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Interventions and Management

1. Interventions and Management

Pathological and physiological muscle co-activation during active elbow extension in children with unilateral cerebral palsy.

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

Clin Neurophysiol. 2016 Oct 29;128(1):4-13. doi: 10.1016/j.clinph.2016.10.086. [Epub ahead of print]

OBJECTIVE: To address the roles and mechanisms of co-activation in two flexor/extensor pairs during elbow extension in children with cerebral palsy (CP). **METHODS:** 13 Typically Developing (TD) and 13 children with unilateral spastic CP performed elbow extension/flexion at different speeds. Elbow angle and velocity were recorded using a 3D motion analysis system. The acceleration and deceleration phases of extension were analyzed. Co-activation of the brachioradialis/triceps and biceps/triceps pairs was computed for each phase from surface electromyographic signals. Statistical analysis involved linear mixed effects models and Spearman rank correlations. **RESULTS:** During the acceleration phase, there was strong co-activation in both muscle pairs in the children with CP, which increased with speed. Co-activation was weak in the TD children and it was not speed-dependent. During the deceleration phase, co-activation was strong and increased with speed in both groups; co-activation of brachioradialis/triceps was stronger in children with CP, and was negatively correlated with extension range and positively correlated with flexor spasticity. **CONCLUSIONS:** Abnormal patterns of co-activation in children with CP were found throughout the entire movement. Co-activation was specific to the movement phase and to each flexor muscle. **SIGNIFICANCE:** Co-activation in children with CP is both physiological and pathological.

[PMID: 27866118](#)

2. Does Corticospinal Tract Connectivity Influence the Response to Intensive Bimanual Therapy in Children With Unilateral Cerebral Palsy?

Smorenburg AR, Gordon AM, Kuo HC, Ferre CL, Brandao M, Bleyenheuft Y, Carmel JB, Friel KM.

Neurorehabil Neural Repair. 2016 Nov 17. pii: 1545968316675427. [Epub ahead of print]

Background Reorganization of the corticospinal tract (CST) can occur in unilateral spastic cerebral palsy (USCP). The affected hand can be controlled via (1) typical contralateral projections from the lesioned hemisphere, (2) ipsilateral projections from the nonlesioned hemisphere, and (3) a combination of contralateral and ipsilateral projections (ie, bilateral). Intensive bimanual therapy and constraint-induced movement therapy (CIMT) improve hand function of children with USCP. Earlier it was suggested that the CST connectivity pattern may influence the efficacy of CIMT. **Objective** To examine whether CST projection pattern influences the efficacy of intensive bimanual therapy in children with USCP. **Participants** Thirty-three children with USCP (age 8.9 ± 2.6 years, 16 females). **Methods** Bimanual therapy was provided in a day-camp setting (90 hours). Participants were involved in different bimanual play and functional activities actively engaging both hands. Hand function was tested before and after the intervention with the Jebsen-Taylor Test of Hand Function, Assisting Hand

Assessment, ABILHAND-Kids, and the Canadian Occupational Performance Measure. Single-pulse transcranial magnetic stimulation (TMS) was used to determine each child's CST projection pattern (ie, ipsilateral, contralateral, or bilateral). Results Children whose affected hand was controlled only by ipsilateral CST projections had worse Jebsen-Taylor Test of Hand Function and Assisting Hand Assessment scores than children in the contralateral group at baseline. Bimanual hand use and functional hand use was independent of CST projection pattern. After bimanual therapy, improvements on all outcome measures were observed, and these improvements were independent of the CST connectivity pattern. Conclusion The efficacy of bimanual therapy on hand function in children with USCP appears to be independent of CST connectivity pattern.

[PMID: 27856938](#)

3. Caregiver-directed home-based intensive bimanual training in young children with unilateral spastic cerebral palsy: a randomized trial.

Ferre CL, Brandão M, Surana B, Dew AP, Moreau NG, Gordon AM.

Dev Med Child Neurol. 2016 Nov 19. doi: 10.1111/dmcn.13330. [Epub ahead of print]

AIM: To examine the efficacy of caregiver-directed, home-based intensive bimanual training in children with unilateral spastic cerebral palsy (USCP) using a randomized control trial. METHOD: Twenty-four children (ages 2y 6mo-10y 1mo; 10 males, 14 females) performed home-based activities directed by a caregiver for 2 hours per day, 5 days per week, for 9 weeks (total=90h). Cohorts of children were age-matched into groups and randomized to receive home-based hand-arm bimanual intensive therapy (H-HABIT; n=12) or lower-limb functional intensive training (LIFT-control; n=12). Caregivers were trained before the intervention and supervised remotely via telerehabilitation. Dexterity and bimanual hand function were assessed using the Box and Blocks test (BBT) and the Assisting Hand Assessment (AHA) respectively. Caregiver perception of functional goals was measured using the Canadian Occupational Performance Measure (COPM). RESULTS: H-HABIT showed greater improvement on the BBT compared to LIFT-control and no improvement on the AHA. H-HABIT demonstrated significant improvement in COPM-Performance compared to LIFT-control and both groups showed equal improvement in COPM-Satisfaction. INTERPRETATION: H-HABIT improved dexterity and performance of functional goals, but not bimanual performance, in children with USCP compared to a control group receiving intervention of equal intensity/duration that also controlled for increased caregiver attention. Home-based models provide a valuable, family-centered approach to achieve increased treatment intensity.

[PMID: 27864822](#)

4. Does Nintendo Wii Balance Board improve standing balance? A randomised controlled trial in children with cerebral palsy.

Gatica-Rojas V, Méndez-Rebolledo G, Guzman-Muñoz E, Soto-Poblete A, Cartes-Velásquez R, Elgueta-Cancino E, Cofré Lizama E.

Eur J Phys Rehabil Med. 2016 Nov 24. [Epub ahead of print]

BACKGROUND: Evidence on the effect of systemic exercise programs to improve the standing balance with the Nintendo Wii system is very limited and its post-treatment effectiveness is unknown in cerebral palsy (CP) patients. AIM: Primary aim was to compare the effect of Nintendo Wii balance board (Wii-therapy) and standard physiotherapy (SPT), on the performance of standing balance in children and adolescents with CP. Secondary aim was to determine the post-treatment effectiveness of Wii-therapy and SPT. DESIGN: Two-arm, matched-pairs, parallel-groups, randomized, controlled clinical trial. SETTING: Outpatient Rehabilitation Centre in the city of Talca. POPULATION: Patients with CP type spastic hemiplegia (SHE) and spastic diplegia (SDI), aged 7 to 14 years, and level I or II of GMFCS or GMFCS-ER. Were excluded patients with FSIQ <80, epilepsy, previous surgeries and application of Botulinum Toxin-A in the lower limb, uncorrected vision and hearing disorders. METHODS: Thirty-two CP patients (10.7±3.2 years old) were randomly assigned to either Wii-therapy (SDI=7; SHE=9) or SPT intervention (SDI=7; SHE=9). In each group, patients received three sessions per week over a period of 6 weeks. Standing balance was assessed at baseline and every 2 weeks. Additionally, two follow-up assessments (4 additional weeks) were performed to determine post-treatment effectiveness. Standing balance was quantified on force platform obtaining the outcomes area of centre-of-pressure (CoP) sway (CoPSway), standard deviation in the medial-lateral (SDML) and the anterior-posterior (SDAP) directions, and velocity in both directions (VML and VAP). RESULTS: Compared to SPT, Wii-therapy significantly reduced the CoPSway (p=0.02) and SDAP in the eyes-open condition (p=0.01). However, the effects wane after 2-4 weeks. Post hoc analysis revealed that only SHE children benefited from Wii-therapy. CONCLUSION: Wii-therapy was

better than SPT in improving standing balance in patients with CP, but improves the balance only in SHE patients. Also, Wii-therapy effectiveness waned 2-4 weeks after the end of the intervention. **CLINICAL REHABILITATION IMPACT:** A systematic exercise program like Wii-therapy using the Nintendo Wii Balance Board device can be considered to improve the standing balance in patients with CP, specifically in the SHE type. This program is easy to transfer to physiotherapists and rehabilitation centres.

[PMID: 27882910](#)

5. Real-time feedback to improve gait in children with cerebral palsy.

van Gelder L, Booth AT, van de Port I, Buizer AI, Harlaar J, van der Krogt MM.

Gait Posture. 2016 Nov 11;52:76-82. doi: 10.1016/j.gaitpost.2016.11.021. [Epub ahead of print]

Real-time feedback may be useful for enhancing information gained from clinical gait analysis of children with cerebral palsy (CP). It may also be effective in functional gait training, however, it is not known if children with CP can adapt gait in response to real-time feedback of kinematic parameters. Sixteen children with cerebral palsy (age 6-16; GMFCS I-III), walking with a flexed-knee gait pattern, walked on an instrumented treadmill with virtual reality in three conditions: regular walking without feedback (NF), feedback on hip angle (FH) and feedback on knee angle (FK). Clinically relevant gait parameters were calculated and the gait profile score (GPS) was used as a measure of overall gait changes between conditions. All children, except one, were able to improve hip and/or knee extension during gait in response to feedback, with nine achieving a clinically relevant improvement. Peak hip extension improved significantly by $5.1 \pm 5.9^\circ$ (NF: $8.9 \pm 12.8^\circ$, FH: $3.8 \pm 10.4^\circ$, $p=0.01$). Peak knee extension improved significantly by $7.7 \pm 7.1^\circ$ (NF: $22.2 \pm 12.0^\circ$, FK: $14.5 \pm 12.7^\circ$, $p<0.01$). GPS did not change between conditions due to increased deviations in other gait parameters. Responders to feedback were shown to have worse initial gait as measured by GPS ($p=0.005$) and functional selectivity score ($p=0.049$). In conclusion, ambulatory children with CP show adaptability in gait and are able to respond to real-time feedback, resulting in significant and clinically relevant improvements in peak hip and knee extension. These findings show the potential of real-time feedback as a tool for functional gait training and advanced gait analysis in CP.

[PMID: 27883988](#)

6. Predicting postoperative gait in cerebral palsy.

Galarraga C OA, Vigneron V, Dorizzi B, Khouri N, Desailly E.

Gait Posture. 2016 Nov 9;52:45-51. doi: 10.1016/j.gaitpost.2016.11.012. [Epub ahead of print]

In this work, postoperative lower limb kinematics are predicted with respect to preoperative kinematics, physical examination and surgery data. Data of 115 children with cerebral palsy that have undergone single-event multilevel surgery were considered. Preoperative data dimension was reduced utilizing principal component analysis. Then, multiple linear regressions with 80% confidence intervals were performed between postoperative kinematics and bilateral preoperative kinematics, 36 physical examination variables and combinations of 9 different surgical procedures. The mean prediction errors on test vary from 4° (pelvic obliquity and hip adduction) to 10° (hip rotation and foot progression), depending on the kinematic angle. The unilateral mean sizes of the confidence intervals vary from 5° to 15° . Frontal plane angles are predicted with the lowest errors, however the same performance is achieved when considering the postoperative average signals. Sagittal plane angles are better predicted than transverse plane angles, with statistical differences with respect to the average postoperative kinematics for both plane's angles except for ankle dorsiflexion. The mean prediction errors are smaller than the variability of gait parameters in cerebral palsy. The performance of the system is independent of the preoperative state severity of the patient. Even if the system is not yet accurate enough to define a surgery plan, it shows an unbiased estimation of the most likely outcome, which can be useful for both the clinician and the patient. More patients' data are necessary for improving the precision of the model in order to predict the kinematic outcome of a large number of possible surgeries and gait patterns.

[PMID: 27871017](#)

7. Medial gastrocnemius specific force of adult men with spastic cerebral palsy.

Hussain AW, Onambele GL, Williams AG, Morse CI.

Muscle Nerve. 2016 Nov 15. doi: 10.1002/mus.25477. [Epub ahead of print]

INTRODUCTION: Muscle weakness determines functional impairment in spastic cerebral palsy (SCP). Measurement of specific force (SF) allows for strength comparison with unimpaired populations (controls) accounting for neural (activation and coactivation), architectural (fascicle length and pennation angle), and structural differences (moment arm length). **METHODS:** Medial gastrocnemius (MG) SF (and its determinants) was assessed in both paretic and non-paretic legs of 11 men with SCP and 11 age-matched controls during plantarflexion maximal voluntary isometric contraction (MVIC). **RESULTS:** SCP fascicles were 28% longer than controls ($P<0.05$). Pennation angle of SCP was 41% smaller than controls. The PCSA of SCP MG was 47% smaller than controls ($P<0.05$). There was no difference in SF between controls and SCP. This article is protected by copyright. All rights reserved.

[PMID: 27862024](#)

8. What's New in the Management of Foot Deformities in Children With Cerebral Palsy.

Heydemann JA, Abousamra O, Franzone JM, Kaufman BE, Sees JP.

J Pediatr Orthop. 2016 Nov 17. [Epub ahead of print]

BACKGROUND: Foot deformities have been frequently reported in cerebral palsy (CP), and numerous diagnostic modalities and treatment options have recently been developed to achieve a better level of management for children with CP. **METHODS:** A thorough search of the English literature, published between January 2013 and March 2016, was performed. A summary of the new findings that had not previously described was reported. The review included recent advances regarding clinical and gait evaluation, orthotic management, botulinum toxin A treatment, and surgical correction. **RESULTS:** The review summarized new findings reported in 46 articles and abstracts that were published between January 2013 and March 2016. Older articles were included and cited when an original description was mentioned, or when a change or development of some findings was discussed. **CONCLUSIONS:** Foot deformity forms an essential part of evaluating children with CP. Dramatic advances have been achieved in gait assessment, conservative management, and surgical correction. Promising results have been reported with the goal to reach a higher level of orthopaedic care and optimize the functional potentials for children with CP.

[PMID: 27861211](#)

9. Changes in Muscle Spasticity in Patients With Cerebral Palsy After Spinal Manipulation: Case Series.

Kachmar O, Voloshyn T, Hordiyevych M.

J Chiropr Med. 2016 Dec;15(4):299-304. Epub 2016 Sep 28.

OBJECTIVE: The purpose of this case series was to report quantitative changes in wrist muscle spasticity in children with cerebral palsy after 1 spinal manipulation (SM) and a 2-week course of treatment. **METHODS:** Twenty-nine patients, aged 7 to 18 years, with spastic forms of cerebral palsy and without fixed contracture of the wrist, were evaluated before initiation of treatment, after 1 SM, and at the end of a 2-week course of treatment. Along with daily SM, the program included physical therapy, massage, reflexotherapy, extremity joint mobilization, mechanotherapy, and rehabilitation computer games for 3 to 4 hours' duration. Spasticity of the wrist flexor was measured quantitatively using a Neuroflexor device, which calculates the neural component (NC) of muscle tone, representing true spasticity, and excluding nonneural components, caused by altered muscle properties: elasticity and viscosity. **RESULTS:** Substantial decrease in spasticity was noted in all patient groups after SM. The average NC values decreased by 1.65 newtons (from 7.6 ± 6.2 to 5.9 ± 6.5) after 1 SM. Another slight decrease of 0.5 newtons was noted after a 2-week course of treatment. In the group of patients with minimal spasticity, the decrease in NC after the first SM was almost twofold—from 3.93 ± 2.9 to 2.01 ± 1.0 . In cases of moderate spasticity, NC reduction was noted only after the 2-week course of intensive treatment. **CONCLUSIONS:** In this sample of patients with cerebral palsy, a decrease in wrist muscle spasticity was noted after SM. Spasticity reduction was potentiated during the 2-week course of treatment.

[PMID: 27857638](#)

10. Sensory processing disorders in children with cerebral palsy.

Pavão SL, Rocha NA.

Infant Behav Dev. 2016 Nov 17;46:1-6. doi: 10.1016/j.infbeh.2016.10.007. [Epub ahead of print]

OBJECTIVE: To evaluate sensory processing in children with CP using the Sensory Profile questionnaire and to compare results with the ones of children with typical development (TD). **METHODS:** We assessed sensory processing of 59 TD children and 43 CP children using the Sensory Profile, a standardized parent reporting measure that records children's responses to sensory events in daily life. Mann-Whitney test was used to compare the results of sensory processing evaluation among the groups. Bonferroni correction was applied. **RESULTS:** We found differences in sensory processing between groups in 16 out of the 23 categories evaluated in the Sensory Profile. **CONCLUSION:** Our results pointed out to the existence of disturbances in the processing of sensory information in CP. Based on the importance of the sensory integration process for motor function, the presence of such important disturbances draw the attention to the implementation of sensory therapies which improve function in these children.

[PMID: 27866043](#)**11. A touchy topic: tactile assessment among pediatric therapists.**

Auld ML, Johnston LM.

Disabil Rehabil. 2016 Nov 20:1-10. [Epub ahead of print]

PURPOSE: Tactile impairments affect over 77% of children with unilateral cerebral palsy (CP). This study aimed to examine the current practices of pediatric therapists in relation to tactile assessment and the barriers to carrying out tactile assessment in children with CP. **METHOD:** The study was in two parts. In part one, pediatric therapists (n = 35) completed a questionnaire detailing their current knowledge and the use of tactile assessments in children. In part two, therapists (n = 12) completed a questionnaire based on the Theoretical Domains Framework examining the barriers and facilitators to completing tactile assessments in clinical practice. **RESULTS:** Most therapists (over 90%) carry out tactile assessments in the minority (less than 25%) of children with CP that they treat. Therapists reported the need for improved knowledge/skills (n = 24) and confidence (n = 19) in carrying out tactile assessments, alongside the provision of necessary equipment (n = 17). Qualitative reports also suggested that organizational assessment guidelines and templates may facilitate the implementation of tactile assessment. **CONCLUSIONS:** A multi-faceted knowledge translation strategy to address the barriers to tactile assessment among pediatric therapists needs to be developed. Implications for rehabilitation Pediatric occupational therapists and physiotherapists may not be completing tactile assessments according to current evidence-based recommendations. Therapists identified five main barriers, including a lack of knowledge, skills, belief in their capabilities (confidence), behavioral regulation (organizational procedures), and environmental context (e.g., equipment). Therapists recommended several potential facilitators, including access to necessary equipment, procedures, record sheets, training in tactile assessments, and research supporting related interventions. Service providers are encouraged to develop multi-faceted knowledge translation strategies that address these barriers and maximize facilitators.

[PMID: 27868435](#)**12. DMCN 2016 highlights: cerebral palsy epidemiology, communication in autism, and more.**

Dan B.

Dev Med Child Neurol. 2016 Dec;58(12):1205. doi: 10.1111/dmcn.13298.

[No abstract available]

[PMID: 27870016](#)

13. Toolbox of multiple-item measures aligning with the ICF Core Sets for children and youth with cerebral palsy.

Schiariti V, Tatla S, Sauve K, O'Donnell M.

Eur J Paediatr Neurol. 2016 Nov 4. pii: S1090-3798(16)30191-X. doi: 10.1016/j.ejpn.2016.10.007. [Epub ahead of print]

Selecting appropriate measure(s) for clinical and/or research applications for children and youth with Cerebral Palsy (CP) poses many challenges. The newly developed International Classification of Functioning, Disability and Health (ICF) Core Sets for children and youth with CP serve as universal guidelines for assessment, intervention and follow-up. The aims of this study were: 1) to identify valid and reliable measures used in studies with children and youth with CP, 2) to characterize the content of each measure using the ICF Core Sets for children and youth with CP as a framework, and finally 3) to create a toolbox of psychometrically sound measures covering the content of each ICF Core Set for children and youth with CP. All clearly defined multiple-item measures used in studies with CP between 1998 and 2015 were identified. Psychometric properties were extracted when available. Construct of the measures were linked to the ICF Core Sets. Overall, 83 multiple-item measures were identified. Of these, 68 measures (80%) included reliability and validity testing. The majority of the measures were discriminative, generic and designed for school-aged children. The degree to which measures with proven psychometric properties represented the ICF Core Sets for children and youth with CP varied considerably. Finally, 25 valid and reliable measures aligned highly with the content of the ICF Core Sets, and as such, these measures are proposed as a novel ICF Core Sets-based toolbox of measures for CP. Our results will guide professionals seeking appropriate measures to meet their research and clinical needs worldwide.

[PMID: 27864012](#)

14. Change in pain status in children with cerebral palsy.

Christensen R, Macintosh A, Switzer L, Fehlings D.

Dev Med Child Neurol. 2016 Nov 15. doi: 10.1111/dmcn.13328. [Epub ahead of print]

AIM: To identify factors associated with a change in pain over time in children with cerebral palsy (CP). METHOD: Pain was assessed at two time-points by physicians and caregiver-rated Health Utilities Index 3 (HUI3) pain scores. RESULTS: One hundred and forty-eight children out of 179 approached from outpatient clinics (83% response; 104 males, 44 females mean age 8y 8mo, range 3y-16y) across all Gross Motor Function Classification System (GMFCS) levels were included. Fifty-five percent had changes in caregiver-reported HUI3 pain. A backward stepwise multiple linear regression retained HUI3 pain score at visit 1 and GMFCS level ($F[2,144] = 23.40$, $R^2 = 0.35$; $p < 0.001$) as variables associated with a change in pain status (HUI3 pain at visit 1: $\beta = 0.61$, $p < 0.001$; GMFCS level: $\beta = -0.17$, $p < 0.015$). The association between HUI3 pain at visit 1 and GMFCS level was significant ($\beta = -0.15$, $p < 0.036$). There was an association between pain etiology and pain trajectory ($F[3,144] = 5.39$, $p = 0.002$). Post-hoc testing revealed musculoskeletal pain had the greatest improvements compared with the no pain group ($p = 0.006$). INTERPRETATION: Children with CP with more severe initial pain and higher gross motor function have lower pain at follow-up indicating an improvement in pain status over time.

[PMID: 27861779](#)

15. Sleep disorders in cerebral palsy.

Gringras P.

Dev Med Child Neurol. 2016 Nov 14. doi: 10.1111/dmcn.13335. [Epub ahead of print]

This commentary is on the original article by Jacquier and Newman]

[PMID: 27859026](#)

16. Fatigue and its relationship with physical activity, age, and body composition in adults with cerebral palsy.

McPhee PG, Brunton LK, Timmons BW, Bentley T, Gorter JW.

Dev Med Child Neurol. 2016 Nov 14. doi: 10.1111/dmcn.13306. [Epub ahead of print]

AIM: The objectives of this exploratory study were (1) to describe the experience of fatigue in adults with cerebral palsy (CP) inclusive of all levels of the Gross Motor Function Classification System (GMFCS); and (2) to determine if physical activity level, sedentary time, age, or body composition can predict fatigue in adults with CP. **METHOD:** An observational study was conducted in an outpatient setting in Ontario, Canada. Participants included adults with CP (n=41; GMFCS levels I-V; mean age 33.7y, standard deviation [SD] 12.3y). Fatigue was measured using the Fatigue Impact and Severity Self-Assessment (FISSA) questionnaire. Habitual physical activity and sedentary time were measured using accelerometry. Body mass index (BMI) and waist circumference were reported as measures of body composition. **RESULTS:** The mean (SD) FISSA score for all participants was 84.5 (30.6), ranging from 54.0 (18.3) (GMFCS level I) to 93.6 (21.9) (GMFCS level V). Significant positive relationships (regression coefficient β [95% confidence intervals]) were observed between BMI and FISSA scores (1.9 [0.73-3.1]), waist circumference and FISSA scores (0.71 [0.19-1.2]), and age and FISSA scores (0.99 [0.26-1.7]). A significant negative relationship was observed between moderate-to-vigorous physical activity (MVPA) per hour and FISSA scores (-6.4 [-12 to -0.83]). Backwards stepwise regression analysis revealed BMI (1.8 [0.61-2.9]) and MVPA per hour (-5.4 [-10 to -0.30]) were significant predictors of FISSA scores. **INTERPRETATION:** Health care providers should consider the importance of weight management and physical activity to prevent and treat fatigue in this population.

[PMID: 27861776](#)

17. Towards a better understanding of fatigue experienced by adults with cerebral palsy.

Morgan P.

Dev Med Child Neurol. 2016 Nov 15. doi: 10.1111/dmcn.13329. [Epub ahead of print]

[This commentary is on the original article by McPhee et al]

[PMID: 27861780](#)

18. Effect of a new treatment protocol called functional chewing training on chewing function in children with cerebral palsy: A double blind randomized controlled trial.

Serel Arslan S, Demir N, Karaduman AA.

J Oral Rehabil. 2016 Nov 17. doi: 10.1111/joor.12459. [Epub ahead of print]

OBJECTIVE(S): Cerebral palsy (CP) is a group of permanent sensorimotor impairments. Children with CP have various feeding difficulties including chewing disorder, which may affect their nutritional status. Functional Chewing Training (FuCT) was designed as a holistic approach to improve chewing function by providing postural alignment, sensory and motor training, and food and environmental adjustments. This study aimed to investigate the effect of FuCT on chewing function in children with CP. **METHODS:** This study was designed as a double-blind, randomized controlled trial. Eighty CP children with chewing disorder were randomized and split between the FuCT group (31 males, 19 females; mean age 3.5±1.9 years) and the control group (16 males, 14 females; 3.4±2.3 years) receiving traditional oral motor exercises. Each group received the training program for 12 weeks with weekly follow-up and with two evaluations at baseline and end of 12 weeks. Chewing function was evaluated by analyzing video recordings and scored with the Karaduman Chewing Performance Scale (KCPS). The Behavioral Pediatrics Feeding Assessment Scale (BPFAS) was used to evaluate feeding behaviors of children. **RESULTS:** A significant improvement was observed in KCPS scores at 12 weeks after training in the FuCT group (p<0.001), but no change was found in the control group (p=0.07). A significant improvement was detected in all parameters of BPFAS at 12 weeks after training in the FuCT group (p<0.001) and in four parameters of BPFAS in the control group (p=0.02, p=0.02). **CONCLUSIONS:** FuCT is an effective method to improve chewing function compared with traditional oral motor exercises. This article is protected by copyright. All rights reserved.

[PMID: 27859478](#)

19. Relationship-based approaches in early childhood intervention: Are these applicable to paediatric occupational therapy under the NDIS?

Barfoot J, Meredith P, Ziviani J, Whittingham K.

Aust Occup Ther J. 2016 Nov 17. doi: 10.1111/1440-1630.12343. [Epub ahead of print]

[No abstract available]

[PMID: 27859334](#)

20. The Case for Musical Instrument Training in Cerebral Palsy for Neurorehabilitation.

Alves-Pinto A, Turova V, Blumenstein T, Lampe R.

Neural Plast. 2016;2016:1072301. Epub 2016 Oct 27.

Recent imaging studies in cerebral palsy (CP) have described several brain structural changes, functional alterations, and neuroplastic processes that take place after brain injury during early development. These changes affect motor pathways as well as sensorimotor networks. Several of these changes correlate with behavioral measures of motor and sensory disability. It is now widely acknowledged that management of sensory deficits is relevant for rehabilitation in CP. Playing a musical instrument demands the coordination of hand movements with integrated auditory, visual, and tactile feedback, in a process that recruits multiple brain regions. These multiple demands during instrument playing, together with the entertaining character of music, have led to the development and investigation of music-supported therapies, especially for rehabilitation with motor disorders resulting from brain damage. We review scientific evidence that supports the use of musical instrument playing for rehabilitation in CP. We propose that active musical instrument playing may be an efficient means for triggering neuroplastic processes necessary for the development of sensorimotor skills in patients with early brain damage. We encourage experimental research on neuroplasticity and on its impact on the physical and personal development of individuals with CP.

[PMID: 27867664](#)

Prevention and Cure

21. Contralesional Corticomotor Neurophysiology in Hemiparetic Children With Perinatal Stroke: Developmental Plasticity and Clinical Function.

Zewdie E, Damji O, Ciechanski P, Seeger T, Kirton A.

Neurorehabil Neural Repair. 2016 Nov 23. pii: 1545968316680485. [Epub ahead of print]

Background Perinatal stroke causes most hemiparetic cerebral palsy. Ipsilateral connections from nonlesioned hemisphere to affected hand are common. The nonlesioned primary motor cortex (M1) determines function and is a potential therapeutic target but its neurophysiology is poorly understood. **Objective** We aimed to characterize the neurophysiological properties of the nonlesioned M1 in children with perinatal stroke and their relationship to clinical function. **Methods** Fifty-two participants with hemiparetic cerebral palsy and magnetic resonance imaging-confirmed perinatal stroke and 40 controls aged 8 to 18 years completed the same transcranial magnetic stimulation (TMS) protocol. Single-pulse TMS to nonlesioned M1 determined rest and active motor thresholds (RMT/AMT), motor-evoked potential (MEP) latencies, and stimulus recruitment curves (SRC: 100%-150% RMT). Paired-pulse TMS evaluated short-latency intracortical inhibition (SICI) and intracortical facilitation (ICF). Ipsilateral (IP) participants (ipsilateral MEP ≥ 0.05 mV in $\geq 5/20$ trials) were compared with contralateral MEP only, nonipsilateral (NI) participants. Assisting Hand and Melbourne assessments quantified clinical function. Results Twenty-five IP were compared with 13 NI (n = 38, median age 12 years, 66% male). IP had lower motor function. SRC to unaffected hand were comparable between IP and NI while IP had smaller ipsilateral SRC. Ipsilateral MEP latencies were prolonged (23.5 ± 1.8 vs 22.2 ± 1.5 ms contra, $P < .001$). Contralateral SICI was different between IP (-42%) and NI (-20%). Ipsilateral SICI was reduced (-20%). Contralateral ICF was comparable between groups (+43%) and ipsilaterally (+43%). Measures correlated between contralateral and ipsilateral sides. **Conclusion** Neurophysiology of nonlesioned M1 and its relationship to motor function is measurable in children with perinatal stroke. Correlation of excitability and intracortical circuitry measures between contralateral and ipsilateral sides suggests common control mechanisms.

[PMID: 27885162](#)

22. Assisted reproduction increases the chance of cerebral palsy.

[No authors listed]

Nurs Stand. 2011 Jan 4;25(17):14-15.

Subfecundity does not appear to be associated with the risk of cerebral palsy in infants, whereas being born after in vitro fertilisation (IVF) or intracytoplasmic sperm injection (ICSI) has an increased risk.

[PMID: 27880413](#)

23. Lung-protective ventilatory strategies in intubated preterm neonates with RDS.

Reiterer F, Schwabegger B, Freidl T, Schmölzer G, Pichler G, Urlesberger B.

Paediatr Respir Rev. 2016 Oct 26. pii: S1526-0542(16)30121-X. doi: 10.1016/j.prrv.2016.10.007. [Epub ahead of print]

This article provides a narrative review of lung-protective ventilatory strategies (LPVS) in intubated preterm infants with RDS. A description of strategies is followed by results on short-and long-term respiratory and neurodevelopmental outcomes. Strategies will include patient-triggered or synchronized ventilation, volume targeted ventilation, the technique of intubation, surfactant administration and rapid extubation to NCPAP (INSURE), the open lung concept, strategies of high-frequency ventilation, and permissive hypercapnia. Based on this review single recommendations on optimal LPVS cannot be made. Combinations of several strategies, individually applied, most probably minimize or avoid potential serious respiratory and cerebral complications like bronchopulmonary dysplasia and cerebral palsy.

[PMID: 27876355](#)

24. Cerebral palsy in preterm infants.

[No authors listed]

Nurs Stand. 1997 Feb 26;11(23):29.

Reducing cerebral palsy in very preterm infants requires integrated management during antenatal, intrapartum and neonatal periods, research suggests.

[PMID: 27874570](#)

25. Case 236: Middle Interhemispheric Variant of Holoprosencephaly.

Yahyavi-Firouz-Abadi N, Poretti A, Idowu OR, Hoon AH Jr, Huisman TA, Izbudak I.

Radiology. 2016 Dec;281(3):969-974.

History A 13-year-old girl presented for evaluation and further management of spastic diplegia cerebral palsy. Absence of the corpus callosum was noted at screening prenatal head ultrasonography. She was born at full term via spontaneous vaginal delivery. Physical examination revealed decreased axial muscle tone and increased muscle tone in her extremities; the latter was more severe. She was nonambulatory. No midline craniofacial anomaly was seen. She had dysarthria but was able to speak in full sentences. She was in sixth grade with an individualized education program. She had mild behavioral problems, such as "acting out" in school. Brain magnetic resonance (MR) imaging, including three-dimensional T1- and T2-weighted sequences, was performed without intravenous administration of contrast material to evaluate the brain.

[PMID: 27870630](#)

26. A comprehensive database of published tDCS clinical trials (2005-2016).

Lefaucheur JP.

Neurophysiol Clin. 2016 Dec;46(6):319-398. doi: 10.1016/j.neucli.2016.10.002. Epub 2016 Nov 17.

Transcranial direct current stimulation (tDCS) is a technique of noninvasive cortical stimulation allowing significant modification of brain functions. Clinical application of this technique was reported for the first time in March 2005. This paper presents a detailed list of the 340 articles (excluding single case reports) which have assessed the clinical effect of tDCS in patients, at least when delivered to cortical targets. The reviewed conditions were: pain syndromes, Parkinson's disease, dystonia, cerebral palsy, post-stroke limb motor impairment, post-stroke neglect, post-stroke dysphagia, post-stroke aphasia, primary progressive aphasia, multiple sclerosis, epilepsy, consciousness disorders, Alzheimer's disease and other types of dementia, tinnitus, depression, auditory hallucinations and negative symptoms of schizophrenia, addiction and craving, autism, and attention disorders. The following data were collected: (i) clinical condition; (ii) study design; (iii) sample size; (iv) anode and cathode locations; (v) stimulation intensity and electrode area; (vi) number and duration of sessions; (vii) clinical outcome measures and results. This article does not include any meta-analysis and aims simply at providing a comprehensive overview of the raw data reported in this field to date, as an aid to researchers.

[PMID: 27865707](#)

27. Early neurodevelopmental outcomes of extremely preterm infants.

Rogers EE, Hintz SR.

Semin Perinatol. 2016 Nov 16. pii: S0146-0005(16)30074-X. doi: 10.1053/j.semperi.2016.09.002. [Epub ahead of print]

Infants born at extreme preterm gestation are at risk for both death and disability. Although rates of survival have improved for this population, and some evidence suggests a trend toward decreased neuromotor impairment over the past decades, a significant improvement in overall early neurodevelopmental outcome has not yet been realized. This review will examine the rates and types of neurodevelopmental impairment seen after extremely preterm birth, including neurosensory, motor, cognitive, and behavioral outcomes. We focus on early outcomes in the first 18-36 months of life, as the majority of large neonatal studies examining neurodevelopmental outcomes stop at this age. However, this early age is clearly just a first glimpse into lifetime outcomes; the neurodevelopmental effects of extreme prematurity may last through school age, adolescence, and beyond. Importantly, prematurity appears to be an independent risk factor for adverse development, but this population demonstrates considerable variability in the types and severity of impairments. Understanding both the nature and prevalence of neurodevelopmental impairment among extremely preterm infants is important because it can lead to targeted interventions that in turn may lead to improved outcomes.

[PMID: 27865437](#)

28. Advanced neuroimaging and its role in predicting neurodevelopmental outcomes in very preterm infants.

Parikh NA.

Semin Perinatol. 2016 Nov 15. pii: S0146-0005(16)30077-5. doi: 10.1053/j.semperi.2016.09.005. [Epub ahead of print]

Up to 35% of very preterm infants survive with neurodevelopmental impairments (NDI) such as cognitive deficits, cerebral palsy, and attention deficit disorder. Advanced MRI quantitative tools such as brain morphometry, diffusion MRI, magnetic resonance spectroscopy, and functional MRI at term-equivalent age are ideally suited to improve current efforts to predict later development of disabilities. This would facilitate application of targeted early intervention therapies during the first few years of life when neuroplasticity is optimal. A systematic search and review identified 47 published studies of advanced MRI to predict NDI. Diffusion MRI and morphometry studies were the most commonly studied modalities. Despite several limitations, studies clearly showed that brain structural and metabolite biomarkers are promising independent predictors of NDI. Large representative multicenter studies are needed to validate these studies.

[PMID: 27863706](#)

29. Spectroscopic biomarkers of motor cortex developmental plasticity in hemiparetic children after perinatal stroke.

Carlson HL, MacMaster FP, Harris AD, Kirton A.

Hum Brain Mapp. 2016 Nov 17. doi: 10.1002/hbm.23472. [Epub ahead of print]

Perinatal stroke causes hemiparetic cerebral palsy and lifelong motor disability. Bilateral motor cortices are key hubs within the motor network and their neurophysiology determines clinical function. Establishing biomarkers of motor cortex function is imperative for developing and evaluating restorative interventional strategies. Proton magnetic resonance spectroscopy (MRS) quantifies metabolite concentrations indicative of underlying neuronal health and metabolism in vivo. We used functional magnetic resonance imaging (MRI)-guided MRS to investigate motor cortex metabolism in children with perinatal stroke. Children aged 6-18 years with MRI-confirmed perinatal stroke and hemiparetic cerebral palsy were recruited from a population-based cohort. Metabolite concentrations were assessed using a PRESS sequence (3T, TE = 30 ms, voxel = 4 cc). Voxel location was guided by functional MRI activations during finger tapping tasks. Spectra were analysed using LCModel. Metabolites were quantified, cerebral spinal fluid corrected and compared between groups (ANCOVA) controlling for age. Associations with clinical motor performance (Assisting Hand, Melbourne, Box-and-Blocks) were assessed. Fifty-two participants were studied (19 arterial, 14 venous, 19 control). Stroke participants demonstrated differences between lesioned and nonlesioned motor cortex N-acetyl-aspartate [NAA mean concentration = 10.8 ± 1.9 vs. 12.0 ± 1.2 , $P < 0.01$], creatine [Cre 8.0 ± 0.9 vs. 7.4 ± 0.9 , $P < 0.05$] and myo-Inositol [Ins 6.5 ± 0.84 vs. 5.8 ± 1.1 , $P < 0.01$]. Lesioned motor cortex NAA and creatine were strongly correlated with motor performance in children with arterial but not venous strokes. Interrogation of motor cortex by fMRI-guided MRS is feasible in children with perinatal stroke. Metabolite differences between hemispheres, stroke types and correlations with motor performance support functional relevance. MRS may be valuable in understanding the neurophysiology of developmental neuroplasticity in cerebral palsy. Hum Brain Mapp, 2016. © 2016 Wiley Periodicals, Inc.

[PMID: 27859933](#)