. These findings highlight the need for clinical vigilance regarding identification of noncommunicable disease in people with CP and further research into the etiology and management of noncommunicable disease in this population.

PMID: [31462583](https://pubmed.ncbi.nlm.nih.gov/31462583/)