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Interventions and Management

1. Accelerometer Measurements Indicate That Arm Movements of Children With Cerebral Palsy Do Not Increase After Constraint-Induced Movement Therapy (CIMT)

Brianna M Goodwin, Emily K Sabelhaus, Ying-Chun Pan, Kristie F Bjornson, Kelly L D Pham, William O Walker, Katherine M Steele

Am J Occup Ther. Sep/Oct 2020;74(5):7405205100p1-7405205100p9. doi: 10.5014/ajot.2020.040246.

Importance: Constraint-induced movement therapy (CIMT) is a common treatment for children with unilateral cerebral palsy (CP). Although clinic-based assessments have demonstrated improvements in arm function after CIMT, whether these changes are translated and sustained outside of a clinic setting remains unclear. **Objective:** Accelerometers were used to quantify arm movement for children with CP 1 wk before, during, and 4 wk or more after CIMT; measurements were compared with those from typically developing (TD) peers. **Design:** Observational. **Setting:** Tertiary hospital and community. **Participants:** Seven children with CP (5 boys, 2 girls; average [AVE] age \pm standard deviation [SD] = 7.4 \pm 1.2 yr) and 7 TD peers (2 boys, 5 girls; AVE age \pm SD = 7.0 \pm 2.3 yr). **Intervention:** 30-hr CIMT protocol. **Outcomes and measures:** Use ratio, magnitude ratio, and bilateral magnitude were calculated from the accelerometer data. **Clinical measures** were administered before and after CIMT, and parent surveys assessed parent and child perceptions of wearing accelerometers. **Results:** During CIMT, the frequency and magnitude of paretic arm use among children with CP increased in the clinic and in daily life. After CIMT, although clinical scores showed sustained improvement, the children's accelerometry data reverted to baseline values. Children and parents in both cohorts had positive perceptions of accelerometer use. **Conclusions and relevance:** The lack of sustained improvement in accelerometry metrics after CIMT suggests that therapy gains did not translate to increased movement outside the clinic. Additional therapy may be needed to help transfer gains outside the clinic. **What this article adds:** Accelerometer measurements were effective at monitoring arm movement outside of the clinic during CIMT and suggested that additional interventions may be needed after CIMT to sustain benefits.

PMID: [32804628](https://pubmed.ncbi.nlm.nih.gov/32804628/)

2. Selective Dorsal Rhizotomy for the Treatment of Spastic Triplegic Cerebral Palsy

T S Park, Susan Joh, Deanna M Walter, Matthew B Dobbs

Cureus. 2020 Jul 15;12(7):e9204. doi: 10.7759/cureus.9204.

Background Spastic triplegia is a recognized subtype of cerebral palsy (CP). In the course of treating spastic triplegic children with selective dorsal rhizotomy (SDR), we found that some children who had "minimal or mild involvement" in the stronger arm improved strikingly after undergoing SDR. Some of them became independent ambulators, which was an outcome that is not usually achieved in spastic quadriplegic children. However, the literature currently contains no data on the natural clinical course and the effects of CP interventions on spastic triplegia. **Objectives** Our aim was to elucidate the clinical characteristics

of spastic triplegia and the effects of SDR on functional outcomes and the quality of life after childhood SDR. **Methods** The Institutional Review Board of the Washington University School of Medicine approved this quality of life survey (number: 201908177). The subjects of this study were children and adults (ages: 3.9-23.8 years at the time of the survey completion; mean: 12.1 ± 5.1 years) with spastic triplegic CP who had undergone SDR (ages: 2.2-15.9 years; mean: 6.1 ± 3.2 years) between 2003 and 2018 at the St. Louis Children's Hospital. The follow-up period ranged from 1-16 years (mean: 6.0 ± 4.3 years). The study included a 76-patient cohort selected from a total of 253 spastic triplegic CP patients who had undergone SDR. All 253 patients were contacted via email or postal mail soliciting their participation in the study including the survey. The cohort included all patients who responded. The survey included questions on demographic information, quality of life, perceptions of health and the SDR procedure, motor and ambulatory functions, braces and orthotics, pain issues, side effects of SDR, and post-SDR treatment. **Results** Thirteen patients had presented with scissored gait, and these patients had undergone partial ventral rhizotomy (PVR) of L1-3 ventral roots immediately after the completion of SDR. Of note, 91% of 76 patients reported that SDR improved their quality of life, and 93% would recommend the procedure to other patients. After SDR, 21 more patients were able to run, 14 more played recreational sports, and 18 more could walk without using walking aids. Sixteen fewer patients used a wheelchair for long-distance walking and in crowds; 37 and 32 patients reported an improvement in the more affected arm and hand, respectively. Sixty-eight patients were able to regularly strengthened their muscles at least once a week, and 60 patients regularly stretched their legs. However, 53 patients required assistance with bathing or showering, 50 with getting dressed, and 56 with grooming or hygiene. Forty-eight patients had orthopedic surgery after SDR. Percutaneous hamstring-lengthening was the most common type of orthopedic surgery performed. Three of 13 patients who received PVR and SDR required adductor release. Six patients used medications for spasticity or dystonia. No late side effects of SDR were observed. **Conclusions** Our report elucidates the clinical features of spastic triplegia before and after SDR. A distinct clinical feature was the wide variation in ambulatory functions, ranging from total independent walking to wheelchair mobility. The vast majority of patients felt that SDR improved their motor functions and quality of life. PVR also resulted in favorable outcomes, with only three of 13 patients requiring additional adductor release surgery. There were no late complications related to SDR surgery.

PMID: [32821558](#)

3. 3D ultrasound to quantify lateral hip displacement in children with cerebral palsy: a validation study

Rebecca H Kay, Jonathan J Noble, Liam Johnston, Stephen F Keevil, Michail Kokkinakis, Daniel Reed, Martin Gough, Adam P Shortland

Dev Med Child Neurol. 2020 Aug 18. doi: 10.1111/dmcn.14647. Online ahead of print.

Aim: To assess the validity of a new index, lateral head coverage (LHC), for describing hip dysplasia in a population of children with cerebral palsy (CP). **Method:** LHC is derived from 3D ultrasound assessment. Twenty-two children (15 males, seven females; age 4-15y) with CP undergoing routine hip surveillance were recruited prospectively for the study. Each participant had both a planar radiograph acquired as part of their routine care and a 3D ultrasound assessment within 2 months. Reimer's migration percentage (RMP) and LHC were measured by the same assessor, and the correlation between them calculated using Pearson's correlation coefficient. The repeatability of LHC was investigated with three assessors, analysing each of 10 images three times. Inter- and intra-assessor variation was quantified using intraclass correlation coefficients. **Results:** LHC was strongly correlated with RMP (Spearman's rank correlation coefficient=-0.86, $p < 0.001$). LHC had similar inter-assessor reliability to that reported for RMP (intraclass correlation coefficient=0.97 and intra-assessor intraclass correlation coefficient=0.98). **Interpretation:** This is an initial validation of the use of 3D ultrasound in monitoring hip development in children with CP. LHC is comparable with RMP in estimating hip dysplasia with similar levels of reliability that are reported for RMP.

PMID: [32812217](#)

4. Effective botulinum neurotoxin injection in treating iliopsoas spasticity

Kyu-Ho Yi, Hyung-Jin Lee, Ji-Hyun Lee, Kyu-Lim Lee, Hee-Jin Kim

Clin Anat. 2020 Aug 17. doi: 10.1002/ca.23670. Online ahead of print.

Introduction: To detect ideal locations for botulinum toxin injection by exploring the intramuscular nerve arborization of the psoas major and iliacus muscles. **Method:** A modified Sihler's method was performed on the psoas major and iliacus muscles (16 specimens each). Intramuscular nerve arborization was recorded according to the most prominent point of the anterior superior iliac spine, the posterior superior iliac spine, the lesser trochanter, and the transverse process of the 12th thoracic

vertebra. Result: Intramuscular nerve arborization of the psoas major muscle was the largest from 1/5 to 3/5 the distance from the transverse process of the 12th thoracic vertebra to the posterior superior iliac spine, and the tendinous portion of the muscle occupied from 3/5 to 5/5 this distance. In terms of the plane of the anterior superior iliac spine, the posterior superior iliac spine and the lesser trochanter, the arborization of the iliacus muscle was the largest from 1/5 to 3/5 the horizontal distance and 0 to 1/3 the distance longitudinally, and from 1/5 to 2/5 the horizontal distance and 1/3 to 2/3 the longitudinal distance. Discussion: These results suggest that an injection of botulinum toxin to the psoas major and iliacus muscle should be applied in specific areas. Additionally, the posterior approach is an ideal method for targeting only the psoas major because the injection point is above the posterior superior iliac spine. However, when treating both the psoas major and iliacus muscles, the proximal anterior approach is an ideal method according to the arborization patterns. This article is protected by copyright. All rights reserved.

PMID: [32805076](#)

5. Severe Hip Dysplasia in Skeletally Mature Patients With Spastic Cerebral Palsy: The Technique and Early Outcome of Comprehensive Surgical Correction (Including the Bernese PAO)

Mark L Miller, John C Clohisy, Gail E Pashos, Lisa M Berglund, Perry L Schoenecker

J Pediatr Orthop. 2020 Aug 14. doi: 10.1097/BPO.0000000000001635. Online ahead of print.

Background: Treatment of symptomatic hip dysplasia in skeletally mature patients with spastic cerebral palsy (CP) can be challenging. This study examines our technical experience with the Bernese periacetabular osteotomy (PAO) in combination with adjunctive procedures in the treatment of this complex hip deformity. Methods: Sixteen consecutive patients (18 hips) with symptomatic CP hip dysplasia were treated with a PAO and variable adjunctive procedures and retrospectively reviewed. Two patient (2 hips) were excluded due to insufficient follow-up. The average age at the time of surgery was 17.7 years (range: 13 to 28 y). We compared the preoperative to postoperative changes in radiographic parameters as well as early outcomes as measured by patient assessment of hip pain and function using the modified Harris Hip Score (mHHS). Results: The average time of follow-up was 3.3 years (range: 2.0 to 6.3 y). Tonnis angles decreased from a median of 30 degrees (range: 18 to 45 degrees) preoperatively to a median of 6 degrees (range: -9 to 21 degrees) postoperatively. Lateral center-edge angles increased from a median of -8 degrees (range: -28 to 15 degrees) to a median of 32 degrees (range: 19 to 38 degrees). Anterior center-edge angles increased from a median of 2 degrees (range: -22 to 39 degrees) to a median of 35 degrees (range: 22 to 47 degrees). The extrusion index decreased from a median of 57% preoperatively (range: 35% to 73%) to a median of 21% (range: 11% to 36%) postoperatively. The median mHHS was 62 (range: 37 to 81) preoperatively and 85 (range: 65 to 100) postoperatively. Notably, the pain component of the mHHS improved from 20 (range: 0 to 44) to 42 (range: 30 to 44). Tonnis osteoarthritis grade preoperatively was either 0 (11 hips) or 1 (5 hips) and remained unchanged in 11 hips and increased by 1 grade in 5 hips. Conclusions: It has been our experience that the Bernese PAO in combination with appropriate adjunctive treatments has provided a very satisfactory surgical approach in the treatment of CP hip dysplasia. In the adolescent and young adult with spastic CP, utilizing the Bernese PAO technique makes it possible to obtain redirection of often a very severe acetabular dysplasia. Adjunctive soft tissue procedures and a proximal femoral osteotomy are frequently necessary to maintain postoperative stability. A notable improvement in the quality of life and function directly attributable to our surgical treatment of their pre-existing problematic hip dysplasia has been consistently noted in early follow-up for our patients. Level of evidence: Level IV-therapeutic.

PMID: [32804861](#)

6. Patella Alta in Ambulatory Children With Cerebral Palsy: Prevalence and Functional Significance

Jon R Davids, Vedant A Kulkarni, Anita M Bagley, Nina Q Cung, Roy B Davis, David E Westberry, Ashley Carpenter

J Pediatr Orthop. 2020 Aug 14. doi: 10.1097/BPO.0000000000001664. Online ahead of print.

Background: Gait dysfunction associated with patella alta (PA) in subjects with cerebral palsy (CP) has been presumed but not objectively established clinically or through biomechanical modeling. It is hypothesized that PA is associated with increasing level of motor impairment, increasing age, obesity, and worse stance phase knee kinematics and kinetics in children with CP. Methods: Retrospective case series of 297 subjects with CP studied in our Motion Analysis Center. Data analyzed included patient demographics (age, body mass index, CP classification), patella height (Koshino-Sugimoto Index), and knee kinematics and kinetics. Results: PA was present in 180 of 297 subjects (61%), in 68 of the 146 (47%) with unilateral CP, and 112 of 151 subjects (74%) with bilateral CP. For unilateral CP, the prevalence of PA was not significantly different between Gross Motor

Function Classification System (GMFCS) I and II ($P=0.357$). For bilateral CP, the prevalence of PA in GMFCS III was significantly greater than in GMFCS I and II ($P=0.02$). Regression analysis showed a significant trend between increasing age and PA in unilateral and bilateral groups ($P<0.001$ and 0.001 , respectively). The prevalence of PA was not significantly different across body mass index categories for either unilateral or bilateral groups. There were only 2 of 10 significant correlations between PA and gait parameters for subjects with unilateral CP functioning at the GMFCS I and II levels. There were 8 of 12 significant correlations between PA and gait parameters for subjects with bilateral CP functioning at the GMFCS I, II, and III levels. Conclusions: PA is common in ambulatory children with CP across topographic types and motor functional levels. PA is well tolerated with respect to gait dysfunction in unilateral CP, but may contribute to crouch gait in bilateral CP. Gait dysfunction cannot be inferred from the radiographic assessment of patellar height, and radiographic evidence of PA by itself does not justify surgical correction with patellar tendon advancement or shortening. Level of evidence: Level III-prognostic, retrospective series.

PMID: [32804868](#)

7. Effects of horse riding simulator on sitting motor function in children with spastic cerebral palsy

Hemachithra Chinniah, Meena Natarajan, Ramanathan Ramanathan, John William Felix Ambrose

Physiother Res Int. 2020 Aug 18;e1870. doi: 10.1002/pri.1870. Online ahead of print.

Background: Horse riding simulator (HRS) is an electronic horse, working under the principles of hippotherapy. It is one of the advanced therapeutic methods to improve postural control and balance in sitting, which could be recommended in the rehabilitation of cerebral palsy if real horses are unavailable. **Objective:** To investigate the therapeutic effects of HRS on sitting motor function in children with spastic diplegia and evaluate the changes in sitting motor function at different periods of time (4, 8 and 12 weeks). **Methods:** This study is a randomized controlled trial conducted over a period of 12 weeks. Thirty children with spastic diplegia age between 2 and 4 years with Gross Motor Function Classification System (GMFCS) Level I-III were included and divided into two groups. The control group received the conventional physiotherapy while the experimental group received HRS along with conventional physiotherapy. Sitting motor function was assessed by Gross Motor Function Measure (GMFM)-88 (sitting dimension B) at baseline, 4, 8 and 12 weeks. Pre- and post-intervention scores were measured and analysed. **Results:** The baseline characteristics were similar in both groups before the intervention with $p > .01$. The observed mean value of GMFM in both groups improved over a period of 12 weeks. The results denote that the sitting motor function gradually improved over a period of time in both groups and the experimental group showed significant improvement ($p < .01$) than the control group in all the weeks. **Conclusion:** The study results confirmed that gradual improvement in sitting motor function was observed in both groups. Children exposed to HRS show better improvement than the children in the control group. It was concluded that HRS is effective in improving the sitting motor function in children with spastic diplegia and the continuous provision of HRS in longer duration provide more benefits than the shorter duration.

PMID: [32808394](#)

8. Slipped capital femoral epiphysis in an ambulant patient with spastic cerebral palsy. A long-term evolution

S García-Mata, A F D'Arrigo Azarelli, J N Albiñana-Cunningham

Case Reports An Sist Sanit Navar. 2020 Jul 24;0(0). doi: 10.23938/ASSN.0864. Online ahead of print.

We report the case of a boy aged 13 years and 9 months, with predominantly right-sided spastic tetraparesis, who could walk with assistance, GMFCS III, phenotype consistent with adiposogenital syndrome. He presented a 4-week history of left-sided limp without pain, radiologically classified as a stable, chronic slipped capital femoral epiphysis (SCFE) with mild slippage ($<30^\circ$) on the Southwick classification. In situ fixation of the hip was performed using a full-headed screw, followed by six weeks of rest. Twelve years since the intervention, the patient remains asymptomatic with no clinical or radiological changes. SCFE in patients with cerebral palsy, while highly unusual, is possible. A high level of suspicion is required for diagnosing it. We would suggest ruling out the appearance of SCFE during surveillance screening of patients with cerebral palsy, ≈ 10 years-old, particularly in obese individuals with or without adiposogenital phenotype and limited ability to communicate verbally.

PMID: [32814930](#)

9. Doubts About Primary Versus Repeat Hamstring Surgical Lengthening in Cerebral Palsy

Marcos A Matos, Cristiane C Dias, Amanda A Pereira

J Pediatr Orthop. 2020 Aug 14. doi: 10.1097/BPO.0000000000001652. Online ahead of print.

PMID: [32804866](#)**10. Action Observation Treatment in a tele-rehabilitation setting: a pilot study in children with cerebral palsy**

Anna Molinaro, Serena Micheletti, Federica Pagani, Gioacchino Garofalo, Jessica Galli, Andrea Rossi, Elisa Fazzi, Giovanni Buccino

Disabil Rehabil. 2020 Aug 17;1-6. doi: 10.1080/09638288.2020.1793009. Online ahead of print.

Objective: Action Observation Treatment is a novel rehabilitation approach exploiting a neurophysiological mechanism that allows one to recruit the neural structures sub-serving action execution during the mere observation of those same actions. Action Observation Treatment is effective in the rehabilitation of several neurological diseases. In this pilot study, we used Action Observation Treatment in a telerehabilitation setting in children with Cerebral Palsy. Materials and methods: Ten children with Cerebral Palsy, aged 5-12 years, entered the study. They followed the Action Observation Treatment rehabilitation program at home with remote supervision by a child neurologist located at the hospital. Outcome measures were the scores at the Melbourne Assessment of Unilateral Upper Limb Function Scale and the Assisting Hand Assessment. Results: Scores obtained after treatment and at a two months' follow-up significantly differed from baseline and overlapped those obtained in randomized controlled studies carried out in a conventional setting. Conclusions: Action Observation Treatment is therefore a promising approach that can be used on a large scale in a telerehabilitation setting. IMPLICATIONS FOR REHABILITATION Tele-rehabilitation has the potential to enhance early intervention service provision for children with Cerebral Palsy. Action Observation Treatment has the potential to become a routine approach in a telerehabilitation setting.

PMID: [32805150](#)**11. A Collaborative and Cognitive-based Intervention for Young People with Cerebral Palsy**

Larissa K Sousa, Marina Brito Brandão, Clare M Curtin, Livia C Magalhães

Can J Occup Ther. 2020 Aug 17;8417420946608. doi: 10.1177/0008417420946608. Online ahead of print.

Background.: Evidence-based approaches to improve function in individuals with cerebral palsy are needed. Purpose.: To investigate the effectiveness of the Cognitive Orientation to daily Occupational Performance approach™ (CO-OP) to improve performance on self-chosen, functional goals as compared to traditional occupational therapy for cerebral palsy. Method.: Crossover design with 12 participants, aged 6-15 years, randomly assigned to CO-OP and traditional intervention groups, followed by crossover and a 3-month follow-up. The participants identified three occupation-based goals for CO-OP and each group received ten 45-minutes intervention twice weekly in clinical context. Occupational performance, manual dexterity and Gross Motor Function Measures were analysed using generalized estimating equations. Findings.: There were clinical and statistically significant improvements in functional goals following CO-OP and not traditional therapy. There were gains in dexterity but not in gross motor skills. Implications.: CO-OP was effective to improve functional performance in young people with cerebral palsy and should be more utilized.

PMID: [32799649](#)**12. Oral health in children with cerebral palsy: A systematic review and meta-analysis**

Caterina Bensi, Micaela Costacurta, Raffaella Docimo

Review Spec Care Dentist. 2020 Aug 20. doi: 10.1111/scd.12506. Online ahead of print.

Aims: Aim of the present systematic review and meta-analysis is to investigate the oral health status of children with cerebral palsy and to compare it to that of healthy children. **Methods and results:** An electronic search extended to October 2019 was conducted on PubMed, Scopus, Web of Science and Cochrane Library. Two independent reviewers selected publications using a two-stage process; data were extracted according to PRISMA statement. The Newcastle Ottawa Scale was used to evaluate the risk of bias in individual studies. After screening of the 5460 studies selected 20 publications were included in the systematic review, 15 underwent quantitative analysis. In the palsy population statistical analysis showed an OR = 1.45 (95% CI: 1.05-2.00) for dental caries in the primary dentition and OR = 1.87 (95% CI: 1.07-3.24) for the simplified oral hygiene index. The OR of Angle's Class II and anterior open bite were 3.27 (95% CI: 1.22-8.81) and 14.06 (95% CI: 6.26-31.62), respectively. **Conclusion:** Children with cerebral palsy seem to present an increased risk of dental caries in the primary dentition, of Angle's Class II malocclusion, anterior open bite and a lower gingival status.

PMID: [32815638](#)

13. Prevention and management of respiratory disease in young people with cerebral palsy: consensus statement

Noula Gibson, Amanda M Blackmore, Anne B Chang, Monica S Cooper, Adam Jaffe, Wee-Ren Kong, Katherine Langdon, Lisa Moshovis, Karolina Pavleski, Andrew C Wilson

Dev Med Child Neurol. 2020 Aug 9. doi: 10.1111/dmcn.14640. Online ahead of print.

Respiratory illness is the leading cause of mortality in children with cerebral palsy (CP). Although risk factors for developing chronic respiratory illness have been identified, comprehensive clinical care recommendations for the prevention and management of respiratory illness do not currently exist. We invited over 200 clinicians and researchers from multiple disciplines with expertise in the management of respiratory illness in children with CP to develop care recommendations using a modified Delphi method on the basis of the RAND Corporation-University of California Los Angeles Appropriateness Method. These recommendations are intended for use by the wide range of practitioners who care for individuals living with CP. They provide a framework for recognizing multifactorial primary and secondary potentially modifiable risk factors and for providing coordinated multidisciplinary care. We describe the methods used to generate the consensus recommendations, and the overall perspective on assessment, prevention, and treatment of respiratory illness in children with CP. **WHAT THIS PAPER ADDS:** The first consensus statement for preventing and managing respiratory disease in cerebral palsy (CP). Risk factors for respiratory disease in CP should be identified early. Individuals with CP at risk of respiratory disease require regular assessment of risk factors. Effective partnerships between multidisciplinary teams, individuals with CP, and families are essential. Treatment of respiratory disease in individuals with CP must be proactive.

PMID: [32803795](#)

14. The Effectiveness of Massage for Children With Cerebral Palsy: A Systematic Review

Zehra Güçhan Topcu, Hayriye Tomaç

Adv Mind Body Med. 2020 Spring;34(2):4-13.

Context: Massage is a widely used alternative therapy among health professionals and parents for children with cerebral palsy (CP). **Objective:** The review intended to determine the effects of massage on the rehabilitation of children with CP. **Design:** The research team conducted a literature review that examined the use of massage for children with various types of CP, such as ataxia, using relevant keywords. It included articles published up to December 2019. The research team searched the electronic databases PubMed, MEDLINE, Embase, Scopus, and the Cochrane Central Register of Controlled Trials. **Setting:** The study took place at Eastern Mediterranean University in Famagusta, Cyprus. **Participants:** Participants in the reviewed studies were children with CP. **Outcome measures:** The strength of the research designs was rated using Sackett's Levels of Evidence. The Physiotherapy Evidence Database (PEDro) scale was used to assess the studies' methodological quality. The outcome measures were classified according to the International Classification of Functioning, Disability, and Health (ICF). **Results:** Eleven studies that included 297 CP children were reviewed. According to the PEDro scores, 5 studies had high methodological quality; 5 studies had fair quality; and one study had poor quality. No study investigated the effects of massage for all classifications of the ICF. Muscle tone was decreased significantly in the reviewed studies, either between the groups or within the massage group ($P < .05$). No consensus existed about the other effects of massage due to the limited research. **Conclusions:** This study is a first review in this area and can be an important guide for professionals and caregivers who want properly use massage for children with CP. Massage as an adjunct to traditional therapies should be used to reduce muscle tone in spastic-type CP. More clear methods and relevant outcome measures should be used in future studies. Further studies with

randomized controlled trials are required to determine massage type, massage applier, and oil for this population and to investigate immediate and long-term effects of massage on all ICF's domains.

PMID: [32822329](#)

15. Reliability and Validity of the Dyskinesia Impairment Scale in Children and Young Adults with Inherited or Idiopathic Dystonia

Annika Danielsson, Inti Vanmechelen, Cecilia Lidbeck, Lena Krumlinde-Sundholm, Els Ortibus, Elegast Monbaliu, Kristina Tedroff

J Clin Med. 2020 Aug 11;9(8):E2597. doi: 10.3390/jcm9082597.

Background: The Dyskinesia Impairment Scale (DIS) is a new assessment scale for dystonia and choreoathetosis in children and youth with dyskinetic cerebral palsy. Today, the Burke-Fahn-Marsden Dystonia Rating Scale (BFM) is mostly used to assess dystonia in children with inherited dystonia. The aim of this study was to assess reliability and validity of the DIS in children and youth with inherited or idiopathic dystonia. **Methods:** Reliability was measured by (1) the intraclass correlation coefficients (ICCs) for inter-rater and test-retest reliability, as well as (2) standard error of measurement (SEM) and minimal detectable difference (MDD). For concurrent validity of the DIS-dystonia subscale, the BFM was administered. **Results:** In total, 11 males and 9 females (median age 16 years and 7 months, range 6 to 24 years) were included. For inter-rater reliability, the ICCs for the DIS total score and the dystonia and choreoathetosis subscale scores were 0.83, 0.87, and 0.71, respectively. For test-retest reliability, the ICCs for the DIS total score and the dystonia and choreoathetosis subscale scores were 0.95, 0.88, and 0.93, respectively. The SEM and MDD for the total DIS were 3.98% and 11.04%, respectively. The Spearman correlation coefficient between the dystonia subscale and the BFM was 0.88 ($p < 0.01$). **Conclusions:** Good to excellent inter-rater, test-retest reliability, and validity were found for the total DIS and the dystonia subscale. The choreoathetosis subscale showed moderate inter-rater reliability and excellent test-retest reliability. The DIS may be a promising tool to assess dystonia and choreoathetosis in children and young adults with inherited or idiopathic dystonia.

PMID: [32796550](#)

16. Protocol for the Sri Lankan Cerebral Palsy Register pilot study

Thilini Madushika Heiyanthuduwege, Samanmali P Sumanasena, Gopi Kitnasamy, Hayley Smithers Sheedy, Gulam Khandaker, Romaniya Fernando, Saraji Wijesekara, Jayatri Jagoda, Pyara Ratnayake, Jithangi Wanigasinghe, Sarah McIntyre, Shona Goldsmith, Emma Waight, Nadia Badawi, Mohammad Muhit, Nimisha Muttiah

BMJ Open. 2020 Aug 20;10(8):e039353. doi: 10.1136/bmjopen-2020-039353.

Introduction: Cerebral palsy (CP) describes a heterogeneous group of motor disorders resulting from disturbance in the developing brain. CP occurs in approximately 2.1 per 1000 live births in high-income countries, but in low- and middle-income countries (LMICs) the prevalence and severity of CP may be greater and aetiological risk factors different. In Sri Lanka, a LMIC, there have been no epidemiological studies of CP to date. Systematically collected data are required to identify opportunities for primary and secondary prevention, to plan and establish services to support children and adults with CP and their families and to act as a sampling frame for new research. Here we describe a pilot study protocol for a CP register in Sri Lanka. **Methods and analysis:** The aim of this study is to establish a CP register in Sri Lanka. We will use different surveillance methodologies in two provinces of Sri Lanka: hospital and community surveillance in the Western Province and community surveillance in the Eastern Province. A common record form will collect demographic, clinical and service data for children with CP <18 years living in these two provinces. Data will be transferred to a secure online data repository and used to describe the epidemiology of CP in these regions. We will describe the strengths and challenges of the surveillance mechanisms and estimate the resources required for ongoing hospital and community based surveillance in the Western and Eastern provinces and to include additional provinces across the country. **Ethics and dissemination:** This study has ethical clearance from The University of Kelaniya, National Health Research Council, the Institutional Ethics Review Committee of the Lady Ridgeway Hospital, Colombo South Teaching Hospital and the Director of the North Colombo Teaching Hospital. Results from this research will be disseminated through local and international conferences and through publications in peer-reviewed journals.

PMID: [32820001](#)

17. Study protocol: functioning curves and trajectories for children and adolescents with cerebral palsy in Brazil - PartiCipa Brazil

Paula S C Chagas, Carolyne M Drumond, Aline M Toledo, Ana Carolina de Campos, Ana Cristina R Camargos, Egmar Longo, Hércules R Leite, Kênea M A Ayupe, Rafaela S Moreira, Rosane L S Morais, Robert J Palisano, Peter Rosenbaum, on Behalf of PartiCipa Brazil Research Group

BMC Pediatr. 2020 Aug 20;20(1):393. doi: 10.1186/s12887-020-02279-3.

Background: Gross motor development curves for children with Cerebral Palsy (CP), grouped by Gross Motor Function Classification System (GMFCS) levels, help health care professionals and parents to understand children's motor function prognosis. Although these curves are widely used in Brazil to guide clinical decision-making, they were developed with Canadian children with CP. Little is known about how these patterns evolve in children and adolescents with CP in low-income countries like Brazil. The PARTICIPA BRAZIL aims to: (i) to identify and draw a profile of functioning and disability of Brazilian children and adolescents with CP by classifying them, for descriptive purposes, with all five valid and reliable functional classifications systems (gross motor function, manual ability, communication function, visual and eating and drinking abilities); (ii) to create longitudinal trajectories capturing the mobility capacity of Brazilian children and adolescents with CP for each level of the GMFCS; (iii) to document longitudinal trajectories in the performance of activities and participation of Brazilian children and adolescents with CP across two functional classification systems: GMFCS and MACS (Manual Abilities Classification System); (iv) to document longitudinal trajectories of neuromusculoskeletal and movement-related functions and exercise tolerance functions of Brazilian children and adolescents with CP for each level of the GMFCS; and (v) to explore interrelationships among all ICF framework components and the five functional classification systems in Brazilian children and adolescents with CP. **Methods:** We propose a multi-center, longitudinal, prospective cohort study with 750 Brazilian children and adolescents with CP from across the country. Participants will be classified according to five functional classification systems. Contextual factors, activity and participation, and body functions will be evaluated longitudinally and prospectively for four years. Nonlinear mixed-effects models for each of the five GMFCS and MACS levels will be created using test scores over time to create prognosis curves. To explore the interrelationships among ICF components, a multiple linear regression will be performed. **Discussion:** The findings from this study will describe the level and nature of activities and levels of participation of children and youth with CP in Brazil. This will support evidence-based public policies to improve care to this population from childhood to adulthood, based on their prognosis.

PMID: [32819318](#)

18. Differences in responses to English and Korean versions of the Caregiver Priorities & Child Health Index of Life with Disabilities (CPCHILD)

Ki Hyuk Sung, Soon-Sun Kwon, Gyeong Hee Cho, Chin Youb Chung, Clarissa Encisa, Huroy Menal, Unni G Narayanan, Moon Seok Park

Health Qual Life Outcomes. 2020 Aug 17;18(1):282. doi: 10.1186/s12955-020-01528-4.

Background: The purpose of this study was to identify differences in caregiver responses to Korean-language and English-language versions of the Caregiver Priorities & Child Health Index of Life with Disabilities (CPCHILD) questionnaire. **Methods:** Patient data were acquired from the Cerebral Palsy Hip Outcomes Project database, which was established to run a large international multicenter prospective cohort study of the outcomes of hip interventions in cerebral palsy. Thirty-three children whose caregivers had completed the Korean version of CPCHILD were matched by propensity scoring with 33 children whose parents completed the English version. Matching was performed on the basis of 12 covariates: age, gender, gross motor function classification system level, migration percentage of right and hip, seizure status, feeding method, tracheostomy status, pelvic obliquity, spinal deformity, parental report of hip pain and contracture interfering with care. **Results:** There were no significant differences in CPCHILD scores for section 4 (Communication and Social Interaction), and section 5 (Health) between two groups. Korean-language CPCHILD scores were significantly lower than English-language CPCHILD scores for section 1 (Personal Care/Activities of Daily Living), section 2 (Positioning, Transferring and Mobility), section 3 (Comfort and Emotions) and section 6 (Overall Quality of Life) as well as in terms of total score. **Conclusions:** Cultural influences, and the community or social environment may impact the caregivers' perception of the health-related quality of life of their children. Therefore, physicians should consider these differences when interpreting the study outcomes across different countries.

PMID: [32807199](#)

19. Efficacy of group social skills interventions on social competency and participation in adolescents with acquired and developmental disabilities: a systematic review protocol

Rosemary Gilmore, Jenny Ziviani, Leanne Sakzewski

JBIS Evid Synth. 2020 Jul 3. doi: 10.11124/JBISRIR-D-19-00400. Online ahead of print.

Objective: The objective of this review is to evaluate the efficacy of group social skills interventions in improving social knowledge, social competency, and social participation in adolescents with acquired and developmental disabilities.
Introduction: Difficulties with social functioning and participation are commonly experienced by adolescents with a range of acquired and developmental disabilities. There is evidence for the use of group social skills interventions in youth with autism spectrum disorder, although less is known about their efficacy with youth with other disabilities. **Inclusion criteria:** This review will include studies that evaluate group social skills interventions in adolescents with an acquired or developmental disability, excluding a primary mental health disorder. Randomized control trials will be the only experimental design included and group social skills interventions must have an available intervention manual to allow use in clinical practice. Primary outcomes will include measures of social knowledge, social competence, and social participation. **Methods:** PubMed, CINAHL, Embase, Cochrane Register of Controlled Trials, PsycINFO and Web of Science will be searched for eligible studies published in English. Clinical Trials Registry, Google Scholar, and ProQuest Dissertation and Theses will also be searched. Screening, study selection, critical appraisal, and data extraction will be conducted by two independent reviewers using standardized tools. Studies will be pooled, where possible, with statistical meta-analysis and the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) Summary of Findings presented. Systematic review registration number: The protocol for this systematic review has been submitted to PROSPERO.

PMID: [32813425](#)

20. Early neurodevelopmental outcomes of congenital gastrointestinal surgical conditions: a single-centre retrospective study

Vamsi Batta, Shripada Rao, Deepika Wagh, Jason Khay Ghim Tan, Ian Gollow, Karen Simmer, Max K Bulsara, Sanjay Patole

BMJ Paediatr Open. 2020 Aug 11;4(1):e000736. doi: 10.1136/bmjpo-2020-000736. eCollection 2020.

Background: Evidence is emerging that surgery in the neonatal period is associated with increased risk of suboptimal neurodevelopmental outcomes (SNDO). The aim of this study was to describe neurodevelopmental outcomes (at 1 year) of neonatal surgery for congenital gastrointestinal surgical conditions (CGSC) and to explore risk factors. **Methods:** Retrospective study (2005-2014) of infants born ≥ 34 weeks gestation with CGSC and admitted to the surgical neonatal intensive care unit of Perth Children's Hospital, Western Australia. Clinical details and 1-year developmental outcomes based on Griffiths Mental Developmental Assessment Scales were collated from the database and by reviewing the medical records of study infants. SNDO was defined as one or more of the following: a general quotient less than 88 (ie, >1 SD below mean), cerebral palsy, blindness or sensorineural deafness. Univariable and multivariable logistic regression analyses were carried out to explore risk factors for SNDO. A total of 413 infants were included, of which 13 died. Median gestation was 37.6 weeks (IQR: 36.4-39.1). Information on developmental outcomes was available from 262 out of 400 survivors. A total of 43/262 (16.4%) had SNDO. On univariable analysis, lower z scores for birth weight, prolonged duration of antibiotics, increased episodes of general anaesthesia and prolonged duration of hospital stay were associated with SNDO. On multivariable analysis, lower z scores for birth weight and prolonged hospital stay were associated with increased risk of SNDO. **Conclusions:** Late preterm and term infants undergoing neonatal surgery for CGSC may be at risk for SNDO. Studies with longer duration of follow-up are needed to further evaluate the role of potentially modifiable risk factors on their neurodevelopmental outcomes.

PMID: [32821861](#)

21. Emerging health challenges for children with physical disabilities and their parents during the COVID-19 pandemic: the ECHO French survey

Marine Cacioppo, Sandra Bouvier, Rodolphe Bailly, Laetitia Houx, Mathieu Lempereur, Johanne Mensah-Gourmel, Christèle Kandalafi, Roxane Varengue, Alain Chatelin, Jacky Vagnoni, Carole Vuillerot, Vincent Gautheron, Mickael Dinomais, Elea Dheilley, Sylvain Brochard, Christelle Pons, ECHO Group

Ann Phys Rehabil Med. 2020 Aug 17;S1877-0657(20)30157-3. doi: 10.1016/j.rehab.2020.08.001. Online ahead of print.

Background: The daily lives of children with physical disabilities and their families have been significantly affected by the COVID-19 pandemic. The children face health risks, especially mental, behavioral, social and physical risks. **Objective:** This study aimed to identify potential healthcare issues relating to the wellbeing of disabled children, continuity of rehabilitation and medical care, and parental concerns during the COVID-19 lockdown. **Methods:** The *Enfant Confinement Handicap besOins* (ECHO [child lockdown disability needs]) national survey was developed by a multidisciplinary group and disseminated in France from April 6, 2020 via email and social networks. This online survey was addressed to the parents of children with physical disabilities aged 0 to 18 years. It explored the experiences of children and their families during the lockdown. Information regarding children's wellbeing, rehabilitation and family organization was collected. The first 1000 eligible surveys were analyzed. **Results:** The children (mean [SD] age 9.5 [4.8] years) mostly had cerebral palsy (42%) or neuromuscular diseases (11%). The lockdown had negative effects on morale (44% of children), behaviour (55% of children) and social interactions (55% no contact with other children). Overall, 44% of children stopped physical activities; 76% were educated at home; 22% maintained medical follow-up, and 48% and 27% continued physiotherapy and occupational therapy respectively. For more than 60% of children, parents performed the therapy. The main parental concern was rehabilitation (72%) and their main difficulty was the mental load (50%); parents complained of lack of help and support (60%). **Conclusions:** This study highlighted substantial effects on the health of children with physical disabilities and loss of opportunity, with a massive interruption of medical follow-up and rehabilitation, during the lockdown. Regular assessment of the health benefit/risk is essential to support families and ensure continuity of care during a pandemic.

PMID: [32818674](#)

22. Impact of Social Isolation due to the COVID-19 Pandemic in Patients with Pediatric Disorders: Rehabilitation Perspectives From a Developing Country

André Luís Ferreira Meireles, Louisiana Carolina Ferreira de Meireles

Phys Ther. 2020 Aug 17;pzaa152. doi: 10.1093/ptj/pzaa152. Online ahead of print.

PMID: [32805029](#)

23. Integrative medicine rehabilitation for children with cerebral palsy: a study protocol for a multicenter pragmatic randomized controlled trial

Mi-Joo Lee, Young-Ju Yun, Sun-Ae Yu, Yong-Beom Shin, Soo-Yeon Kim, Jun-Hee Han

Trials. 2020 Aug 17;21(1):723. doi: 10.1186/s13063-020-04639-x.

Background: Traditional Korean medicine (TKM) has been employed for the treatment of children with cerebral palsy in Korea; however, the addition of TKM to usual rehabilitation (UR) treatment is hindered by insufficient evidence of clinical improvement with TKM in patients with cerebral palsy. In this study, we will evaluate the effectiveness and safety of integrative medicine rehabilitation (IMR) for cerebral palsy through a randomized controlled clinical study. **Methods:** Eighty children (2-6 years old) diagnosed with cerebral palsy will be recruited and randomly divided into groups A and B. Patients in group A will receive IMR with UR, while those in group B will receive only UR during weeks 1-12 of the study. IMR includes acupuncture treatment (head and limb acupuncture) three times a week and the administration of herbal medicine (Yukgunzatang and Yukmijihwang-tang extracts) twice a day in parallel with UR. Evaluations will be conducted at the beginning of the study and at 12 and 24 weeks (follow-up). The primary outcome is the Gross Motor Function Measure-88 score, and the secondary outcomes are the scores for the Goal Attainment Scale, Korean Bayley Scales of Infant Development III, and the Pediatric Quality of Life Inventory, and adverse events. **Discussion:** This will be the first pragmatic randomized controlled trial to evaluate the efficacy and safety of IMR in children with cerebral palsy in Korea. The results will help to demonstrate if IMR is an effective therapeutic approach for cerebral palsy. Trial registration: Ministry of Food and Drug Safety 31361 (<http://www.mfds.go.kr>). Registered on 29 June 2017. Clinical Research Information Service KCT0002620 (https://cris.nih.go.kr/cris/search/search_result_st01.jsp?seq=9819). Registered on 29 December 2017.

PMID: [32807229](#)

24. Striatal cholinergic interneuron numbers are increased in a rodent model of dystonic cerebral palsy

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Neurobiol Dis. 2020 Aug 13;144:105045. doi: 10.1016/j.nbd.2020.105045. Online ahead of print.

Neonatal brain injury leading to cerebral palsy (CP) is the most common cause of childhood dystonia, a painful and functionally debilitating movement disorder. Rare monogenic etiologies of dystonia have been associated with striatal cholinergic interneuron (ChI) pathology. However it is unclear whether striatal ChI pathology is also associated with dystonia following neonatal brain injury. We used unbiased stereology to estimate striatal ChI and parvalbumin-positive GABAergic interneuron (PVI) numbers in a rodent model of neonatal brain injury that demonstrates electrophysiological markers of dystonia and spasticity. Striatal ChI numbers are increased following neonatal brain injury while PVI numbers are unchanged. These numbers do not correlate with electrophysiologic measures of dystonia severity. This suggests that striatal ChI pathology, though present, may not be the primary pathophysiologic contributor to dystonia following neonatal brain injury. Increased striatal ChI numbers could instead represent a passenger or protective phenomenon in the setting of dystonic CP.

PMID: [32800997](#)**25. Randomized Controlled Early versus Late Ventricular Intervention Study (ELVIS) in Posthemorrhagic Ventricular Dilatation: Outcome at 2 Years**

Mehmet N Cizmeci, Floris Groenendaal, Kian D Liem, Ingrid C van Haastert, Isabel Benavente-Fernández, Henrica L M van Straaten, Sylke Steggerda, Bert J Smit, Andrew Whitelaw, Peter Woerdeman, Axel Heep, Linda S de Vries, ELVIS study group

J Pediatr. 2020 Aug 12;S0022-3476(20)30996-3. doi: 10.1016/j.jpeds.2020.08.014. Online ahead of print.

Objective: To compare the effect of intervention at low versus high threshold of ventriculomegaly in preterm infants with posthemorrhagic ventricular dilatation on death or severe neurodevelopmental disability. **Study design:** Multicenter randomized controlled trial. Lumbar punctures were initiated after either a low threshold (LT, ventricular index $>p97 + 4$ mm and anterior horn width >6 mm) or high threshold (HT, ventricular index $>p97 + 4$ mm and anterior horn width >10 mm). The composite adverse outcome was defined as death or cerebral palsy or Bayley composite cognitive/motor scores <-2 standard deviations at 24 months corrected age. **Results:** Outcomes were assessed in 113/126 infants. The composite adverse outcome was seen in 20/58 (35%) infants in the LT group, and 28/55 (51%) in HT ($p=0.07$). LT intervention was associated with a decreased risk of an adverse outcome after correcting for gestational age, severity of intraventricular hemorrhage and cerebellar hemorrhage (adjusted odds ratio: 0.24, 95% confidence interval [CI], 0.07 to 0.87, $p=0.03$). Infants with a favorable outcome had a smaller fronto-occipital horn ratio (crude mean difference: -0.06 , 95% CI $[-0.09$ to $-0.03]$; $p<0.001$) at term-equivalent age. Infants in the LT group with a ventriculo-peritoneal shunt, had cognitive and motor scores similar to those without ($p=0.3$ for both), whereas in the HT group those with a ventriculo-peritoneal shunt had significantly lower scores than those without a ventriculo-peritoneal shunt ($P = .01$ and $p=0.004$, respectively). **Conclusion:** In a post-hoc analysis, earlier intervention was associated with lower odds of death or severe neurodevelopmental disability in preterm infants with progressive posthemorrhagic ventricular dilatation.

PMID: [32800815](#)