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Interventions and Management

1. Hand function development of children with hemiplegic cerebral palsy: A scoping review

James V McCall, Miranda C Ludovice, Catherine Elliott, Derek G Kamper

J Pediatr Rehabil Med. 2021 Nov 30. doi: 10.3233/PRM-200714. Online ahead of print.

Purpose: Hemiplegic cerebral palsy (hCP) typically impacts sensorimotor control of the hand, but comprehensive assessments of the hands of children with hCP are relatively rare. This scoping review summarizes the development of hand function for children with hCP. **Methods:** This scoping review focused on the development of hand function in children with hCP. Electronic databases (PubMed, PEDro, Web of Science, CINAHL, and SpringerLink) were searched to identify studies assessing hand function in children with hCP. The search was performed using keywords (e.g., "hemiplegia"). An iterative approach verified by two authors was used to select the studies. Articles which reported quantitative data for children with hCP on any items of a specified set of hand evaluations were included. Measures were sorted into three categories: quantitative neuromechanics, clinical assessments, and clinical functional evaluations. **Results:** Initial searches returned 1536 articles, 131 of which were included in the final review. Trends between assessment scores and age were examined for both hands. **Conclusion:** While several studies have evaluated hand function in children with hCP, the majority relied on clinical scales, assessments, or qualitative descriptions. Further assessments of kinematics, kinetics, and muscle activation patterns are needed to identify the underlying impairment mechanisms that should be targeted for treatment.

PMID: [34864699](https://pubmed.ncbi.nlm.nih.gov/34864699/)

2. Feasibility of High Repetition Upper Extremity Rehabilitation for Children with Unilateral Cerebral Palsy

Megan J Metzler, Kathleen O'Grady, Linda Fay, Mia Herrero, Mary Dunbar, Darcy Fehlings, John Andersen, Adam Kirton

Phys Occup Ther Pediatr. 2021 Dec 7;1-17. doi: 10.1080/01942638.2021.2010857. Online ahead of print.

Aims: In pediatric upper extremity rehabilitation, feasible repetition rates are unknown. Our objectives were to examine repetition rates during rehabilitation and their impact on outcomes. **Methods:** Children with unilateral cerebral palsy due to perinatal stroke (n = 55, median 10 y 7 mo, 30 males) received Constraint-Induced Movement Therapy (CIMT) followed by Bimanual Therapy, each for 5 days. Repetitions were documented during one-on-one therapy (1.5 h/day). Outcomes included the Assisting Hand Assessment (AHA), Jebsen Taylor Test of Hand Function (JTTHF), and Box and Block Test (BBT). Means and standard deviations for motor outcomes and frequencies for repetition rates were calculated. Factors associated with repetition rates and outcome change were explored using standard linear regression. **Results:** Repetitions/hour averaged 365 ± 165 during CIMT and 285 ± 103 during Bimanual Therapy. Higher repetition rates were associated with higher baseline function by older age, a main effect of younger age, and improving motor skill ($p < .05$). Higher repetition rates corresponded with improvement of the AHA and BBT ($p < .05$, standardized $\beta = 0.392, 0.358$). **Conclusions:** Results suggest high repetition

therapy is feasible in school-aged children with perinatal stroke, albeit with high individual variability. Multiple associations between repetition rates and baseline function and change point to the clinical importance of this measurable and potentially modifiable factor.

PMID: [34872435](#)

3. Paralytic dislocation of the hip in children

Elke Viehweger, Michèle Kläusler, Naima Loucheur

Review Orthop Traumatol Surg Res. 2021 Dec 3;103166. doi: 10.1016/j.otsr.2021.103166. Online ahead of print.

Despite the progress made in the past decades, hip disorders are one of the most common orthopedic problems in the context of paralysis. The etiology can be congenital (malformation such as myelomeningoceles, genetic neuromuscular disorders) or acquired (cerebral palsy, post-traumatic). In these conditions, the orthopedic deformities are minimal at birth. They can develop as the child grows, at different ages, depending on the etiology, severity of the neuromuscular disorder and functional potential. Hip subluxation and dislocation can compromise standing and walking capacities, but also the quality of the seated position and the personal care. Daily life activities and participation are restricted and influence the disabled person's quality of life. Paralytic dislocation of the hip is the orthopedic deformity that has the biggest impact on day-to-day life, general health and the overall orthopedic result in adulthood. Neuro-orthopedic care is challenging. However, there are basic principles that one must know to ensure good long-term quality of life in patients suffering from paralytic dislocations of the hip. When planning the treatment strategy, it is essential to take into consideration the day-to-day life and to integrate the patient's experiences and needs, along with those of their caretakers. The objective of this review is to outline the differences in paralytic dislocations of the hip of diverse etiology, to present evaluation principles useful in daily clinical practice and to help practitioners in choosing a treatment strategy.

PMID: [34871796](#)

4. Fascia Iliaca Pain Block Results in Lower Overall Opioid Usage and Shorter Hospital Stays than Epidural Anesthesia After Hip Reconstruction in Children With Cerebral Palsy

Dominique Laron, Jennifer Kelley, Vidya Chidambaran, James McCarthy

J Pediatr Orthop. 2021 Dec 9. doi: 10.1097/BPO.0000000000002028. Online ahead of print.

Introduction and objective: Epidural anesthesia (EA) is often used for pain control in children with cerebral palsy (CP) who undergo hip reconstructions. The purpose of this study is to determine if preoperative fascia iliaca (FI) pain blocks would improve pain scores, decrease opioid use, and result in shorter hospital stays in comparison to the use of EA. Methods: This is a nonrandomized retrospective cohort study examining 60 consecutive patients with CP who underwent hip reconstruction utilizing either a fascia iliac compartment nerve block (FICNB) (N=37) or continuous lumbar epidural (N=22) from January 2017 to March 2019. Age at surgery was 8.5±4.6 years. We recorded age, weight, operating room (OR) time, FLACC (Face, Legs, Activity, Cry, Consolability scale) scores on postoperative days (PODs) 0, 1, 2, and 3, opioid doses, overall opioid (mg) used, and length of stay. We compared pain scores, opioid usage, OR time, and lengths of stay between our 2 patient groups. Results: Pain scores were similar between groups on POD #0, 2, and 3 but were statistically improved on POD #1 (1.8±1.3 vs. 3.1±1.4, P<0.001). Total number of opioid doses (7.9±4.4 vs. 10.7±2.3, P=0.004), total milligram given (18.3±11.8 vs. 24.7±12.3, P<0.05), and milligram per kilogram given (0.77±0.42 vs. 1.11 mg/kg±0.36 mg/kg, P=0.001) were less for the FI group versus the epidural group. The OR time (which includes time for blocks/epidurals) was lower in the FI group (4.6±1.2 vs. 5.7±1.1 h, P=0.0002). Overall hospital stays were lower in the FI group (3.4±1.5 vs. 4.1±1.0 d, P<0.05). Conclusions: This study demonstrates that in the setting of hip reconstruction, patients that received preoperative FI blocks used a lower amount of opioids, required fewer rescue doses and ultimately had a shorter hospital length of stay than those undergoing EA.

PMID: [34882587](#)

5. [Extension osteotomy of the lateral distal femur using the contralateral TomoFix® plate][Article in German]

Milena M Ploeger, Martin Gathen, Sebastian Koob, Matthias D Wimmer, Richard Placzek

Review Oper Orthop Traumatol. 2021 Dec 6. doi: 10.1007/s00064-021-00740-9. Online ahead of print.

Objective: Supracondylar distal femoral osteotomy. Fixation with the contralateral TomoFix® (Fa. DePuy Synthes, Oberdorf, Switzerland) lateral distal femur plate. Use of the laterally reversed plate to improve the reconstruction of the sagittal anatomical axis of the leg. **Indications:** To correct knee flexion contractures with a deficiency of extension $>20^\circ$ at the age of 10 years. **Contraindications:** Surgical site infections or tumors. **Surgical technique:** Ventral closed wedge osteotomy of the distal femur. **Implantation of the locking compression TomoFix® lateral distal femur plate.** **Postoperative management:** Full weight bearing. **Results:** In all, 16 distal femoral osteotomies were performed in 9 patients. All patients had knee flexion contraction due to neurological disease. Patients with cerebral palsy showed a better GMFCS (gross motor function classification scale) level after surgery. Hardware was removed after 11.5 months (range: 9-18 months).

PMID: [34870725](#)**6. Efficacy of foot-ankle orthosis on balance for children with hemiplegic cerebral palsy: An observational study**

Yeliz Bahar-Özdemir, Çağrı Ünal-Ulutatar, Duygu Karali-Bingül, Evrim Karadağ-Saygi

Turk J Phys Med Rehabil. 2021 Sep 1;67(3):336-343. doi: 10.5606/tftrd.2021.5175. eCollection 2021 Sep.

Objectives: The aim of this study was to investigate the impact of ankle-foot orthoses (AFOs) on the balance and gait and to compare the effects of hinged AFOs with solid AFOs on balance in patients with cerebral palsy (CP). **Patients and methods:** Between January 2015 and January 2016, 19 hemiplegic children with CP (11 males, 8 females; mean age: 9.5 ± 2.2 years; range, 6 to 15 years) and 23 sex- and age-matched controls (8 males, 15 females; mean age: 10 ± 1.6 years; range, 6 to 13 years) were included in this study. All patients were using either solid or hinged AFO. Hemiplegic patients were attended to specific tests with orthoses and barefoot. Pediatric Balance Scale (PBS) and Five Times Sit to Stand Test (FTSST) were used for functional evaluation. The quantitative balance was evaluated using the device-assisted balance tests, Limits of Stability (LOS), Walk Across (WA), and Sit to Stand (STS) tests. **Results:** The control group had a better functional balance than the CP group ($p < 0.001$ for PBS and $p < 0.001$ for FTSST) and the CP group with AFO had a better balance than the barefoot ($p = 0.001$ for PBS and $p = 0.009$ for FTSST). Children with CP also showed a higher sway velocity in STS ($p < 0.001$) than the control group. In patients with AFO, a decrease in the sway velocity in STS ($p = 0.037$) and an increase in directional control in LOS ($p = 0.044$) were observed, compared to barefoot. **Conclusion:** The AFO use offers a significant contribution to the functional balance in CP. Prescribing AFOs are usually required in ambulatory CP patients in combined with a well-designed standard physiotherapy.

PMID: [34870121](#)**7. The Observational Gait Scale Can Help Determine the GMFCS Level in Children With Cerebral Palsy**

Karina A Zapata, Charter L Rushing, Mauricio R Delgado, Chanhee Jo

Pediatr Phys Ther. 2021 Dec 3. doi: 10.1097/PEP.0000000000000851. Online ahead of print.

Purpose: To evaluate the association between the Observational Gait Scale (OGS) and the Gross Motor Function Classification System (GMFCS) in walking children with cerebral palsy (CP). **Methods:** The charts of 512 children with CP GMFCS levels I to IV were reviewed for the OGS score and GMFCS level at their initial visit. **Results:** The OGS score decreased with increasing GMFCS levels. The average OGS for GMFCS level I was 13.1 (2.8), level II was 11.3 (2.7), level III was 7.7 (2.7), and level IV was 6.1 (2.0). A significant negative relationship was seen between the OGS and the GMFCS. In particular, each GMFCS level was different across all levels in a pairwise comparison. In addition, multivariate modeling analysis confirmed that the association between the OGS and the GMFCS was still valid, after adjusting for age and gender. **Conclusions:** The OGS is a quick tool to rate gait and help confirm a child's GMFCS level.

PMID: [34864805](#)

8. Commentary on "The Observational Gait Scale Can Help Determine the GMFCS Level in Children With Cerebral Palsy"

Hillary Finnigan, Kristie Bjornson

Pediatr Phys Ther. 2021 Dec 3. doi: 10.1097/PEP.0000000000000857. Online ahead of print.

PMID: [34864803](#)

9. Parental subjective assessment of gait limitations: Comparison with objective gait variables

A Marron, K Brady, D Kiernan

Gait Posture. 2021 Nov 30;92:218-222. doi: 10.1016/j.gaitpost.2021.11.039. Online ahead of print.

Background: Subjective assessment is an important part of clinical examination providing quality insights into impairments of body structure and functions. Research into the associations between parental perceptions of gait in children with cerebral palsy (CP) and objective clinical gait measures is limited. Research question: What are the parental perceived gait limitations in children with CP and are these perceptions associated with objective clinical gait analysis? Methods: Parent questionnaires were retrospectively analysed for children with CP who attended our gait analysis laboratory over a 24-month period. Perceived walking limitations caused by pain, weakness, lack of endurance, mental ability, safety concerns, and balance were recorded on a 5-point Likert scale. Normalised gait speed, normalised step length and the Gait Deviation Index (GDI) were calculated. Differences between responses were assessed using Chi-squared tests with Dunn's post hoc test with Bonferroni adjustment. Spearman's rank correlations were performed to determine the relationship between responses and gait parameters. Results: Data from 251 participants were included, mean age 9 ± 3.4 years, Gross Motor Function Classification System (GMFCS) level I = 158, II = 64 and III = 29. Balance was perceived to limit walking to the greatest extent, followed by weakness, lack of endurance, safety concerns, pain and mental ability. This rank was consistent across GMFCS levels I, II and III. Perceived balance limitations showed the strongest correlations with objective gait variables, GDI ($r = -0.31$ $p = 0.000$), normalised step length ($r = -0.30$ $p = 0.0000$) and normalised gait speed ($r = -0.24$ $p = 0.0001$). Significance: Subjective gait perceptions provide a valuable indication of gait function but are weakly associated with objective clinical gait analysis. Outcome measures that are sensitive to changes in balance may be more responsive to parental concerns and help to satisfy their goals and expectations.

PMID: [34871926](#)

10. Psychometric Properties of Lower Limb Somatosensory Function and Body Awareness Outcome Measures in Children with Upper Motor Neuron Lesions: A Systematic Review

Petra Marsico, Lea Meier, Marietta L van der Linden, Tom H Mercer, Hubertus J A van Hedel

Dev Neurorehabil. 2021 Dec 6;1-14. doi: 10.1080/17518423.2021.2011976. Online ahead of print.

Purpose: A systematic review of the psychometric properties and feasibility of outcome measures assessing lower limb somatosensory function and body awareness in children with upper motor neuron lesion. Methods: We followed the Consensus-based Standards for the selection of health Measurement INstruments guidelines. Two raters independently judged the quality and risk of bias of each study. Data synthesis was performed, and aspects of feasibility were extracted. Results: Twelve studies investigated eleven somatosensory function measures quantifying four modalities and eight body awareness measures quantifying two modalities. The best evidence synthesis was very low to low for somatosensory function modalities and low for body awareness modalities. Few feasibility aspects were reported (e.g., the percentage or minimum age of participants able to perform the tests). Conclusion: Current evidence on the psychometric characteristics of somatosensory function and body awareness outcome measures are relatively sparse. Further research on psychometric properties and practical application is needed.

PMID: [34872425](#)

11. Accommodating variable-resistance exercise enhance weight-bearing/gait symmetry and balance capability in children with hemiparetic cerebral palsy: a parallel-group, single-blinded randomized clinical trial

Ragab K Elnagar, Ahmed Alhowimel, Mazyad Alotaibi, Mohamed S Abdrabo, Mohammed A Elshafey

Eur J Phys Rehabil Med. 2021 Dec 6. doi: 10.23736/S1973-9087.21.07324-X. Online ahead of print.

Background: Children with hemiparetic cerebral palsy (HCP) tend preferentially to bear their body weight on the non-paretic side, which leads to the emergence of asymmetrical walking patterns and limited ability to maintain balance. Therefore, improved and clearly effective intervention strategies to remedy these impairments are needed. **Aim:** This study endeavored to evaluate the efficacy of an accommodating variable-resistance exercise (AVr-Ex) program on weight-bearing symmetry, gait symmetry, and dynamic balance in children with HCP. **Design:** This study employed a parallel-group, single-blinded randomized controlled design. **Settings:** Physical Therapy Outpatient Clinic and University Hospital, and a tertiary referral hospital. **Population:** Thirty-six children with HCP aged between eight and 16 years were assigned randomly to the AVr-Ex group (n = 18) or Control group (n = 18). **Methods:** Children in the AVr-Ex group undergone an AVr-Ex program, three sessions/week over eight consecutive weeks, besides the usual physical therapy while children in the Control group received the usual physical therapy alone. **Outcome measures** were evaluated before and after intervention and included weight-bearing symmetry indices [rearfoot (RF-WbSI), and forefoot (FF-WbSI)], gait symmetry indices [spatial (GSIspatial), and temporal (GSItemporal)], and dynamic balance. **Results:** The post-treatment RF-WbSI ($P < .001$; $\eta^2 = 0.41$), GSIspatial ($P < .001$; $\eta^2 = 0.42$), GSItemporal ($P < .001$; $\eta^2 = 0.52$), and dynamic balance variables (all $P < .05$; η^2 ranged from 0.21 to 0.51) improved significantly in the AVr-Ex group compared to the control group, when controlled for the pre-treatment scores. **Conclusions:** This study suggests that AVr-Ex can improve weight-bearing symmetry, gait symmetry, and dynamic balance in children with HCP when incorporated into the usual physical rehabilitation program. **Clinical rehabilitation impact:** AVr-Ex is likely an effective training paradigm to address weight-bearing/gait asymmetry and balance issues in children with HCP, which provides the basis for its incorporation in rehabilitation programs for such a patient population.

PMID: [34870387](#)

12. Aspiration of an exfoliated primary molar in a child with cerebral palsy: A case report

Homa Amini, James R Boynton

Case Reports Spec Care Dentist. 2021 Dec 7. doi: 10.1111/scd.12686. Online ahead of print.

Foreign body aspiration is a concern in children which may occur with anything introduced to the oral cavity and can result in significant morbidity and mortality. Food and foreign objects are the most commonly aspirated objects in young children. Aspiration of a normally exfoliated primary tooth is thought to be extremely rare, if not unheard-of. The purpose of this case report is to describe the events occurring to a 10-year-old child with a cerebral palsy presenting with signs and symptoms of respiratory distress due to aspiration of a naturally exfoliating primary molar. Recommendations are provided for delivery of appropriate anticipatory guidance, management of exfoliating primary teeth, and safe clinical practice.

PMID: [34874069](#)

13. Perception of pain in patients with adolescent cerebral palsy: self report or parent's report

Fatma Özcan, Sibel Ünsal Delialioğlu, Sumru Özel, Yasin Demir

Somatosens Mot Res. 2021 Dec 9;1-6. doi: 10.1080/08990220.2021.2014805. Online ahead of print.

Purpose: To compare mothers' report on children's pain with patients' own reports and to explore the prevalence, intensity, localisation and the effect of pain on daily living activities of adolescents with CP. **Materials and methods:** A total of 75 adolescent with CP (34 females and 41 males) and their mothers were included in this cross-sectional study. Demographical and clinical characteristics were recorded. The adolescent and the mother independently completed the pain questionnaire in a face-to-face interview administrated by a psychiatrist. **Results:** The prevalence of pain in the previous week was 28% by self report and was 40% by mothers' report. No significant difference was determined between mother's report and self report ($p = 0.121$). There was no significant difference in the prevalence of pain, pain intensity, and the effect of pain on activities of daily living according to Gross Motor Functional Classification System levels and CP types in terms of mothers' report and self

report. Conclusions: Pain is a common condition in adolescents with CP and it affects quality of life negatively. While the self-report of pain is ideal, parent's reports in various situations is important for the assessment of pain.

PMID: [34881687](#)

14. Barriers and Facilitators to Seeking Sleep Solutions for Children With Cerebral Palsy: A Qualitative Study

Sacha Petersen, Dinah S Reddihough, Sally Lima, Adrienne Harvey, Fiona Newall

Front Psychiatry. 2021 Nov 17;12:729386. doi: 10.3389/fpsy.2021.729386. eCollection 2021.

Background: Published evidence to date suggests that sleep problems are common in children with cerebral palsy (CP). This qualitative study is a follow up to a previously published quantitative phase on the experience and impact of sleep problems in this population. Aims: The aim of this study was to explore the experience and impact of sleep disturbance and seeking of sleep solutions for parents of school aged children with CP. Materials and Methods: Semi-structured 19 qualitative interviews were conducted with parents of children with CP aged 6-12 years. Interview data were transcribed verbatim and the thematic analysis techniques by Braun and Clarke was used to identify themes. Results: Thematic analysis identified 7 themes: (1) My Child Doesn't Fit into the Box, (2) A Mother's Ears are Always On, (3) Sleep Disturbance is like Water Torture, (4) Sleep is One of Many Spot Fires, I Put it on the Backburner, (5) Luck, Money or Jumping Up and Down, (6) There is Never One Silver Bullet and (7) Help: The Earlier the Better. The key finding was that parents of children with CP often described their child's needs being distinct from what is provided by systems and services. Conclusion: Parents face significant challenges sourcing effective sleep solutions for their child with CP. Sleep is often not a priority for either the parent or the clinician as other health problems take precedence. Parents reflected that early sleep intervention for their child was or would have been helpful. The barriers and facilitators to sleep care identified in this study should be used to inform clinical change in care for children with CP. Sleep needs to be prioritized in healthcare for children.

PMID: [34867520](#)

15. Examining the Relationship Between Community Integration and Mental Health Characteristics of Individuals With Childhood Acquired Neurological Disability

Christine Nguyen, Abigail Leung, Andrea Lauzon, Mark T Bayley, Laura L Langer, Dorothy Luong, Sarah E P Munce

Front Pediatr. 2021 Nov 22;9:767206. doi: 10.3389/fped.2021.767206. eCollection 2021.

Background: Many individuals with cerebral palsy (CP) or acquired brain injury (ABI) are at higher risk of lowered psychosocial functioning, poor mental health outcomes and decreased opportunities for community integration (CI) as they transition to adulthood. It is imperative to understand the characteristics of those at highest risk of dysfunction so that targeted interventions can be developed to reduce the impact. Methods: This quantitative, cross-sectional study examines current patients of the Living Independently Fully Engaged [(LIFEspan) Service], a tertiary outpatient hospital-based clinic. The Patient Health Questionnaire-4 (PHQ-4) and the Community Integration Questionnaire (CIQ) were administered to participants. Personal health information was also collected from participants' health charts, and participant interviews. Associations of sex and condition with the outcomes of screening for further assessment of depression, screening for further assessment of anxiety, and CI were calculated using t-tests and Chi-square tests. Results: 285 participants completed standardized screening tools for depression and anxiety (PHQ-4) and 283 completed the Community Integration Questionnaire (CIQ). Mean age was 23.4 (4.2) years; 59% were diagnosed with CP, 41% diagnosed with ABI, and 56% were male. A moderate proportion of the sample screened positive for further assessment of anxiety (28%) and depression (16%), and the overall mean score on the CIQ for the sample was 15.8 (SD 5.1). Participants that screened positive for further assessment of depression and anxiety on the PHQ-4 had lower scores on the Social Integration subscale of the CIQ ($p = 0.04$ and $p = 0.036$, respectively). Females were found to have significantly higher community integration than males ($p = 0.0011$) and those diagnosed with ABI were found to have significantly higher community integration than those with CP ($p = 0.009$), respectively. A weak negative association was found between age for the total sample and overall PHQ-4 score ($p = 0.0417$). Presence of an intellectual or learning disability/challenge was associated with a lower CIQ score ($p = 0.0026$). Conclusions: This current study, highlights the need for further research to explore the unique needs and barriers faced by this population. This study may inform assessments and interventions to support the mental health and community integration of this population.

PMID: [34881213](#)

16. Validity and Reliability of the German Version of the CP QOL-Child and CP QOL-Teen Questionnaire

Manuel Maier, Corinna Stoltenburg, Akosua Sarpong-Bengelsdorf, Susanne Lebek

Neuropediatrics. 2021 Dec 8. doi: 10.1055/s-0041-1740377. Online ahead of print.

The aim of the study was to determine the psychometric properties of the German version of the Cerebral Palsy Quality of Life Questionnaire for Children and Adolescents (CP QOL-Child and -Teen). It is a condition-specific questionnaire with a self-report version, measuring well-being rather than ill-being, which differs from existing measurement methods. Fourteen children (9-12 years) and 64 caregivers (4-12 years) answered the child questionnaire. Twenty-one adolescents and 26 caregivers (all adolescents 13-18 years) replied to the teen version. Functioning was categorized by the Gross Motor Function Classification System. For CP QOL-child internal consistency (Cronbach's α) ranged from 0.58 to 0.88 and for CP QOL-Teen from 0.68 to 0.95. Test-retest reliability after 2 to 4 weeks ranged between 0.75 and 0.94 in children's version and 0.89 and 0.96 in teen's version. Correlation with well-established generic KIDSCREEN-10 questionnaire was moderate to strong. The German versions of CP QOL-Child and -Teen are appropriate tools for assessing the quality of life of children and adolescents with cerebral palsy in the German-speaking population.

PMID: [34879423](#)**17. The Effect of Insight Questions Inventory and Visual Support Strategies on Carer-Reported Quality of Life for Children With Cerebral Palsy and Perceptual Visual Dysfunction in Nigeria: A Randomized Controlled Trial**

Roseline E Duke, Torty Chimaeze, Min J Kim, Soter Ameh, Kathryn Burton, Richard Bowman

Front Hum Neurosci. 2021 Nov 16;15:706550. doi: 10.3389/fnhum.2021.706550. eCollection 2021.

Structured clinical history question inventories have previously been used to try and elicit symptoms of perceptual visual dysfunction (PVD) in children with cerebral palsy (CP) in different settings. Earlier studies have suggested that PVD may affect quality of life and specific habilitational strategies, linked to inventory responses, may improve quality of life. Through an RCT, based on a community based sample of children with CP in Cross River State, Nigeria, we aimed to determine if a structured history inventory such as the Insight question inventory (IQI) and associated tailored visual support strategies (IQI VSS) for the management of those children who have PVD, can improve quality of life and is superior to standard therapy. Children with CP were recruited by the key informant method and confirmed by clinical examination. The parent reported IQI was used to identify children with PVD. Primary outcome measures were both Pediatric Quality of Life 4.0 Generic (PedsQL 4.0 Generic) and Pediatric Quality of Life 3.0 Cerebral Palsy (PedsQL 3.0 CP) scale scores. Children were enrolled with a parallel arm allocation to either IQI and IQI VSS or to standard therapy for CP. Children were followed up for 6 weeks with weekly phone call session and the questionnaires repeated at the end of the 6 weeks' period. Results show that the children in the treatment group ($n = 191$) showed no significantly different change between baseline and follow up in quality of life (PedsQL 4.0 Generic $p = 0.943$; and PedsQL-CP 3.0 $p = 0.287$), compared to the control group. There was suggestion of a better improvement ($p = 0.035$) in the PedsQL 3.0 CP subscale of speech and communication for the intervention group. The use of IQI VSS for the treatment of PVD in children with CP in this population does not show any superiority over current standard CP management in terms of overall quality of life. However, there was some evidence of improvement in quality of life in the area of speech and communication. Further research and refinement of these management method is required. Clinical Trial Registration: www.ClinicalTrials.gov, identifier [PACTR20161200188] 6396.

PMID: [34867233](#)**18. Cerebral palsy in children: subtypes, motor function and associated impairments in Addis Ababa, Ethiopia**

Selamenesh Tsige, Ayalew Moges, Amha Mekasha, Workeabeba Abebe, Hans Forsberg

BMC Pediatr. 2021 Dec 3;21(1):544. doi: 10.1186/s12887-021-03026-y.

Background: Although, there is no population-level data in Ethiopia, a previous retrospective hospital-based study identified CP as the most common developmental disability in children. The overall aim of this study is to describe the clinical spectrum of CP in Tikur Anbessa Specialized Hospital in Addis Ababa, including CP subtype, gross and fine motor function, presence

and pattern of associated impairments, and possible risk factors in children aged 2 to 18 years. Methods: A hospital-based descriptive cross-sectional study conducted- July - September of 2018 among 207 children with suspected motor symptoms. The Surveillance of CP in Europe (SCPE) decision tree was used as a guideline for inclusion and evaluation was by standardized questionnaire and clinical examination. Descriptive, bivariate and multivariate statistical analyses, Chi-square test, crudes association and adjusted odds ratio with 95% confidence interval employed. Result: One hundred seventy four children who fulfilled the clinical criteria were included. Half (50.6%) were under the age of 5 years with a mean age of 5.6 (SD 3.6) years; 55.2 were male. The majority had bilateral spastic CP (60.4%) followed by unilateral spastic CP 21.8%, dyskinetic CP 10.4%, and ataxic CP 3.4%; 4% were unclassifiable. Of the children, 95.4% had speech difficulty, 87.4% learning disabilities, 60.9% epilepsy, 24.7% visual impairment and 8.6% hearing impairment. On gross motor function (GMFCS) and manual ability (MACS) classification systems, 75.3% of the children had level IV and V functional impairment. More than 80% of the mothers had complications during delivery Half of the neonates did not cry immediately after birth, 44% were resuscitated with bag mask ventilation at birth and 64% immediately admitted to NICU. During the first month of life, 50% had infection, 62% had trouble feeding, 49.4% had difficulty breathing, 35% had seizure and 13.8% had jaundice. Conclusion: The severe forms of CP predominate; most children are dependent on their parents for routine activities of daily living and cannot communicate well. Multidisciplinary care approaches and focused functional habilitation services are needed. Causal relationships cannot be drawn from these data but findings make a strong argument for improving maternal and child health care.

PMID: [34861837](#)

19. Cerebral palsy and related neuromotor disorders: Overview of genetic and genomic studies

Jan M Friedman, Peter van Essen, Clara D M van Karnebeek

Review Mol Genet Metab. 2021 Nov 8;S1096-7192(21)00819-2. doi: 10.1016/j.ymgme.2021.11.001. Online ahead of print.

Cerebral palsy (CP) is a debilitating condition characterized by abnormal movement or posture, beginning early in development. Early family and twin studies and more recent genomic investigations clearly demonstrate that genetic factors of major effect contribute to the etiology of CP. Most copy number variants and small alterations of nucleotide sequence that cause CP arise as a result of de novo mutations, so studies that estimate heritability on basis of recurrence frequency within families substantially underestimate genetic contributions to the etiology. At least 4% of patients with typical CP have disease-causing CNVs, and at least 14% have disease-causing single nucleotide variants or indels. The rate of pathogenic genomic lesions is probably more than twice as high among patients who have atypical CP, i.e., neuromotor dysfunction with additional neurodevelopmental abnormalities or malformations, or with MRI findings and medical history that are not characteristic of a perinatal insult. Mutations of many different genetic loci can produce a CP-like phenotype. The importance of genetic variants of minor effect and of epigenetic modifications in producing a multifactorial predisposition to CP is less clear. Recognizing the specific cause of CP in an affected individual is essential to providing optimal clinical management. An etiological diagnosis provides families an "enhanced compass" that improves overall well-being, facilitates access to educational and social services, permits accurate genetic counseling, and, for a subset of patients such as those with underlying inherited metabolic disorders, may make precision therapy that targets the pathophysiology available. Trio exome sequencing with assessment of copy number or trio genome sequencing with bioinformatics analysis for single nucleotide variants, indels, and copy number variants is clinically indicated in the initial workup of CP patients, especially those with additional malformations or neurodevelopmental abnormalities.

PMID: [34872807](#)

20. Methods for Monitoring Risk of Hypoxic Damage in Fetal and Neonatal Brains: A Review

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Fetal, perinatal, and neonatal asphyxia are vital health issues for the most vulnerable groups in human beings, including fetuses, newborns, and infants. Severe reduction in oxygen and blood supply to the fetal brain can cause hypoxic-ischemic encephalopathy, leading to long-term neurological disorders, including mental impairment and cerebral palsy. Such neurological disorders are major healthcare concerns. Therefore, there has been a continuous effort to develop clinically useful diagnostic tools for accurately and quantitatively measuring and monitoring blood and oxygen supply to the fetal and neonatal brain to avoid severe consequences of asphyxia Hypoxic-Ischemic Encephalopathy (HIE) and Neonatal Encephalopathy (NE).

Major diagnostic technologies used for this purpose include fetal heart rate monitoring (FHRM), fetus scalp blood sampling (FBS), ultrasound (US) imaging, magnetic resonance imaging (MRI), x-ray computed tomography (CT), and nuclear medicine. In addition, given the limitations and shortcomings of traditional diagnostic methods, emerging technologies such as near-infrared spectroscopy (NIRS) and photoacoustic (PA) imaging have also been introduced as stand-alone or complementary solutions to address this critical gap in fetal and neonatal care. This review provides a thorough overview of the traditional and emerging technologies for monitoring fetal and neonatal brain oxygenation status and describes their clinical utility, performance, advantages, and disadvantages.

PMID: [34872080](#)

21. Neurodevelopmental profiles of infants born <30 weeks gestation at 2 years of age

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Background: Infants born <30 weeks postmenstrual age (PMA) are at increased risk for neurodevelopmental impairment by age 2. Prior studies report rates of impairment for individual outcomes separately. Our objective was to describe neurodevelopmental profiles of children born <30 weeks PMA, using cognitive, language, motor, and behavioral characteristics. **Methods:** We studied 587 children from a multi-center study of infants born <30 weeks PMA. Age 2 outcomes included Bayley-III subscale scores, Child Behavior Checklist syndrome scores, diagnosis of cerebral palsy (CP), and positive screen for autism spectrum disorder (ASD) risk. We used latent profile analysis (LPA) to group children into mutually exclusive profiles. **Results:** We found four discrete neurodevelopmental profiles indicating distinct combinations of developmental and behavioral outcomes. Two of the profiles included 72.7% of the sample with most having Bayley scores within the normal range. The other two profiles included the remaining 27.3% of the sample with most having Bayley scores outside of the normal range. Only one profile (11% of sample) was comprised of children with elevated behavioral problems. **Conclusion:** Child-centered analysis techniques could facilitate the development of targeted intervention strategies and provide caregivers and practitioners with an integrative understanding of child behavior. **Impact:** Most studies examining neurodevelopmental outcomes in very preterm children report rates of impairment for individual outcomes separately. Comprehensive, "child-centered" approaches that integrate across multiple domains can be used to identify subgroups of children who experience different types of neurodevelopmental impairments. We identified four discrete neurodevelopmental profiles indicating distinct combinations of developmental and behavioral outcomes in very preterm children at 24 months. "Child-centered" analysis techniques may provide clinically useful information and could facilitate the development of targeted intervention strategies for high-risk children.

PMID: [34880445](#)

22. Spasticity and Dystonia are Underidentified in Young Children at High Risk for Cerebral Palsy

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Background: Early spasticity and dystonia identification in cerebral palsy is critical for guiding diagnostic workup and prompting targeted treatment early when it is most efficacious. However, differentiating spasticity from dystonia is difficult in young children with cerebral palsy. **Methods:** We sought to determine spasticity and dystonia underidentification rates in children at high risk for cerebral palsy (following neonatal hypoxic-ischemic encephalopathy) by assessing how often child neurologists identified hypertonia alone versus specifying the hypertonia type as spasticity and/or dystonia by age 5 years. **Results:** Of 168 children, 63 developed cerebral palsy and hypertonia but only 19 (30%) had their hypertonia type specified as spasticity and/or dystonia by age 5 years. **Conclusions:** Child neurologists did not specify the type of hypertonia in a majority of children at high risk of cerebral palsy. Because early tone identification critically guides diagnostic workup and treatment of cerebral palsy, these results highlight an important gap in current cerebral palsy care.

PMID: [34866453](#)

23. Respiratory pre-habilitation in paediatric anaesthesia in Children with Muscular and Neurologic disease

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Children with neuromuscular, chronic neurologic and chest wall diseases are at increased risk of post-operative respiratory complications including atelectasis, pneumonia, respiratory failure with the possible need for reintubation or even tracheostomy. These complications negatively impact patient outcomes, including increased healthcare resource utilization and increased surgical mortality. In these children, existing respiratory reserve is often inadequate to withstand the stresses brought on during anesthesia and surgery. A thorough clinical assessment and objective evaluation of pulmonary function and gas exchange can help identify which children are at particular risk for poor postoperative outcomes and thus merit preoperative interventions. These may include initiation and optimization of non-invasive ventilation and mechanical insufflation-exsufflation. Furthermore, such an evaluation will help identify children who may require a post-operative extubation plan tailored to neuromuscular diseases. Such strategies may include avoidance of pre-extubation lung recruitment by precluding continuous positive airway pressure trials, aggressively weaning to room air and extubating directly to non-invasive ventilation with a high inspiratory to expiratory pressure differential of at least 10 cm H₂O. Children with cerebral palsy and other neurodegenerative or neurodevelopmental disorders are a more heterogeneous group of children who may share some operative risk factors with children with neuromuscular disease; they may also be at risk of sleep disordered breathing, may also require non-invasive ventilation or mechanical insufflation-exsufflation and may have associated chronic lung disease from aspirations that may require peri-operative treatment.

PMID: [34865276](#)

24. *Saccharomyces boulardii* improves the behaviour and emotions of spastic cerebral palsy rats through the gut-brain axis pathway

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Background: Cerebral palsy (CP) is a kind of disability that influences motion, and children with CP also exhibit depression-like behaviour. Inflammation has been recognized as a contributor to CP and depression, and some studies suggest that the gut-brain axis may be a contributing factor. Our team observed that *Saccharomyces boulardii* (*S. boulardii*) could reduce the inflammatory level of rats with hyperbilirubinemia and improve abnormal behaviour. Both CP and depression are related to inflammation, and probiotics can improve depression by reducing inflammation. Therefore, we hypothesize that *S. boulardii* may improve the behaviour and emotions of spastic CP rats through the gut-brain axis pathway. **Methods:** Our new rat model was produced by resecting the cortex and subcortical white matter. Seventeen-day-old CP rats were exposed to *S. boulardii* or vehicle control by gastric gavage for 9 days, and different behavioural domains and general conditions were tested. Inflammation was assessed by measuring the inflammatory markers IL-6 and TNF- α . Hypothalamic-pituitary-adrenal (HPA) axis activity was assessed by measuring adrenocorticotropic hormone and corticosterone in the serum. Changes in the gut microbiome were detected by 16S rRNA. **Results:** The hemiplegic spastic CP rats we made with typical spastic paralysis exhibited depression-like behaviour. *S. boulardii* treatment of hemiplegic spastic CP rats improves behaviour and general conditions and significantly reduces the level of inflammation, decreases HPA axis activity, and increases gut microbiota diversity. **Conclusions:** The model developed in this study mimics a hemiplegic spastic cerebral palsy. Damage to the cortex and subcortical white matter of 17-day-old Sprague-Dawley (SD) rats led to spastic CP-like behaviour, and the rats exhibited symptoms of depression-like behaviour. Our results indicate that *S. boulardii* might have potential in treating hemiplegic spastic CP rat models or as an add-on therapy via the gut-brain axis pathway.

PMID: [34876019](#)