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Interventions and Management

1. Dystonia during hand activity in children with spastic unilateral cerebral palsy, an observational study

Kristina Tedroff, Cecilia Lidbeck, Kristina Löwing

Eur J Paediatr Neurol. 2022 Jul 11;41:36-40. doi: 10.1016/j.ejpn.2022.06.015. Online ahead of print.

Background: Spasticity and dyskinesia are motor signs that co-exist in cerebral palsy (CP). It is well accepted that, in spastic bilateral CP, dystonia can be present in addition to spasticity, and equally that spasticity is often present in individuals with dyskinetic CP. In unilateral spastic CP, dystonia of the upper extremity is only rarely identified or addressed. The aim of this study was to investigate if dystonia was present in the hand of children with unilateral spastic CP, and, if present, to what extent, and when it was first noticeable. **Method:** Ninety-seven children with unilateral spastic CP, born 1999-2014, with standardized digital films of hand function from Assisting Hand Assessments (AHA), were included. Films were reviewed, and presence or absence, of dystonia and choreoathetosis were scored by three experienced raters. **Results:** Dystonia in the hand was present during activities in 70% (68/97) of the children at a mean age of 12 years (SD 4,4). In 74% (50/68) of these children, dystonia was present more than 50% of the evaluated time. For 63% (43/68) more than one digital recording at younger ages were available. Dystonia could first clearly be observed at a mean age of 3,8 years. Choreoathetosis was observed in 7% (5/68) of the children with dystonia. Children without dystonia had significantly higher (corresponding to better function) AHA units (median: 75, 25th - 75th: 45-82) in comparison to children with dystonia (median: 57, 25th - 75th: 52-63) ($p = 0.01$). **Conclusion:** Dystonia in the hand is common in unilateral CP and correlates to lower hand functioning.

PMID: [36201922](https://pubmed.ncbi.nlm.nih.gov/36201922/)

2. Brachial plexus birth injury and cerebral palsy lead to a common contracture phenotype characterized by reduced functional muscle length and strength

Sia Nikolaou, Micah C Garcia, Jason T Long, Allison J Allgier, Qingnian Goh, Roger Cornwall

Front Rehabil Sci. 2022 Aug 16;3:983159. doi: 10.3389/fresc.2022.983159. eCollection 2022.

Introduction: Brachial plexus birth injury (BPBI) and cerebral palsy (CP) both cause disabling contractures for which no curative treatments exist, largely because contracture pathophysiology is incompletely understood. The distinct neurologic nature of BPBI and CP suggest different potential contracture etiologies, although imbalanced muscle strength and insufficient muscle length have been variably implicated. The current study directly compares the muscle phenotype of elbow flexion contractures in human subjects with BPBI and CP to test the hypothesis that both conditions cause contractures characterized by a deficit in muscle length rather than an excess in muscle strength. **Methods:** Subjects over 6 years of age with unilateral BPBI or hemiplegic CP, and with elbow flexion contractures greater than 10 degrees on the affected side, underwent bilateral elbow flexion isokinetic strength testing to identify peak torque and impulse, or area under the torque-angle curve. Subjects

then underwent needle microendoscopic sarcomere length measurement of bilateral biceps brachii muscles at symmetric joint angles. Results: In five subjects with unilateral BPBI and five with hemiplegic CP, peak torque and impulse were significantly lower on the affected versus unaffected sides, with no differences between BPBI and CP subjects in the percent reduction of either strength measurement. In both BPBI and CP, the percent reduction of impulse was significantly greater than that of peak torque, consistent with functionally shorter muscles. Similarly, in both conditions, affected muscles had significantly longer sarcomeres than unaffected muscles at symmetric joint angles, indicating fewer sarcomeres in series, with no differences between BPBI and CP subjects in relative sarcomere overstretch. Discussion: The current study reveals a common phenotype of muscle contracture in BPBI and CP, with contractures in both conditions characterized by a similar deficit in muscle length rather than an excess in muscle strength. These findings support contracture treatments that lengthen rather than weaken affected muscles. Moreover, the discovery of a common contracture phenotype between CP and BPBI challenges the presumed dichotomy between upper and lower motor neuron lesions in contracture pathogenesis, instead revealing the broader concept of "myobrevopathy", or disorder of short muscle, warranting increased investigation into the poorly understood mechanisms regulating muscle length.

PMID: [36188997](#)

3. Commentary on "Feasibility of Using Joystick-Operated Ride-on-Toys to Promote Upper Extremity Function in Children With Cerebral Palsy: A Pilot Study"

Hsiang-Han Huang, Ai-Tzu Chan, Ching-Ching Wu

Pediatr Phys Ther. 2022 Oct 1;34(4):518. doi: 10.1097/PEP.0000000000000958.

No abstract available

PMID: [36194743](#)

4. Surgical Approaches to Upper Limb Spasticity in Adult Patients: A Literature Review

Mahdis Hashemi, Nadine Sturbois-Nachef, Marry Ann Keenan, Paul Winston

Review Front Rehabil Sci. 2021 Aug 31;2:709969. doi: 10.3389/fresc.2021.709969. eCollection 2021.

Introduction: Spasticity is the main complication of many upper motor neuron disorders. Many studies describe neuro-orthopedic surgeries for the correction of joint and limb deformities due to spasticity, though less in the upper extremity. The bulk of care provided to patients with spasticity is provided by rehabilitation clinicians, however, few of the surgical outcomes have been summarized or appraised in the rehabilitation literature. Objective: To review the literature for neuro-orthopedic surgical techniques in the upper limb and evaluate the level of evidence for their efficacy in adult patients with spasticity. Method: Electronic databases of MEDLINE, EMBASE, CINAHL, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systematic Reviews were searched for English, French as well as Farsi languages human studies from 1980 to July 2, 2020. After removing duplicated articles, 2,855 studies were screened and 80 were found to be included based on the criteria. The studies were then divided into two groups, with 40 in each trial and non-trial. The results of the 40 trial articles were summarized in three groups: shoulder, elbow and forearm, and wrist and finger, and each group was subdivided based on the types of intervention. Results: The level of evidence was evaluated by Sackett's approach. There were no randomized control trial studies found. About, 4 studies for shoulder, 8 studies for elbow and forearm, 26 studies for wrist and finger (including 4 for the thumb in palm deformity), and 2 systematic reviews were found. Around, two out of 40 trial articles were published in the rehabilitation journals, one systematic review in Cochrane, and the remaining 38 were published in the surgical journals. Conclusion: Most surgical procedures are complex, consisting of several techniques based on the problems and goals of the patient. This complexity interferes with the evaluation of every single procedure. Heterogeneity of the participants and the absence of clinical trial studies are other factors of not having a single conclusion. This review reveals that almost all the studies suggested good results after the surgery in carefully selected cases with goals of reducing spasticity and improvement in function, pain, hygiene, and appearance. A more unified approach and criteria are needed to facilitate a collaborative, evidence-based, patient referral, and surgical selection pathway.

PMID: [36188802](#)

5. Cerebral Palsy: Current Concepts and Practices in Musculoskeletal Care

Jonathan Sheu, Dorian Cohen, Ted Sousa, Kelly L D Pham

Pediatr Rev. 2022 Oct 1;43(10):572-581. doi: 10.1542/pir.2022-005657.

Cerebral palsy is a neurologic disorder characterized by a spectrum of motor and cognitive deficits resulting from insults to the developing brain. The etiologies are numerous and likely multifactorial; an increasing portion of cases may be attributable to genetic causes, although the exact mechanisms responsible remain poorly understood. Major risk factors include intrauterine stroke and prematurity and neonatal infection, trauma, and hypoxia, which may occur in the prenatal, perinatal, or postnatal period. The Gross Motor Function Classification System (GMFCS) is a widely used tool to establish a child's level of function and to guide treatment; however, additional metrics are necessary to formulate long-term prognoses. Goals of care are to maximize function and independence, which directly correlate with overall quality of life, and family participation is key to establishing goals early in treatment. Nonpharmaceutical treatments include physical, occupational, and speech therapy, as well as bracing, equipment, and technology. There is a breadth of medical interventions for managing hypertonia, including medications, botulinum toxin injections, intrathecal baclofen pumps, and selective dorsal rhizotomy. Orthopedic interventions are indicated for symptomatic or progressive musculoskeletal sequelae. Treatments for dysplastic hips and/or hip instability range from soft tissue releases to bony procedures. Neuromuscular scoliosis is managed with posterior spinal fusion because bracing is ineffective against these rapidly progressive curves. The degree of care varies considerably depending on the child's baseline GMFCS level and functional capabilities, and early screening, diagnosis, and appropriate referrals are paramount to initiating early care and maximizing the child's quality of life.

PMID: [36180545](#)

6. Dynamics of changes in motor development depending on the quality in the 3rd month of life

Ewa Gajewska, Mariusz Naczek, Alicja Naczek, Magdalena Sobieska

Front Public Health. 2022 Sep 16;10:939195. doi: 10.3389/fpubh.2022.939195. eCollection 2022.

The aim of the study was to show that the quantitative and qualitative motor development from the 3rd month of life is key to achieving milestones and that it may be an early warning signal in children at risk of cerebral palsy (CP). The study population included 93 children (69 born at term). Children were born at week 38 ± 4 , the mean body weight was $3,102 \pm 814$ g. All children were evaluated after reaching the 3rd month of life (quantitative and qualitative assessment), and then the 4.5th, 7th, and 12th of life (quantitative assessment). In case of suspected CP, children were followed until the 18th month, when the diagnosis was confirmed. If at the age of 3 months, a child achieved a quadrangle of support and symmetrical support, then its development at the 4.5th month of life was correct, it would creep, and it would assume a crawl position, then in the final assessment (12th month of life), the child would start to walk. If a child failed to achieve a quadrangle of support and symmetrical support and the dynamics of its development were incorrect, the development would be delayed (12th month of life), or CP would develop. A correct qualitative assessment in the 3rd month of life with a high probability guarantees corrects quantitative development at the 4.5th, 7.5th, and 12th months of life. If the qualitative assessment in the 3rd month of life was very low the child would probably be diagnosed with CP at 18 months.

PMID: [36187673](#)

7. Characterizing Cycling Smoothness and Rhythm in Children With and Without Cerebral Palsy

Ashwini Sansare, Ahad Behboodi, Therese E Johnston, Barry Bodt, Samuel C K Lee

Front Rehabil Sci. 2021 Sep 7;2:690046. doi: 10.3389/fresc.2021.690046. eCollection 2021.

Stationary cycling is a practical exercise modality in children with cerebral palsy (CP) that lack the strength for upright exercises. However, there is a lack of robust, sensitive metrics that can quantitatively assess the motor control during cycling. The purpose of this brief report was to characterize the differences in motor control of cycling in children with CP and with typical development by developing novel metrics to quantify cycling smoothness and rhythm. Thirty one children with spastic diplegic CP and 10 children with typical development cycled on a stationary cycle. Cycling smoothness was measured by cross-correlating the crank angle with an ideal cycling pattern generated from participant-specific cadence and cycling duration.

Cycling rhythmicity was assessed by evaluating the revolution-to-revolution variability in the time required to complete a revolution. Statistically significant differences ($p < 0.001$) using the Wilcoxon Rank Sum test were found between the two groups for both the metrics. Additionally, decision tree analysis revealed thresholds of smoothness <0.01 and rhythm $<0.089-0.115$ s for discriminating a less smooth, irregular cycling pattern characteristic of CP from typical cycling. In summary, the objective measures developed in this study indicate significantly less smoothness and rhythm of cycling in children with CP compared to children with typical development, suggestive of altered coordination and poor motor control. Such quantitative assessments of cycling motion in children with CP provide insights into neuromotor deficits that prevent them from cycling at intensities required for aerobic benefits and for participating in cycling related physical activities with their peers.

PMID: [36188813](#)

8. A pilot study combining noninvasive spinal neuromodulation and activity-based neurorehabilitation therapy in children with cerebral palsy

Susan Hastings, Hui Zhong, Rochel Feinstein, Gittel Zelcer, Christel Mitrovich, Parag Gad, V Reggie Edgerton

Nat Commun. 2022 Oct 5;13(1):5660. doi: 10.1038/s41467-022-33208-w.

Cerebral Palsy (CP) is the most common pediatric motor disability with multiple symptoms and etiologies. CP is exhibited through sensorimotor delays, impaired posture resulting in limited activities and participation. Our recently concluded, single arm, unblinded, pilot study (NCT04882592) explored whether an intervention combining non-invasive spinal neuromodulation during an activity-based neurorehabilitation therapy (ABNT) can improve voluntary sensory-motor function captured via the Gross Motor Function Measure (GMFM-88) scores (primary outcome). Sixteen children diagnosed with CP with Gross Motor Function Classification Scale levels I-V were recruited and received the same intervention (2x/week for 8 weeks) to correct the dysfunctional connectivity between supraspinal and spinal networks using the normally developed proprioception. We demonstrate that the intervention was associated with clinically and statistically significant improvement in GMFM-88 scores in all children, thus meeting the prespecified primary endpoint. However, the improvement with ABNT alone needs further exploration. No serious adverse events were observed (safety endpoint).

PMID: [36198701](#)

9. The Experience of Locomotor Training From the Perspectives of Therapists and Parents of Children With Cerebral Palsy

Dayna Pool, Catherine Elliott, Claire Willis, Ashleigh Thornton

Front Rehabil Sci. 2021 Dec 2;2:740426. doi: 10.3389/fresc.2021.740426. eCollection 2021.

Objective: The objective of this study was to explore the experiences of intensive locomotor training from the perspective of therapists and parents of children with cerebral palsy. **Design:** A qualitative study using semi-structured interviews was employed to capture perspectives following an intensive locomotor training intervention. Data were analyzed thematically, systematically coding and interpreted by grouping information into themes and sub-theme categories. **Participants:** Five therapists and seven parents of children with high daily physical assistance and equipment needs participated in the study. **Setting:** A pediatric tertiary hospital. **Results:** Experiences of locomotor training were described with relation to the suitability of locomotor training with sub-themes of intervention length and time, engagement within sessions, the importance of support, and the utility of locomotor training beyond a research context. Motivation for participating in locomotor training was described in relation to the enjoyment of movement and for increasing activity level. The barriers and facilitators who participated in locomotor training provided environmental and personal factor subthemes. Finally, the outcomes from the intervention were related to improvements in physical health, sleep, affect and emotion, and ambulation in daily activities. **Conclusion:** The experience of intensive locomotor training from the perspectives of parents of children who have high physical assistance and equipment needs and the therapists providing the intervention was described. Future studies should consider outcome measures beyond motor capacity to quantify the perceived outcomes of interventions that are meaningful to families.

PMID: [36188854](#)

10. Assessing the Sprint Force-Velocity Profile in International Football Players with Cerebral Palsy: Validity, Reliability and Sport Class' Profiles

Iván Peña-González, Alejandro Javaloyes, José Manuel Sarabia, Manuel Moya-Ramón

J Hum Kinet. 2022 Apr 26;82:253-262. doi: 10.2478/hukin-2022-0065. eCollection 2022 Apr.

This study assessed and described the Sprint Force-velocity (SFv) profile, and its validity and reliability in international cerebral palsy (CP) football players. Twenty international male CP football players (age: 26.9±7.4) performed a 30-m sprint, a vertical jump (CMJ), a change of direction (MAT), a dribbling and an intermittent endurance (Yo-YoIR1) test. The SFv profile and physical performance variables were shown according to the players' sport class with the estimation of the effect sizes between classes. The SFv showed high reliability (ICC=0.77 to 0.99; SEM=0.89 to 8.66%). Validity for the SFv was provided by its positive correlation with the players' sport class ($r=0.53$ to 0.75 ; $p=.02$ to $<.01$) and the rest of the physical performance tests ($r=0.45$ to 0.99 ; $p=.04$ to $<.01$). The RFmax was the main SFv profile variable that explained players' performance in the rest of the tests ($\beta=0.77$ to 1.0 ; $p<.05$; $R^2=0.59$ to 0.99). The SFv profile seems to be an efficient test to assess international CP football players' physical performance. This provides information about the players' individual sprint mechanical characteristics and their sprint strengths and weaknesses, allowing coaches and conditioning trainers to individualize their training interventions to optimize sprint performance.

PMID: [36196356](#)

11. Commentary on "Physiological Response to the 6-Minute Frame Running Test in Children and Adults With Cerebral Palsy"

Brad Corr, Wyatt Spalding

Pediatr Phys Ther. 2022 Oct 1;34(4):535. doi: 10.1097/PEP.0000000000000961.

No abstract available

PMID: [36194745](#)

12. Commentary on "Maintenance of Functional Gains Following a Goal-Directed and FES-Assisted Cycling Program for Children With Cerebral Palsy"

Ashwini Sansare, Melissa Xanthopoulos

Pediatr Phys Ther. 2022 Oct 1;34(4):488. doi: 10.1097/PEP.0000000000000957.

No abstract available

PMID: [36194740](#)

13. Commentary on "Safety and Feasibility of 1-Repetition Maximum (1-RM) Testing in Children and Adolescents With Bilateral Spastic Cerebral Palsy"

Ozgun Kaya Kara, Sebahat Yaprak Cetin

Pediatr Phys Ther. 2022 Oct 1;34(4):479. doi: 10.1097/PEP.0000000000000955.

No abstract available

PMID: [36194739](#)

14. Comparative Efficacy of Botulinum Toxin in Salivary Glands vs. Oromotor Therapy in the Management of Sialorrhea in Cerebral Palsy Impact on Sleep Quality

Juan Francisco Marquez-Vazquez, María Elena Arellano-Saldaña, Karla Nayeli Rojas-Martinez, Paul Carrillo-Mora

Front Rehabil Sci. 2022 Jun 16;3:875235. doi: 10.3389/fresc.2022.875235. eCollection 2022.

Aims: The aim of this study was to compare the effects of intraglandular abobotulinumtoxinA application and oromotor therapy in the management of sialorrhea in patients with cerebral palsy and its effect on sleep quality. **Methods:** A comparative study (n = 134), mean age 7.1 years (\pm 3.9 years) was performed in pediatric patients, between the efficacy of abobotulinumtoxinA in salivary glands and oromotor therapy (JT), with a control group receiving exclusive oromotor therapy (EOMT). Demographic variables, as well as Gross Motor Function Classification System (GMFCS), Drooling Severity and Frequency Scale (DSFS), Sleep Disturbance Scale for Children (SDSC) and Eating and Drinking Ability Classification System (EDACS) were analyzed in 134 patients considering two measurements 6 months apart. Statistical analysis was developed between both groups. **Results:** The greatest improvement in safety and efficacy of swallowing were those in the JT group with initial levels of EDACS IV and V. Both therapies result in favorable changes of all subscales means of SDSC, with joint therapy showing the greater benefit (p = 0.003) over EOMT (p = 0.06), especially for Sleep Breathing Disorders and Disorders of initiating and maintaining sleep (p < 0.01 vs. p = 0.07). No major adverse effects were found, only those expected from the application of the toxin, such as pain, mild, and transient local inflammation. **Interpretation:** A correlation between frequency and intensity of sialorrhea, with the frequency of sleep disorders and dysphagia was found. Conventional EOMT proved to be useful, improving the safety and efficacy of swallowing, sialorrhea and sleep disorder, however it can be enhanced with the application of abobotulinumtoxinA.

PMID: [36188909](#)

15. Mental health problems among adolescents and young adults with childhood-onset physical disabilities: A scoping review

Shalini Lal, Stephanie Tremblay, Danielle Starcevic, Melina Mauger-Lavigne, Dana Anaby

Review Front Rehabil Sci. 2022 Sep 6;3:904586. doi: 10.3389/fresc.2022.904586. eCollection 2022.

Aim: This scoping review aims to better understand the extent and nature of research activity on the topic of mental health problems in young people with childhood-onset physical disabilities. Specifically, we document what has been investigated in terms of the occurrence and experience of mental health problems among young people with childhood-onset physical disabilities, and their access to mental health services. **Methods:** We searched four databases (Medline, PsycINFO, CINAHL, Embase) for articles published between 2007 and 2019. Studies were included if they addressed: (1) young people between the ages of 13 and 24 with a childhood-onset physical disability, and (2) mental health assessment, treatment, or service access and use. **Results:** We identified 33 peer-reviewed studies that focused mainly on young people with cerebral palsy, juvenile arthritis, and spina bifida. The most common mental health problems investigated were depression and mood related difficulties (73%), anxiety (39%), and social/behavioural issues (33%) and the most common age range was 13 to 17. Ten studies explored access, use, and experiences of mental health services; stigma; caregiver mental health; and value for comprehensive care, using qualitative, quantitative, or mixed methods. **Conclusions:** Findings suggest the importance of developing integrated models of service delivery to identify and address the mental health needs of this population, and consensus on best practices for assessment and reporting rates of subclinical symptoms and psychiatric conditions.

PMID: [36189015](#)

16. Commentary on "Chronic Pain in Young People With Cerebral Palsy: Activity Limitations and Coping Strategies"

Julia Schroeder, Cindy Dodds

Pediatr Phys Ther. 2022 Oct 1;34(4):496. doi: 10.1097/PEP.0000000000000956.

No abstract available

PMID: [36194741](#)

17. Voluntary-assisted Upper Limb Training for Severe Cerebral Palsy Using Robotics Devices and Neuromuscular Electrical Stimulation: Three Case Reports

Mayumi Matsuda Kuroda, Nobuaki Iwasaki, Kenichi Yoshikawa, Ryoko Takeuchi, Yuki Mataka, Tomohiro Nakayama, Junko Nakayama, Haruka Ohguro, Kayo Tokeji, Hirotaka Mutsuzaki

Case Reports Prog Rehabil Med. 2022 Sep 15;7:20220050. doi: 10.2490/prm.20220050. eCollection 2022.

Background: Constraint-induced movement therapy (CIMT) improves the motor function of paralyzed upper limbs of adults after stroke. However, in patients with severe spastic cerebral palsy (CP), the use of CIMT is not warranted. Our aim was to investigate the feasibility and effectiveness of repetitive voluntary-assisted upper limb training (VAUT) for three patients with severe CP using a combination of robotics [Hybrid Assistive Limb (HAL)] and functional electrical stimulation [Integrated Volitional Control Electrical Stimulation (IVES)]. **Case:** Three patients with CP were enrolled. Patients 1, 2, and 3 were 8-, 19-, and 18-year-old males, respectively. Patient 1 had spastic hemiplegia, while patients 2 and 3 had spastic quadriplegia. VAUT using single-joint HAL was performed for 1 or 2 sessions/month for 50 min/session over an 8-month period for 9-13 sessions in total. One patient's voluntary hand movement was insufficient, affecting his upper limb exercise performance; therefore, IVES was required in addition to HAL. **Outcome measures** included motor function of the upper limbs and use of paralyzed hands, which were measured before and after intervention. No adverse events were observed during VAUT. After intervention, the Action Research Arm Test scores showed improvements in all three patients. The Children's Hand-use Experience Questionnaire showed improvements in two patients. **Discussion:** The use of VAUT, together with new systems such as HAL and IVES, for severe CP is safe and may be effective. Our study suggested that upper limb function can be improved for patients with severe CP.

PMID: [36188138](#)

18. Challenges of brain-computer interface facilitated cognitive assessment for children with cerebral palsy

Jane E Huggins, Petra Karlsson, Seth A Warschausky

Front Hum Neurosci. 2022 Sep 20;16:977042. doi: 10.3389/fnhum.2022.977042. eCollection 2022

Brain-computer interfaces (BCIs) have been successfully used by adults, but little information is available on BCI use by children, especially children with severe multiple impairments who may need technology to facilitate communication. Here we discuss the challenges of using non-invasive BCI with children, especially children who do not have another established method of communication with unfamiliar partners. Strategies to manage these challenges require consideration of multiple factors related to accessibility, cognition, and participation. These factors include decisions regarding where (home, clinic, or lab) participation will take place, the number of sessions involved, and the degree of participation necessary for success. A strategic approach to addressing the unique challenges inherent in BCI use by children with disabilities will increase the potential for successful BCI calibration and adoption of BCI as a valuable access method for children with the most significant impairments in movement and communication.

PMID: [36204719](#)

19. Robotic Rehabilitation and Transcranial Direct Current Stimulation in Children With Bilateral Cerebral Palsy

Liliane Raess, Rachel L Hawe, Megan Metzler, Ephrem Zewdie, Elizabeth Condliffe, Sean P Dukelow, Adam Kirton

Front Rehabil Sci. 2022 Feb 25;3:843767. doi: 10.3389/fresc.2022.843767. eCollection 2022.

Aim: To identify challenges of combining robotic upper extremity rehabilitation with tDCS in children with upper extremity bilateral cerebral palsy (CP) by assessing feasibility, tolerability and safety. **Methods:** This was an unblinded, open-label, pilot clinical trial. Participants completed 10 × 1 h sessions of robotic rehabilitation combined with motor cortex anodal tDCS. Feasibility, acceptability and practicality, were assessed including the number of participants completing the protocol, factors limiting participation, time required for sessions, and completion of functional assessments and tolerability scales. To assess safety, standardized clinical and robotic measures of sensorimotor function were performed. The trial was registered at clinicaltrials.gov (NCT04233710). **Results:** Eight children were recruited (mean age 8y ± 1.8y, range 6-11 years) and 5 completed the intervention. There were no serious adverse events. One child developed focal seizures 6 weeks after the trial

that were deemed to be unrelated. Barriers to completion included time and scheduling demands and patient factors, specifically cognitive/behavioral impairments and dyskinesia. No decline in clinical function was appreciated. Conclusions: Robotic upper extremity rehabilitation combined with tDCS may be feasible in children with bilateral CP. Careful participant selection, family engagement, and protocol adaptations are recommended to better understand the feasibility and tolerability of future trials.

PMID: [36188922](#)

20. Application of tDCS in children with cerebral palsy: A mini review

Lin Tang, Yuwei Wu, Jiayin Ma, Yan Lu, Ling Wang, Chunlei Shan

Review Front Pediatr. 2022 Sep 20;10:966650. doi: 10.3389/fped.2022.966650. eCollection 2022

Cerebral palsy (CP) refers to a group of diseases characterized by persistent central dyskinesia, postural development disorder and activity limitation syndromes caused by nonprogressive brain injury in the developing fetus or infant, which is often accompanied by sensory, cognitive and attention disorders. The routine rehabilitation methods for children with CP mainly include physical therapy, occupational therapy, speech therapy and other methods. In recent years, noninvasive brain stimulation (NIBS), as a relatively new intervention method, has been widely used because of its potential to regulate cortical excitability and plasticity. Transcranial direct current stimulation (tDCS) is an NIBS technique that is easier and more convenient to perform. It does not require patients to remain stationary for a long time or have a significant impact on treatment results due to children's frequent activities. Compared with other NIBS techniques, tDCS has greater flexibility and no strict restrictions on patients' activities; it also helps the therapist conduct occupational therapy or speech therapy while a child receives tDCS, which markedly reduces the treatment time and avoids burnout due to a long treatment duration. Thus, tDCS is a better and more convenient intervention for CP children and warrants further exploration. Accordingly, this article reviews tDCS application in children with CP and discusses tDCS application prospects for such children to promote its expansion in clinical practice.

PMID: [36204667](#)

21. Factors influencing neuromuscular responses to gait training with a robotic ankle exoskeleton in cerebral palsy

Benjamin C Conner, Alyssa M Spomer, Katherine M Steele, Zachary F Lerner

Assist Technol. 2022 Oct 4;1-8. doi: 10.1080/10400435.2022.2121324. Online ahead of print.

A current limitation in the development of robotic gait training interventions is understanding the factors that predict responses to treatment. The purpose of this study was to explore the application of an interpretable machine learning method, Bayesian Additive Regression Trees (BART), to identify factors influencing neuromuscular responses to a resistive ankle exoskeleton in individuals with cerebral palsy (CP). Eight individuals with CP (GMFCS levels I - III, ages 12-18 years) walked with a resistive ankle exoskeleton over seven visits while we measured soleus activation. A BART model was developed using a predictor set of kinematic, device, study, and participant metrics that were hypothesized to influence soleus activation. The model ($R^2 = 0.94$) found that kinematics had the largest influence on soleus activation, but the magnitude of exoskeleton resistance, amount of gait training practice with the device, and participant-level parameters also had substantial effects. To optimize neuromuscular engagement during exoskeleton training in individuals with CP, our analysis highlights the importance of monitoring the user's kinematic response, in particular, peak stance phase hip flexion and ankle dorsiflexion. We demonstrate the utility of machine learning techniques for enhancing our understanding of robotic gait training outcomes, seeking to improve the efficacy of future interventions.

PMID: [36194197](#)

22. Naming cerebral palsy 'CP': Physiology and service provision

Bernard Dan

Editorial Dev Med Child Neurol. 2022 Nov;64(11):1312-1313. doi: 10.1111/dmcn.15378.

No abstract available

PMID: [36181366](#)

23. An association study of IL2RA polymorphisms with cerebral palsy in a Chinese population

Yimeng Qiao, Yangong Wang, Yiran Xu, Jin Zhang, Yu Su, Ye Cheng, Dan Bi, Juan Song, Lei Xia, Ming Li, Xiaoli Zhang, Dengna Zhu, Ting Wang, Jian Ding, Xiaoyang Wang, Changlian Zhu, Qinghe Xing

BMC Med Genomics. 2022 Oct 4;15(1):208. doi: 10.1186/s12920-022-01350-5.

Background: Cerebral palsy (CP), the most common physical disability of childhood, is a nonprogressive movement disorder syndrome. Eighty percent of cases are considered idiopathic without a clear cause. Evidence has shown that cytokine abnormalities are widely thought to contribute to CP. **Methods:** An association between 6 SNPs (rs12244380, rs2025345, rs12722561, rs4749926, rs2104286 and rs706778) in IL2RA (interleukin 2 receptor subunit alpha) and CP was investigated using a case-control method based on 782 CP cases and 778 controls. The allele, genotype and haplotype frequencies of SNPs were assessed using the SHEsis program. Subgroup analyses based on complications and clinical subtypes were also conducted. **Results:** Globally, no differences in genotype or allele frequencies for any SNPs remained significant after Bonferroni correction between patients and controls, except rs706778, which deviated from Hardy-Weinberg equilibrium and was excluded from further analyses. However, subgroup analysis revealed a significant association of rs2025345 with spastic tetraplegia (P genotype = 0.048 after correction) and rs12722561 with CP accompanied by global developmental delay (P allele = 0.045 after correction), even after Bonferroni correction. **Conclusions:** These findings indicated that genetic variations in IL2RA are significantly associated with CP susceptibility in the Chinese Han population, suggesting that IL2RA is likely involved in the pathogenesis of CP. Further investigation with a larger sample size in a multiethnic population is needed to confirm the association.

PMID: [36195861](#)

24. Information and Empowerment of Families of Children With Cerebral Palsy in Brazil: The Knowledge Translation Role of Nossa Casa Institute

Marina J Airoldi, Beatriz S Vieira, Rachel Teplicky, Deborah Chalfun, Rafael G A S Bonfim, Marisa C Mancini, Peter Rosenbaum, Marina B Brandão

Front Rehabil Sci. 2021 Jul 19;2:709983. doi: 10.3389/fresc.2021.709983. eCollection 2021.

Knowledge translation (KT) is gaining attention in the pediatric rehabilitation field. Nossa Casa Institute is the first organization in Brazil aiming to foster cerebral palsy (CP) awareness and empower families by discussing reliable information. This study aims to build a network where individuals with CP and their families, researchers, health care professionals, and services can communicate and share experiences. In this article, we describe the experience of planning and conducting an educational and interactive online workshop to foster principles of family-centered service (FCS). We used the action cycle from the Knowledge to Action (KTA) framework to describe and ground the proposed activities. In Module 1, "Challenges and barriers to incorporate family-centered principles," we discussed the historical perspective, main principles, and challenges related to FCS implementation. Module 2, "What is my contribution to the family-centered service?" was aimed to foster strategies to improve the implementation of principles of FCS in the care of children with disabilities. In Module 3, "What can we do together?" the groups presented their ideas and suggestions. This interactive and educational workshop was an opportunity for Nossa Casa Institute to disseminate accessible and reliable information regarding FCS and to empower families to participate actively in the rehabilitation process and advocate for the best provision of care for their children. Future actions of Nossa Casa Institute include the coordination of a national conference to connect families, individuals with CP, healthcare and rehabilitation professionals, and researchers. There is also a need, and opportunity, for formal evaluation of these KT activities.

PMID: [36188792](#)

25. Short-term neurodevelopment and growth outcomes of very and moderate preterm Indian infants

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J Perinatol. 2022 Oct 2. doi: 10.1038/s41372-022-01519-x. Online ahead of print.

Objective: To study the growth and neurodevelopmental outcome of very and moderate preterm infants (VMPT) compared to term appropriate-for-age (term AGA) infants at 18-months corrected age. **Methods:** This prospective cohort study enrolled consecutively born 212 VMPT infants and 250 term AGA controls delivered during study period. **Outcome measures:** Major neurodevelopmental impairment (NDI) defined as any one of cerebral palsy, motor (MoDQ) or mental developmental quotient (MoDQ) <70 on Developmental Assessment Scale for Indian infants, visual or hearing impairment, or epilepsy, and growth outcomes. **Results:** Among 195 VMPT and 240 term AGA infants who completed follow-up, the frequency of major NDI was 12.8% and 2.5% respectively (RR 5.1; 95% CI [2.13-12.19]). Major NDI was higher among infants <28 weeks gestation (39%) and birthweight <1000 grams (27%). A quarter of VMPT infants exhibited wasting and 18% stunting than 7% each among controls. **Conclusion:** VMPT infants had a higher frequency of major NDI and growth failure at 18-months.

PMID: [36184641](#)

26. TNAP-a potential cytokine in the cerebral inflammation in spastic cerebral palsy

Xiao-Kun Wang, Chao Gao, He-Quan Zhong, Xiang-Yu Kong, Rui Qiao, Hui-Chun Zhang, Bai-Yun Chen, Yang Gao, Bing Li

Front Mol Neurosci. 2022 Sep 14;15:926791. doi: 10.3389/fnmol.2022.926791. eCollection 2022.

Objective: Several studies have shown the significance of neuroinflammation in the pathological progress of cerebral palsy (CP). However, the etiology of CP remains poorly understood. Spastic CP is the most common form of CP, comprising 80% of all cases. Therefore, identifying the specific factors may serve to understand the etiology of spastic CP. Our research aimed to find some relevant factors through protein profiling, screening, and validation to help understand the pathogenesis of cerebral palsy. **Materials and methods:** In the current study, related clinical parameters were assessed in 18 children with spastic CP along with 20 healthy individuals of the same age. Blood samples of the spastic CP children and controls were analyzed with proteomics profiling to detect differentially expressed proteins. On the other hand, after hypoxic-ischemic encephalopathy (HIE) was induced in the postnatal day 7 rat pups, behavioral tests were performed followed by detection of the differentially expressed markers and inflammatory cytokines in the peripheral blood and cerebral cortex of the CP model rats by Elisa and Western blot. Independent sample t-tests, one-way analysis of variance, and the Pearson correlation were used for statistical analysis. **Results:** Through proteomic analysis, differentially expressed proteins were identified. Among them, tissue-nonspecific alkaline phosphatase (TNAP), the gene expression product of alkaline phosphatase (ALPL), was downregulated in spastic CP. In addition, significantly lower TNAP levels were found in the children with CP and model rats. In contrast, compared with the sham rats, the model rats demonstrated a significant increase in osteopontin and proinflammatory biomarkers in both the plasma and cerebral cortex on the ischemic side whereas serum 25 hydroxyvitamin D and IL-10 were significantly decreased. Moreover, serum TNAP level was positively correlated with serum CRP and IL-10 in model rats. **Conclusion:** These results suggest that TNAP is the potential molecule playing a specific and critical role in the neuroinflammation in spastic CP, which may provide a promising target for the diagnosis and treatment of spastic CP.

PMID: [36187348](#)

27. Follow-up care of the extremely preterm infant after discharge from the neonatal intensive care unit [Article in English, English]

Leonora Hendson, Paige T Church, Rudaina Banihani

Review Paediatr Child Health. 2022 Oct 3;27(6):359-371. doi: 10.1093/pch/pxac058. eCollection 2022 Oct.

The survival of babies born extremely preterm (EP, <28 weeks gestation) has improved over time, and many have good outcomes and quality of life. They remain at risk for health issues, including neurosensory and neurodevelopmental difficulties requiring monitoring by primary physicians, paediatricians, and specialty clinics. This statement reviews potential medical and

neurodevelopmental consequences for EP infants in the first 2 years after discharge and provides strategies for counselling, early detection, and intervention. EP-related conditions to assess for early include bronchopulmonary dysplasia or respiratory morbidity, feeding and growth concerns, neurosensory development (vision and hearing), cerebral palsy, and autism spectrum disorder. Correction for gestational age should be used for growth and development until 36 months of age. Integral to quality care of the child born EP is attention to the emotional well-being of parents and caregivers.

PMID: [36200103](#)

28. Early Neurodevelopmental Outcomes after Previaible Preterm Prelabour Rupture of Membranes (pPPROM)

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Case Reports Case Rep Pediatr. 2022 Sep 20;2022:3428841. doi: 10.1155/2022/3428841. eCollection 2022.

Objective: To describe the early neurodevelopmental outcomes following fetal exposure to previable preterm prelabour rupture of membranes (pPPROM). **Methods:** This was a secondary analysis of a subgroup of neonates born following pPPROM from a retrospective cohort study (2009-2015). Surviving infants who underwent standardized neurodevelopmental evaluation at 18-24 months corrected age (CA) between 2017 and 2019 were eligible for inclusion. Data abstracted from hospital charts were linked to prospectively collected developmental outcomes stored in an electronic database from a regional neonatal follow-up clinic. The primary outcome was Bayley-III composite scores (compared to the population mean 100, standard deviation (SD) 15). Secondary outcomes included presence of cerebral palsy, vision loss, hearing impairment, and requirement of rehabilitation therapy. Descriptive statistics were used to present results. **Results:** 25.7% (19/74) of neonates born after pPPROM survived to hospital discharge, but only 21.6% (16/74) survived to 18-24 months CA. Of these, 9 infants were eligible for follow-up at the regional clinic and 7 had developmental outcomes stored in the electronic database. Infants exposed to pPPROM exhibited Bayley-III scores more than 1 SD below the population mean across all three domains: cognitive 84.9 (SD 12.2); motor 82.3 (SD 11.5); and language 66.4 (SD 18.9). There were particular deficiencies in language development with 71% (5/7) scoring more than 2 SDs below the population mean. There were no cases of cerebral palsy. **Conclusions:** Only 1 in 5 infants born following expectantly managed pPPROM survived to 18-24 months CA. These infants born after pPPROM had significantly lower Bayley-III scores and particular deficiencies in language development. Better understanding of early neurodevelopmental challenges following pPPROM will help refine counselling of families contemplating expectant management and provide insights into the postnatal educational resources required to improve long-term developmental outcomes for these children.

PMID: [36193210](#)

29. Neurodevelopmental outcomes of very preterm infants who received cord milking at birth: a randomized controlled trial

Walid El-Naggar, Douglas McMillan, Arif Hussain, Anthony Armson, Linda Dodds, Andrew Warren, Robin Whyte, Michael Vincer, C David Simpson

Eur J Pediatr. 2022 Oct 4. doi: 10.1007/s00431-022-04638-x. Online ahead of print.

Umbilical cord milking improves postnatal adaptation and short-term outcomes of very preterm infants compared to early cord clamping. Little is known about the impact of umbilical cord milking on long-term neurodevelopmental outcomes. The objective of this study is to compare the effects of intact umbilical cord milking (UCM) vs. early cord clamping (ECC) at birth on neurodevelopmental outcomes at 36 months' corrected age. Preterm infants < 31 weeks' gestation who were randomized at birth to receive three time milking of their attached cord or ECC (< 10 s) were evaluated at 36 months' corrected age. Neurodevelopmental outcomes were assessed by blinded examiners using Bayley Scales of Infant and Toddler Development (version III). Analysis was by intention to treat. Out of the 73 infants included in the original trial, 2 died and 65 (92%) infants were evaluated at 36 months' corrected age. Patient characteristics and short-term outcomes were similar in both study groups. There were no significant differences in the median cognitive, motor or language scores or in the rates of cerebral palsy, developmental impairment, deafness, or blindness between study groups. **Conclusion:** Neurodevelopmental outcomes at 36 months' corrected age of very preterm infants who received UCM were not shown to be significantly different from those who received ECC at birth. **Trial registration:** ClinicalTrials.gov: NCT01487187 **What is Known:** • Compared to early cord clamping, umbilical cord milking improves postnatal adaptation and short-term outcomes of very preterm infants compared to early cord clamping. • Little is known about the impact of umbilical cord milking on neurodevelopmental outcomes. **What is new:** • Neurodevelopmental outcomes at 3 years of age were not significantly different in very preterm infants who received

cord milking vs. those who received early cord clamping at birth.

PMID: [36194256](#)

30. Functional and Structural Brain Connectivity in Children With Bilateral Cerebral Palsy Compared to Age-Related Controls and in Response to Intensive Rapid-Reciprocal Leg Training

Diane L Damiano, James J Pekar, Susumu Mori, Andreia Vasconcellos Faria, X Ye, Elaine Stashinko, Christopher J Stanley, Katharine E Alter, Alec H Hoon, Eric M Chin

Front Rehabil Sci. 2022 Apr 5;3:811509. doi: 10.3389/fresc.2022.811509. eCollection 2022.

Background: Compared to unilateral cerebral palsy (CP), less is known about brain reorganization and plasticity in bilateral CP especially in relation or response to motor training. The few trials that reported brain imaging results alongside functional outcomes include a handful of studies in unilateral CP, and one pilot trial of three children with bilateral CP. This study is the first locomotor training randomized controlled trial (RCT) in bilateral CP to our knowledge reporting brain imaging outcomes. **Methods:** Objective was to compare MRI brain volumes, resting state connectivity and white matter integrity using DTI in children with bilateral CP with PVL and preterm birth history (<34 weeks), to age-related controls, and from an RCT of intensive 12 week rapid-reciprocal locomotor training using an elliptical or motor-assisted cycle. We hypothesized that connectivity in CP compared to controls would be greater across sensorimotor-related brain regions and that functional (resting state) and structural (fractional anisotropy) connectivity would improve post intervention. We further anticipated that baseline and post-intervention imaging and functional measures would correlate. **Results:** Images were acquired with a 3T MRI scanner for 16/27 children with CP in the trial, and 18 controls. No conclusive evidence of training-induced neuroplastic effects were seen. However, analysis of shared variance revealed that greater increases in precentral gyrus connectivity with the thalamus and pons may be associated with larger improvements in the trained device speed. Exploratory analyses also revealed interesting potential relationships between brain integrity and multiple functional outcomes in CP, with functional connectivity between the motor cortex and midbrain showing the strongest potential relationship with mobility. Decreased posterior white matter, corpus callosum and thalamic volumes, and FA in the posterior thalamic radiation were the most prominent group differences with corticospinal tract differences notably not found. **Conclusions:** Results reinforce the involvement of sensory-related brain areas in bilateral CP. Given the wide individual variability in imaging results and clinical responses to training, a greater focus on neural and other mechanisms related to better or worse outcomes is recommended to enhance rehabilitation results on a patient vs. group level.

PMID: [36189020](#)

31. Case Report: Perspective of a Caregiver on Functional Outcomes Following Bilateral Lateral Pectoral Nerve Cryoneurotomy to Treat Spasticity in a Pediatric Patient With Cerebral Palsy

Jack Scobie, Paul Winston

Case Reports Front Rehabil Sci. 2021 Sep 6;2:719054. doi: 10.3389/fresc.2021.719054. eCollection 2021.

Spasticity is common and difficult to manage complication of cerebral palsy that significantly affects the function and quality of life of patients. This case study reports a 15-year-old male with quadriplegic cerebral palsy, Gross Motor Function Classification System 5 (GMFCS 5), who presented with significant bilateral adducted and internally rotated shoulders as a component of generalized spasticity. Spasticity in the lower limb of the patient had been treated with botulinum toxin A (BoNT-A) injections; however, the shoulder region was spared due to concerns of toxin spread and aspiration risk. Following diagnostic nerve blocks, the patient underwent bilateral cryoneurotomies of the right and left lateral pectoral nerves (LPNs) lasting 3.5 min for each lesion. One month after the cryoneurotomies, the range of motion (ROM) had improved from 86° to 133° on the right and 90° to 139° on the left. Improvements in ROM were retained at 9 months post-procedure. At 8.5 months following the cryoneurotomies, the caregiver reported improvements in upper body dressing, upper body washing, transferring, and the ability of the patient to remain sitting in his wheelchair for extended periods. Cryoneurotomy may be an effective procedure for improving shoulder ROM and specific functional outcomes for caregivers of patients with spasticity arising from cerebral palsy.

PMID: [36188857](#)

32. Commentary on "Spasticity Measurement Tools and Their Psychometric Properties Among Children and Adolescents With Cerebral Palsy: A Systematic Review"

Kimberly Scarberry, Kelly Greve, Alexandra Sankovic

Pediatr Phys Ther. 2022 Oct 1;34(4):464. doi: 10.1097/PEP.0000000000000954.

No abstract available

PMID: [36194737](#)

33. Metabolic assessment of cerebral palsy with normal clinical MRI using 18F-FDG PET imaging: A preliminary report

Ruimin Wu, Yan Gao, Huaqiong Zhang, Yijia Chen, Fan Tan, Daobing Zeng, Huabing Wan, Yi Yang, Jiaowei Gu, Zhijun Pei

Front Neurol. 2022 Sep 15;13:844911. doi: 10.3389/fneur.2022.844911. eCollection 2022.

To explore the cerebral metabolic patterns of cerebral palsy (CP) patients without structural abnormalities by brain magnetic resonance imaging (MRI) scans, we evaluated 18F-fluoro-deoxyglucose positron emission tomography (18F-FDG PET) imaging features in patients. Thirty-one children with CP [Gross Motor Function Classification System (GMFCS) levels II-V] showing no structural abnormalities by MRI were enrolled in this study. Regional glucose metabolic activity values were calculated using Scenium software and compared between the right and left cerebral hemispheres. These comparisons revealed asymmetric metabolic reductions in the central region, cerebellum, frontal lobe, and parietal lobe ($p < 0.01$). We next determined whether averaged brain metabolic activity values in different brain regions correlated with GMFCS levels. The metabolic activity values of basal ganglia, left temporal lobe, and cerebellum correlated negatively with GMFCS scores (all $p < 0.05$). This method was applied to the left cerebellum, which showed higher metabolic activity values than those in the right cerebellum in most patients (83.8%), and these values also correlated negatively with GMFCS scores (Spearman's $r = -0.36$, $p = 0.01$). Differential cortical glucose metabolism by 18F-FDG PET, may help to distinguish between different CP diagnoses that are not detected by MRI.

PMID: [36188357](#)

34. Public and Patient Involvement in Doctoral Research During the COVID-19 Pandemic: Reflections on the Process, Challenges, Impact and Experiences From the Perspectives of Adults With Cerebral Palsy and the Doctoral Researcher

Manjula Manikandan, Kevin Foley, Jessica Gough, Sarah Harrington, Éabha Wall, Fiona Weldon, Jennifer M Ryan, Claire Kerr, Aisling Walsh, Jennifer Fortune

Front Rehabil Sci. 2022 Jun 3;3:874012. doi: 10.3389/fresc.2022.874012. eCollection 2022.

Introduction: Cerebral palsy (CP) is a lifelong condition, where people may experience complications as they age. Including the views of people with CP through Public and Patient Involvement (PPI) ensures that research into the condition is relevant and meaningful in addressing their concerns. However, there is a lack of evidence on incorporating the voices of adults with CP in the doctoral research process. Therefore, this paper aims to provide an overview of how adults with CP were involved in a doctoral research process during the pandemic. **Methods:** This paper describes the PPI process and its impact at various stages of the doctoral research process and reflects on the experiences from the perspective of the doctoral researcher and adults with CP using the INVOLVE Values and Principles framework. Five adults with CP were consulted throughout the doctoral research programme. The data for this paper is a combination of reflection notes, email exchanges, meeting minutes and informal discussions with the PPI team on their experiences of being involved in the PPI process. The content of this paper is informed by GRIPP 2 checklist. **Results:** The doctoral researcher and adult reflections highlighted the value of collaboration and the positive impact on research at each stage of the doctoral research process. Although meetings were adapted due to the pandemic, the values of PPI were adhered to throughout the doctoral research. **Conclusion:** Involving adults with CP positively impacted the doctoral research process. It is recommended to consider individual access needs to ensure meetings and information are accessible for disabled adults. Our reflective findings and recommendations may help other researchers who plan to involve adults with CP in doctoral research.

PMID: [36188919](#)

35. A Narrative Review of Function-Focused Measures for Children With Neurodevelopmental Disorders

Kajaani Shanmugarajah, Peter Rosenbaum, Mohammad Zubairi, Briano Di Rezze

Review Front Rehabil Sci. 2021 Jul 29;2:709978. doi: 10.3389/fresc.2021.709978. eCollection 2021.

Clinical measures in health and rehabilitation settings are often used to examine child functioning to better support the diverse needs of children with neurodevelopmental disorders (NDD) and their families. The WHO's International Classification of Functioning, Disability, and Health (ICF) framework reflects a focus of health beyond biomedical deficits, using the concept of functioning to create opportunities for measurement development involving this construct. In the measures developed in the field of childhood NDD, it is unclear whether and how these tools measure and incorporate the ICF framework and its domains within health care contexts. Understanding how these measures utilize the ICF will enable researchers and clinicians to operationalize function-focused concepts in studies and clinical practice more effectively. This narrative review aims to identify and describe function-focused measures that are based on the ICF for children with NDD, as described in the peer-reviewed literature. This review used a systematic search strategy with multiple health-focused databases (Medline, PsycInfo, EMBASE, EMCARE), and identified 14 clinical measures that provide direct support for children (aged 0-21) with NDD in pediatric health (and other) settings. Results described the measures that were primarily developed for three main diagnostic populations [cerebral palsy, autism spectrum disorder, and communication disorders]; had varying contextual use (clinical-only or multiple settings); and for which authors had conducted psychometric tests in the measure's initial development studies, with the most common being content validity, interrater reliability, test-retest reliability. Participation (79%, n = 11) & Activities (71%, n = 10) were the most common ICF domains captured by the set of measurement tools. Overall (71%, n = 10) of the identified measures utilized multiple ICF domains, indicating that the "dynamic nature" of the interactions of the ICF domains was generally evident, and that this result differentiated from "linking rules," commonly used in research and clinical practice. The implications of these findings suggest that clinical measures can be an effective application of the ICF's defined concepts of functioning for children with NDD.

PMID: [36188829](#)

36. Fathers Matter: Enhancing Healthcare Experiences Among Fathers of Children With Developmental Disabilities

Tatiana Ogourtsova, Maureen E O'Donnell, Derrick Chung, Frank Gavin, Aline Bogossian, Annette Majnemer

Front Rehabil Sci. 2021 Jul 21;2:709262. doi: 10.3389/fresc.2021.709262. eCollection 2021.

Background: Being a parent of a child with a developmental disability (DD; e. g., cerebral palsy, autism) comes with great challenges and apprehensions. Mothers and fathers of children with DD are experiencing heightened levels of psychological distress, physical health problems, financial difficulties, social isolation, and struggles with respect to traditional parenting roles. In relation to the latter, the involvement of fathers in caregiving in today's society is increasing and is highlighted by its importance and positive contribution to the development of their children. However, fathers of children with DD report feeling excluded and marginalized by healthcare providers (HCPs) when arranging for and getting involved in healthcare services for their children. Currently, there is limited evidence as to what factors influence those experiences. We aimed to explore barriers to and facilitators of positive and empowering healthcare experiences, from the perspectives of fathers of children with DD and HCPs. **Methods:** A mixed-method approach, such as quantitative (survey) and qualitative (semi-structured interview) strategies, was used. Participants were fathers of children with DD and HCPs working in childhood disability. Data analysis consisted of using descriptive statistics and an inductive-thematic analysis of emergent themes. **Results:** Fathers (n = 7) and HCPs (n = 13, 6 disciplines) participated. The fathers indicated that while they were moderate to very much satisfied with their interactions with HCPs, they reported that HCPs were only sometimes attentive to them during interactions. Fathers also revealed that positive interactions with HCPs in relation to their children had multiple benefits. Several themes related to barriers and facilitators of optimal interactions and parent-professional relationships emerged. These included session factors (time, attention), personal factors (knowledge of the condition, child and healthcare system, acceptance vs. denial, previous experiences, culture, stereotypes, pre-existing beliefs, stress levels, working schedule), and family dynamics. The participants offered several insights into the different strategies that can be implemented to promote optimal interactions between fathers and HCPs. **Conclusion:** We identified several barriers, facilitators, and improvement strategies for optimal interactions and enhanced parent-professional relationships from the perspectives of fathers and HCPs. These can be integrated by existing clinical settings in efforts to enhance current clinical practices and improve child- and parent-related outcomes.

PMID: [36188790](#)

37. Rehabilitation Evidence-Based Decision-Making: The READ Model

Iona Novak, Anna Te Velde, Ashleigh Hines, Emma Stanton, Maria Mc Namara, Madison C B Paton, Megan Finch-Edmondson, Catherine Morgan

Review Front Rehabil Sci. 2021 Oct 5;2:726410. doi: 10.3389/freesc.2021.726410. eCollection 2021.

Evidence-based practice is the foundation of rehabilitation for maximizing client outcomes. However, an unacceptably high number of ineffective or outdated interventions are still implemented, leading to sub-optimal outcomes for clients. This paper proposes the Rehabilitation Evidence bAsed Decision-Making (READ) Model, a decision-making algorithm for evidence-based decision-making in rehabilitation settings. The READ Model outlines a step-by-step layered process for healthcare professionals to collaboratively set goals, and to select appropriate interventions. The READ Model acknowledges the important multi-layered contributions of client's preferences and values, family supports available, and external environmental factors such as funding, availability of services and access. Healthcare professionals can apply the READ Model to choose interventions that are evidence-based, with an appropriate mode, dose, and with regular review, in order to achieve client's goals. Two case studies are used to demonstrate application of the READ Model: cerebral palsy and autism spectrum disorder. The READ Model applies the four central principles of evidence-based practice and can be applied across multiple rehabilitation settings.

PMID: [36188787](#)

38. Editorial: Women in science: Interventions for rehabilitation

Maryam Zoghi, Maria Rubega, Joyce Fung

Editorial Front Rehabil Sci. 2022 Aug 25;3:1008741. doi: 10.3389/freesc.2022.1008741. eCollection 2022.

No abstract available

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