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Interventions and Management

1. J Pediatr Orthop. 2016 Jul 29. [Epub ahead of print]

Elbow Kinematics During Gait Improve With Age in Children With Hemiplegic Cerebral Palsy.

Gordon BL, Wolff A, Daluiski A.

BACKGROUND: Children with hemiplegic cerebral palsy (hCP) exhibit a typical posture of elbow flexion during gait. However, the change in elbow kinematics and symmetry during gait across age span in both hCP and typically developing (TD) children is not well described. The aim of this study was to quantify the change in elbow kinematics and symmetry across age span in hCP children compared with TD children. METHODS: Upper extremity kinematic data were extracted and analyzed from a database for gait studies performed between 2009 and 2015. A total of 35 hCP and 51 TD children between the ages of 4 and 18 (mean age: TD=11.2±0.6, hCP=9.8±0.5) met inclusionary criteria. The groups were further subdivided into 3 age categories: 4 to 7, 8 to 11, 12+ years old. Elbow angles were extracted and peak elbow flexion, overall range of motion during gait, and asymmetry indices were calculated. A 1-way analysis of variance was performed on each group with post hoc Tukey honestly significant difference pairwise comparisons. RESULTS: Peak elbow flexion during gait increased with age in TD children (P<0.05) and decreased with age in hCP children on the affected side (P<0.05). There was no change on the less affected side of hCP children. TD children demonstrated significantly less elbow flexion (mean=51.9±2.1 deg.) compared with the affected side in hCP (mean=82.1±3.8 deg.) across all age categories (P<0.05). There was no change in elbow asymmetry index (0=perfect symmetry) across age in either controls or hCP children; however, there were differences between hCP and TD groups in younger age groups (TD=28, hCP=62, P<0.05) that resolved by adolescence (TD=32, hCP=40). CONCLUSIONS: During gait, hCP children have greater peak elbow flexion on the affected side than do TD children. Peak elbow flexion angle converged between the 2 groups with age, decreasing in hCP children and increasing in TD children. Furthermore, elbow symmetry during gait improves with age in hCP children, approximating symmetry of TD children by adolescence. These findings have implications for both consideration and optimal timing of surgical intervention to improve elbow flexion in children with hCP.

PMID: 27479191

2. Dev Med Child Neurol. 2016 Aug 1. doi: 10.1111/dmcn.13213. [Epub ahead of print]

The effectiveness of taping on children with cerebral palsy: a systematic review.

Güçhan Z, Mutlu A.

AIM: Taping is popular in a variety of paediatric clinical settings. The purpose of this study was to investigate the effectiveness of taping on the rehabilitation of children with cerebral palsy (CP). METHOD: We used MEDLINE, Embase, PubMed, CINAHL, and the Cochrane Central Register of Controlled Trials as the electronic databases for the review. We

reviewed all relevant studies published up to May 2015. We also analysed pertinent secondary references. We used Sackett's Levels of Evidence and the guidelines for critical review of McMaster University to criticize the reviewed articles. RESULTS: Nine papers met the inclusion criteria. Five of these were randomized controlled trials, three were case series, and one was a single case study. Four papers were high quality according to the methodological critical forms of this review, and two of these found that taping was effective in increasing activity in children with CP. INTERPRETATION: Although benefits of taping were found in the population, and functional gains according to the International Classification of Functioning, Disability and Health were obtained, the evidence was not conclusive. Randomized controlled trials with larger sample sizes and with more specific taping procedures are required to strengthen the evidence for the effectiveness of taping on children with CP.

PMID: 27476831

3. Front Hum Neurosci. 2016 Jul 19;10:361. doi: 10.3389/fnhum.2016.00361. eCollection 2016.

Spared Primary Motor Cortex and The Presence of MEP in Cerebral Palsy Dictate the Responsiveness to tDCS during Gait Training.

Grecco LA, Oliveira CS, Galli M, Cosmo C, Duarte Nde A, Zanon N, Edwards DJ, Fregni F.

The current priority of investigations involving transcranial direct current stimulation (tDCS) and neurorehabilitation is to identify biomarkers associated with the positive results of the interventions such that respondent and non-respondent patients can be identified in the early phases of treatment. The aims were to determine whether: (1) present motor evoked potential (MEP); and (2) injuries involving the primary motor cortex, are associated with tDCS-enhancement in functional outcome following gait training in children with cerebral palsy (CP). We reviewed the data from our parallel, randomized, sham-controlled, double-blind studies. Fifty-six children with spastic CP received gait training (either treadmill training or virtual reality training) and tDCS (active or sham). Univariate and multivariate logistic regression analyses were employed to identify clinical, neurophysiologic and neuroanatomic predictors associated with the responsiveness to treatment with tDCS. MEP presence during the initial evaluation and the subcortical injury were associated with positive effects in the functional results. The logistic regression revealed that present MEP was a significant predictor for the six-minute walk test (6MWT; p = 0.003) and gait speed (p = 0.028), whereas the subcortical injury was a significant predictor of gait kinematics (p = 0.013) and gross motor function (p = 0.021). In this preliminary study involving children with CP, two important prediction factors of good responses to anodal tDCS combined with gait training were identified. Apparently, MEP (integrity of the corticospinal tract) and subcortical location of the brain injury exerted different influences on aspects related to gait, such as velocity and kinematics.

PMID: 27486393

4. Orthop Traumatol Surg Res. 2016 Jul 29. pii: S1877-0568(16)30072-X. doi: 10.1016/j.otsr.2016.04.015. [Epub ahead of print]

Management of spinal infections in children with cerebral palsy.

Sebaaly A, El Rachkidi R, Yaacoub JJ, Saliba E, Ghanem I.

Cerebral palsy patients who undergo posterior spinal instrumentation for scoliosis are at a greater risk of surgical site infection compared to adolescents with idiopathic scoliosis. Many infecting organisms are reported. Risk factors include patients' specific factors, nutritional status as well as surgery related factors. Although surgical management is still controversial, it is always based on irrigation and debridement followed or not by implant removal. The purpose of this paper is to review the pathophysiology of surgical site infection in this patient population and to propose a treatment algorithm, based on a thorough review of the current literature and personal experience.

PMID: 27480292

5. Gait Posture. 2016 Jun 27;49:290-296. doi: 10.1016/j.gaitpost.2016.06.034. [Epub ahead of print]

Femoral derotation osteotomy in adults with cerebral palsy.

Putz C, Wolf SI, Geisbüsch A, Niklasch M, Döderlein L, Dreher T.

BACKGROUND: Internal rotation gait constitutes a complex gait disorder in bilateral spastic cerebral palsy (BSCP) including static torsional and dynamic components resulting in lever arm dysfunction. Although femoral derotation osteotomy (FDO) is a standard procedure to correct increased femoral anteversion in children, unpredictable outcome has been reported. The effect of FDO when it is done as part of single-event multilevel surgery (SEMLS) in adulthood has not been investigated. METHODS: In this study mid-term data of 63 adults with BSCP and internal rotation gait, undergoing SEMLS including FDO were analyzed pre- and 1.7 years postoperatively by clinical examination and 3D-instrumented gait analysis. All legs were categorized as the more or less involved side to consider asymmetry. The mean hip rotation in stance preoperatively and the intraoperative derotation was correlated with the difference pre- and postoperatively. RESULTS: The group as a whole experienced the following results postoperatively: improved mean hip rotation in stance (p=0.0001), mean foot progression angle (p=0.0001) and a significant improvement of the clinical parameter: passive internal and external hip rotation, midpoint and anteversion (p=0.0001) for both legs separately. With regard to the less and more involved side, clinical and kinematic parameters showed comparable significant changes (p=0.0001). The anteversion improved significantly in proximal compared to distal FDO (p=0.03). CONCLUSION: This study emphasizes an overall good correction of internal rotation gait in adults with bilateral involvement after FDO. However, the results are more predictable in adults compared to studies reporting outcome after FDO in children.

PMID: 27475618

6. Gait Posture. 2016 Jul;48:30-5. doi: 10.1016/j.gaitpost.2016.04.028. Epub 2016 Apr 30.

Validation of hip joint center localization methods during gait analysis using 3D EOS imaging in typically developing and cerebral palsy children.

Assi A, Sauret C, Massaad A, Bakouny Z, Pillet H, Skalli W, Ghanem I.

Localization of the hip joint center (HJC) is essential in computation of gait data. EOS low dose biplanar X-rays have been shown to be a good reference in evaluating various methods of HJC localization in adults. The aim is to evaluate predictive and functional techniques for HJC localization in typically developing (TD) and cerebral palsy (CP) children, using EOS as an image based reference. Eleven TD and 17 CP children underwent 3D gait analysis. Six HJC localization methods were evaluated in each group bilaterally: 3 predictive (Plug in Gait, Bell and Harrington) and 3 functional methods based on the star arc technique (symmetrical center of rotation estimate, center transformation technique and geometrical sphere fitting). All children then underwent EOS low dose biplanar radiographs. Pelvis, lower limbs and their corresponding external markers were reconstructed in 3D. The center of the femoral head was considered as the reference (HJCEOS). Euclidean distances between HJCs estimated by each of the 6 methods and the HJCEOS were calculated; distances were shown to be lower in predictive compared to functional methods (p<0.0001). Contrarily to findings in adults, functional methods were shown to be less accurate than predictive methods in TD and CP children, which could be mainly due to the shorter thigh segment in children. Harrington method was shown to be the most accurate in the prediction of HJC (mean error≈18mm, SD=9mm) and quasi-equivalent to the Bell method. The bias for each method was quantified, allowing its correction for an improved HJC estimation.

PMID: 27477704

7. IEEE Trans Neural Syst Rehabil Eng. 2016 Jul 27. [Epub ahead of print]

A Robotic Exoskeleton for Treatment of Crouch Gait in Children with Cerebral Palsy: Design and Initial Application.

Lerner Z, Damiano D, Park HS, Gravunder A, Bulea T.

Crouch gait, a pathological pattern of walking characterized by excessive knee flexion, is one of the most common gait disorders observed in children with cerebral palsy (CP). Effective treatment of crouch during childhood is critical to maintain mobility into adulthood, yet current interventions do not adequately alleviate crouch in most individuals. Powered exoskeletons provide an untapped opportunity for intervention. The multiple contributors to crouch, including spasticity, contracture, muscle weakness, and poor motor control make design and control of such devices challenging in this population. To our knowledge,

no evidence exists regarding the feasibility or efficacy of utilizing motorized assistance to alleviate knee flexion in crouch gait. Here, we present the design of and first results from a powered exoskeleton for extension assistance as a treatment for crouch gait in children with CP. Our exoskeleton, based on the architecture of a knee-ankle-foot orthosis, is lightweight (3.2 kg) and modular. On board sensors enable knee extension assistance to be provided during distinct phases of the gait cycle. We tested our device on one 6 year old male participant with spastic diplegia from CP. Our results show that the powered exoskeleton improved knee extension during stance by 18.1° while total knee range of motion improved 21.0°. Importantly, we observed no significant decrease in knee extensor muscle activity, indicating the user did not rely solely on the exoskeleton to extend the limb. These results establish the initial feasibility of robotic exoskeletons for treatment of crouch and provide impetus for continued investigation of these devices with the aim of deployment for long term gait training in this population.

PMID: 27479974

8. Child Care Health Dev. 2016 Aug 1. doi: 10.1111/cch.12377. [Epub ahead of print]

Development and face validity of a cerebral visual impairment motor questionnaire for children with cerebral palsy.

Salavati M, Waninge A, Rameckers EA5, van der Steen J, Krijnen WP, van der Schans CP, Steenbergen B.

AIM: The objectives of this study were (i) to develop two cerebral visual impairment motor questionnaires (CVI-MQ's) for children with cerebral palsy (CP): one for children with Gross Motor Function Classification System (GMFCS) levels I, II and III and one for children with GMFCS levels IV and V; (ii) to describe their face validity and usability; and (iii) to determine their sensitivity and specificity. BACKGROUNDS: The initial versions of the two CVI-MQ's were developed based on literature. Subsequently, the Delphi method was used in two groups of experts, one familiar with CVI and one not familiar with CVI, in order to gain consensus about face validity and usability. The sensitivity and specificity of the CVI-MQ's were subsequently assessed in 82 children with CP with (n = 39) and without CVI (n = 43). With the receiver operating curve the cut-off scores were determined to detect possible presence or absence of CVI in children with CP. RESULTS: Both questionnaires showed very good face validity (percentage agreement above 96%) and good usability (percentage agreement 95%) for practical use. The CVI-MQ version for GMFCS levels I, II and III had a sensitivity of 1.00 and specificity of 0.96, with a cut-off score of 12 points or higher, and the version for GMFCS levels IV and V had a sensitivity of 0.97 and a specificity of 0.98, with a cut-off score of eight points or higher. CONCLUSION: The CVI-MQ is able to identify at-risk children with CP for the probability of having CVI.

PMID: 27481724

9. Pain Med. 2016 Jul 29. pii: pnw155. [Epub ahead of print]

Physiological and Behavioral Responses to Calibrated Noxious Stimuli Among Individuals with Cerebral Palsy and Intellectual Disability.

Benromano T, Pick CG, Merick J, Defrin R.

OBJECTIVE: As individuals with intellectual disability (ID) due to cerebral palsy (CP) are at high risk of experiencing pain, measuring their pain is crucial for adequate treatment. While verbal reports are the gold standard in pain measurements, they may not be sufficient in ID. The aim was to detect behavioral/autonomic responses that may indicate the presence and intensity of pain in individuals with CP and ID, using calibrated stimuli, here for the first time. SUBJECTS: Thirteen adults with CP and ID (CPID), 15 healthy controls (HC), and 5 adults with CP with no ID (CPNID). METHODS: Subjects received pressure stimuli of various intensities. Self-reports (using a pyramid scale), facial expressions (retrospectively analyzed with Facial Action Coding System = FACS), and autonomic function (heart rate, heart rate variability, pulse, galvanic skin response) were analyzed. RESULTS: Self-reports and facial expressions but not the autonomic function exhibited stimulus-response relationship to pressure stimulation among all groups. The CPID group had increased pain ratings and facial expressions compared with controls. In addition, the increase in facial expressions along the increase in noxious stimulation was larger than in controls. Freezing in response to pain was frequent in CPID. CONCLUSIONS: 1) Individuals with CP and ID have increased responses to pain; 2) facial expressions and self-reports, but not autonomic variables can reliably indicate their pain intensity; 3) the pyramid scale is suitable for self-report in this population. Although facial expressions may replace verbal reports, increased facial expressions at rest among these individuals may mask pain, especially at lower intensities.

PMID: 27473634

10. Child Care Health Dev. 2016 Sep;42(5):768. doi: 10.1111/cch.12381.

Child and youth experiences and perspectives of cerebral palsy: a qualitative systematic review: letter to the editor.

Boyd B, Madhivanan P, Stephens DP.

[No abstract available]

Prevention and Cure

11. JAMA Pediatr. 2016 Aug 1. doi: 10.1001/jamapediatrics.2016.1210. [Epub ahead of print]

Neurodevelopmental Outcomes Among Extremely Preterm Infants 6.5 Years After Active Perinatal Care in Sweden.

Serenius F, Ewald U, Farooqi A, Fellman V, Hafström M, Hellgren K, Maršál K, Ohlin A, Olhager E, Stjernqvist K, Strömberg B, Ådén U, Källén K; Extremely Preterm Infants in Sweden Study Group.

IMPORTANCE: Active perinatal care increases the rate of survival of extremely preterm infants, but there are concerns that improved survival might increase the rate of disabled survivors. OBJECTIVE: To determine the neurodevelopmental outcomes of a national cohort of children 6.5 years of age who had been born extremely preterm (<27 weeks' gestational age) in Sweden. DESIGN, SETTING, AND PARTICIPANTS: Population-based prospective cohort study of consecutively born extremely preterm infants. All of these infants were born in Sweden during the period from April 1, 2004, to March 31, 2007. Of 707 live-born extremely preterm infants, 486 (68.7%) survived to 6.5 years of age. These children were assessed and compared with matched controls who had been born at term. Comparison estimates were adjusted for demographic differences. Assessments ended in February 2014, and analysis started thereafter. MAIN OUTCOMES AND MEASURES: Cognitive ability was measured with the fourth edition of the Wechsler Intelligence Scale for Children (WISC-IV), and the mean (SD) scores of the children who had been born extremely preterm were compared with those of the controls. Clinical examinations and parental questionnaires were used for diagnosis of cerebral palsy, hearing and vision impairments, and cognition for the children who were not assessed with the WISC-IV. RESULTS: Of 486 eligible infants who were born extremely preterm, 441 (90.7%) were assessed at 6.5 years of age (59 by medical record review only) alongside 371 controls. The adjusted mean (SD) full-scale WISC-IV score was 14.2 (95% CI, 12.1-16.3) points lower for children who had been born extremely preterm than for controls. Cognitive disability was moderate for 18.8% of extremely preterm children and 2.2% of controls (P < .001), and it was severe for 11.1% of extremely preterm children and 0.3% of controls (P < .001). Cerebral palsy was observed in 9.5% of extremely preterm children and 0.0% of controls (P < .001), blindness was observed in 2.0% of extremely preterm children and 0.0% of controls (P < .001), and hearing impairment was observed in 2.1% of extremely preterm children and 0.5% of controls (P = .07). Overall, 36.1% (95% CI, 31.7%-40.6%) of extremely preterm children had no disability, 30.4% (95% CI 26.3%-34.8%) had mild disability, 20.2% (95% CI, 16.6%-24.2%) had moderate disability, and 13.4% (95% CI, 10.5%-16.9%) had severe disability. For extremely preterm children, moderate or severe overall disability decreased with gestational age at birth (adjusted odds ratio per week, 0.65 [95% CI, 0.54-0.79]; P < .001) and increased from 26.6% to 33.5% (P = .01) for children assessed both at 2.5 and 6.5 years. CONCLUSIONS AND RELEVANCE: Of the 441 extremely preterm infants who had received active perinatal care, 293 (66.4%) had no or mild disability at 6.5 years; of the 371 controls, 11 (3.0%) had moderate or severe disability. Disability rates at 6.5 years increased relative to the rates at 2.5 years. Results are relevant for health care professionals and planners, and for clinicians counseling families facing extremely preterm births.

12. J Matern Fetal Neonatal Med. 2016 Aug 3:1-13. [Epub ahead of print]

Antenatal corticosteroid treatment: Factors other than lung maturation.

Haram K, Mortensen JH, Magann EF, Morrison JC.

Antenatal corticosteroid therapy improves both fetal lung mechanism and gas exchange due to accelerated morphologic development of type one and two pneumocytes. This therapy also enhances the production of surfactant binding proteins and fetal lung antioxidant enzymes. In women with threatening preterm delivery, a single course is advocated between 24 and 34 weeks' gestation with either betamethasone (two doses of 12 mg 24 hours apart) or dexamethasone (4-doses of 6 mg at 12-h intervals). Such treatment reduces the rate of respiratory distress syndrome, comorbidity and mortality in neonates in the first 48 hours of life. The optimal time interval between corticosteroid administration and delivery is reported to be 1 to 7 days. Weekly repeat courses reduce the occurrences and severity of respiratory diseases but are associated with reduce fetal growth. Multiple courses should be avoided. However, a repeat course should be considered in women at risk of preterm birth 7 or more days after an initial course in women who remain at risk of preterm birth < 34 weeks' gestation. Corticosteroids may be harmful in growth restricted fetuses associated with an absent or reversed end-diastolic UA flow since they are at increased risk of acidosis and perinatal death. The purpose of this publication is to update and highlight antenatal corticosteroid therapy.

PMID: 27487405

13. J Nutr. 2016 Aug 3. pii: jn232272. [Epub ahead of print]

Intake of Caffeinated Soft Drinks before and during Pregnancy, but Not Total Caffeine Intake, Is Associated with Increased Cerebral Palsy Risk in the Norwegian Mother and Child Cohort Study.

Tollånes MC, Strandberg-Larsen K, Eichelberger KY, Moster D, Lie RT, Brantsæter AL, Meltzer HM, Stoltenberg C, Wilcox AJ.

BACKGROUND: Postnatal administration of caffeine may reduce the risk of cerebral palsy (CP) in vulnerable low-birth-weight neonates. The effect of antenatal caffeine exposure remains unknown. OBJECTIVE: We investigated the association of intake of caffeine by pregnant women and risk of CP in their children. METHODS: The study was based on The Norwegian Mother and Child Cohort Study, comprising >100,000 live-born children, of whom 222 were subsequently diagnosed with CP. Mothers reported their caffeine consumption in questionnaires completed around pregnancy week 17 (102,986 mother-child pairs), week 22 (87,987 mother-child pairs), and week 30 (94,372 mother-child pairs). At week 17, participants were asked about present and prepregnancy consumption. We used Cox regression models to estimate associations between exposure [daily servings (1 serving = 125 mL) of caffeinated coffee, tea, and soft drinks and total caffeine consumption] and CP in children, with nonconsumers as the reference group. Models included adjustment for maternal age and education, medically assisted reproduction, and smoking, and for each source of caffeine, adjustments were made for the other sources. RESULTS: Total daily caffeine intake before and during pregnancy was not associated with CP risk. High consumption (≥6 servings/d) of caffeinated soft drinks before pregnancy was associated with an increased CP risk (HR: 1.9; 95% CI: 1.2, 3.1), and children of women consuming 3-5 daily servings of caffeinated soft drinks during pregnancy weeks 13-30 also had an increased CP risk (HR: 1.7; 95% CI: 1.1, 2.8). A mean daily consumption of 51-100 mg caffeine from soft drinks during the first half of pregnancy was associated with a 1.9-fold increased risk of CP in children (HR: 1.9; 95% CI: 1.1, 3.6). CONCLUSIONS: Maternal total daily caffeine consumption before and during pregnancy was not associated with CP risk in children. The observed increased risk with caffeinated soft drinks warrants further investigation.

PMID: 27489007

14. Neonatology. 2016 Aug 3;110(4):296-302. [Epub ahead of print]

Early Cord Metabolite Index and Outcome in Perinatal Asphyxia and Hypoxic-Ischaemic Encephalopathy.

Ahearne CE, Denihan NM, Walsh BH, Reinke SN, Kenny LC, Boylan GB, Broadhurst DI, Murray DM.

BACKGROUND: A 1H-NMR-derived metabolomic index based on early umbilical cord blood alterations of succinate, glycerol, 3-hydroxybutyrate and O-phosphocholine has shown potential for the prediction of hypoxic-ischaemic encephalopathy (HIE) severity. OBJECTIVE: To evaluate whether this metabolite score can predict 3-year neurodevelopmental outcome in infants with perinatal asphyxia and HIE, compared with current standard biochemical and

clinical markers. METHODS: From September 2009 to June 2011, infants at risk of perinatal asphyxia were recruited from a single maternity hospital. Cord blood was drawn and biobanked at delivery. Neonates were monitored for development of encephalopathy both clinically and electrographically. Neurodevelopmental outcome was assessed at 36-42 months using the Bayley Scales of Infant and Toddler Development, ed. III (BSID-III). Death and cerebral palsy were also considered as abnormal end points. RESULTS: Thirty-one infants had both metabolomic analysis and neurodevelopmental outcome at 36-42 months. No child had a severely abnormal BSID-III result. The metabolite index significantly correlated with outcome ($x03C1;2 = 0.30$, $p < 0.01$), which is robust to predict both severe outcome (area under the receiver operating characteristic curve: 0.92, $p < 0.01$) and intact survival (0.80, $p = 0.01$). There was no correlation between the index score and performance in the individual BSID-III subscales (cognitive, language, motor). CONCLUSIONS: The metabolite index outperformed other standard biochemical markers at birth for prediction of outcome at 3 years, but was not superior to EEG or the Sarnat score.

PMID: 27486995

15. PLoS One. 2016 Aug 3;11(8):e0159540. doi: 10.1371/journal.pone.0159540. eCollection 2016.

Surface-Based fMRI-Driven Diffusion Tractography in the Presence of Significant Brain Pathology: A Study Linking Structure and Function in Cerebral Palsy.

Reid LB, Cunnington R, Boyd RN, Rose SE.

Diffusion MRI (dMRI) tractography analyses are difficult to perform in the presence of brain pathology. Automated methods that rely on cortical parcellation for structural connectivity studies often fail, while manually defining regions is extremely time consuming and can introduce human error. Both methods also make assumptions about structure-function relationships that may not hold after cortical reorganisation. Seeding tractography with functional-MRI (fMRI) activation is an emerging method that reduces these confounds, but inherent smoothing of fMRI signal may result in the inclusion of irrelevant pathways. This paper describes a novel fMRI-seeded dMRI-analysis pipeline based on surface-meshes that reduces these issues and utilises machine-learning to generate task specific white matter pathways, minimising the requirement for manually-drawn ROIs. We directly compared this new strategy to a standard voxelwise fMRI-dMRI approach, by investigating correlations between clinical scores and dMRI metrics of thalamocortical and corticomotor tracts in 31 children with unilateral cerebral palsy. The surface-based approach successfully processed more participants (87%) than the voxel-based approach (65%), and provided significantly more-coherent tractography. Significant correlations between dMRI metrics and five clinical scores of function were found for the more superior regions of these tracts. These significant correlations were stronger and more frequently found with the surface-based method (15/20 investigated were significant; $R^2 = 0.43-0.73$) than the voxelwise analysis (2 sig. correlations; 0.38 & 0.49). More restricted fMRI signal, better-constrained tractography, and the novel track-classification method all appeared to contribute toward these differences.

PMID: 27487011