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## Interventions and Management

### **1. Children with Hemiparesis Arm and Movement Project (CHAMP): protocol for a multisite comparative efficacy trial of paediatric constraint-induced movement therapy (CIMT) testing effects of dosage and type of constraint for children with hemiparetic cerebral palsy.**

Ramey SL, DeLuca S, Stevenson RD, Case-Smith J, Darragh A, Conaway M.

BMJ Open. 2019 Jan 15;9(1):e023285. doi: 10.1136/bmjopen-2018-023285.

**INTRODUCTION:** The Children with Hemiparesis Arm and Movement Project (CHAMP) addresses two pressing issues concerning paediatric constraint-induced movement therapy (CIMT): effects of two dosages and two types of constraint on functional outcomes. Systematic reviews conclude that CIMT is one of the most efficacious treatments, but wide variations in treatment protocols, outcome measures and patient characteristics have prevented conclusions about potential effects of dosage levels and constraint methods. **METHODS AND ANALYSIS:** CHAMP is a multisite comparative efficacy randomised controlled trial of 135 children (2-8 years) with hemiparetic cerebral palsy. The 2×2 factorial design tests two dosage levels-60 hours (3.0 hours/day, 5 days/week × 4 weeks) and 30 hours (2.5 hours/day, 3 days/week × 4 weeks) and two constraint conditions-full-arm, full-time cast and part-time splint, plus usual and customary (UCT) controls, yielding five groups: (1) 60 hours CIMT+full-time cast, (2) 60 hours CIMT+part-time splint, (3) 30 hours CIMT+full-time cast, (4) 30 hours CIMT+part-time splint and (5) UCT. Trained therapists deliver the standardised ACQUIREc protocol for CIMT. Blinded assessments at baseline, end of treatment, and 6 and 12 months post treatment include the Assisting Hand Assessment, and subscales from the Peabody Developmental Motor Scales-2 and modified Quality of Upper Extremity Skills Test. Parents complete the Pediatric Motor Activity Log and Pediatric Evaluation of Disability Inventory. A new Fidelity of Implementation Rehabilitation Measure monitors treatment delivery. Data analyses involve repeated-measures multivariate analysis of co-variance controlling for selected baseline variables. **ETHICS AND DISSEMINATION:** Ethics boards at site universities approved the study protocol. To promote equipoise, parents of UCT controls are offered ACQUIREc after 6 months. A Data Safety and Monitoring Committee reviews results regularly, including measures of child and family stress. We will disseminate CHAMP results via peer-reviewed publications and presentations to professional and advocacy organisations. **TRIAL REGISTRATION NUMBER:** NCT01895660; Pre-results.

PMID: [30782701](https://pubmed.ncbi.nlm.nih.gov/30782701/)

### **2. Validity and reliability of the Persian ABILHAND-Kids in a sample of Iranian children with cerebral palsy.**

Mohammadkhani-Pordanjani E, Arnould C, Raji P, Nakhostin Ansari N, Hasson S.

Disabil Rehabil. 2019 Feb 19;1-9. doi: 10.1080/09638288.2018.1530307. [Epub ahead of print]

**AIM:** To develop a Persian version of ABILHAND-Kids and to determine its reliability and validity in Persian-speaking children with cerebral palsy (CP). **METHOD:** The ABILHAND-Kids questionnaire was translated into Persian language and

cross-culturally adapted following guidelines. The Persian ABILHAND-Kids was administered to 50 parents of CP children. Among the 50 parents of CP children, 30 of them participated in a test-retest reliability phase. Fifty parents of healthy children participated for discriminative validity. RESULTS: The Rasch analysis indicated the unidimensionality, reliability, and global invariance of the Persian ABILHAND-Kids. The internal consistency reliability was high (Cronbach's alpha = 0.96). Floor and ceiling effects were insignificant (4%). The Intraclass Correlation Coefficients of test-retest reliability were 0.96 and 0.70 for item difficulties and children's measures, respectively. The standard error of measurement and smallest detectable change for CP measure were 11.21 and 31.07%, respectively. The discriminative validity of the Persian ABILHAND-Kids was demonstrated by statistically significant lower ABILHAND-Kids measures in CP children than in healthy children ( $p < 0.001$ ). Cross-cultural validity between the Persian and original version was established for 19 out of the 21 ABILHAND-Kids items. INTERPRETATION: The Persian ABILHAND-Kids questionnaire is reliable and valid for assessing manual ability in Persian speaking children with CP. Implications for rehabilitation The Persian version of ABILHAND-Kids is developed and presented as a valid and reliable instrument for use by Persian-speaking clinicians and researchers. It is now possible for the Persian-speaking researchers to participate in international investigations and to compare Persian data with those from other countries.

PMID: [30777463](#)

### 3. Upper limb impairments, process skills, and outcome in children with unilateral cerebral palsy.

Russo RN, Skuza PP, Sandelance M, Flett P.

Dev Med Child Neurol. 2019 Feb 18. doi: 10.1111/dmcn.14185. [Epub ahead of print]

AIM: To examine the relationships between upper limb impairments and independence in self-care (ISC) in children with unilateral cerebral palsy (CP). METHOD: One hundred and eight children with unilateral CP (46 females, 62 males; mean age 8y 7mo, SD 3y 9mo) recruited from a population register were assessed for upper limb muscle power, spasticity, sensation, motor control, and process skills, and for ISC as the functional outcome using structural equation modelling. RESULTS: The model showed good fit indices and explained 90% of the variance in ISC. Direct effects were significant between manual ability and ISC ( $\beta=0.47$ ), and process skills and ISC ( $\beta=0.63$ ). Sensation had a significant positive indirect effect on ISC through manual ability ( $\beta=0.24$ ) and a positive but marginally non-significant indirect effect through process skills ( $\beta=0.21$ , bootstrapped 95% confidence interval -0.05 to 0.55). Spasticity had a significant negative indirect effect on ISC through its effect on manual ability ( $\beta=-0.21$ ). Age had a significant positive indirect effect on ISC, as did intellect, through their effect on process skills ( $\beta=0.34$  and  $0.21$  respectively). INTERPRETATION: ISC is affected by upper limb impairments and process skill. Sensation influences ISC through its effects on manual and process skill abilities. Both sensation and process skills require further evaluation to assist ISC in children with unilateral CP. WHAT THIS PAPER ADDS: Process skills and manual ability most strongly positively influence independence in self-care (ISC) in children with unilateral cerebral palsy. Sensation influences ISC through manual ability and process skill.

PMID: [30775778](#)

### 4. Association Between the Elasticity of Hip Muscles and the Hip Migration Index in Cerebral Palsy.

Doruk Analan P, Aslan H.

J Ultrasound Med. 2019 Feb 18. doi: 10.1002/jum.14969. [Epub ahead of print]

OBJECTIVES: Cerebral palsy (CP) increases the risk of hip displacement during childhood. Abnormal hip muscle forces have been proposed as the predisposing factors. In CP, the amount of hip displacement is commonly evaluated by the Reimers hip migration index (MI) on an anteroposterior pelvic radiograph. To the best of our knowledge, the association between the elasticity of hip muscles measured by shear wave elastography and the MI has not been studied yet. Herein, we aimed to analyze the correlation between the elasticity of hip muscles and the MI. METHODS: Bilateral hips of 25 children with spastic CP were included prospectively in this study. Anteroposterior pelvic radiographs were used to measure the MI. Shear wave elastography was performed to evaluate the elasticity of muscles. The correlation between the MI and the elasticity of hip flexor and adductor muscle groups was assessed. Also, the association between the elasticity of agonist/antagonist muscles was analyzed. RESULTS: The MI showed fair to good correlations with hip flexors and adductors for both readers ( $0.71 \geq r \geq 0.52$ ). The mean MIs of the patients  $\pm$  SDs were  $22.64\% \pm 7.79\%$  for reader 1 and  $21.55\% \pm 8.83\%$  for reader 2. The elasticity of agonist/antagonist muscle groups showed little/no to a weak correlation for both readers ( $0.32 \geq r \geq -0.07$ ). CONCLUSIONS: Although, hip flexor and adductor muscle elasticity showed a correlation with MI, it seems very hard to say that increased elasticity of hip flexor and adductor muscles causes hip dislocation.

PMID: [30779197](#)

**5. The effect of femoral orientation on the measurement of the head shaft angle: an ex-vivo study.**

Wordie SJ, Gaston MS, Hägglund G, Czuba T, Robb JE.

J Pediatr Orthop B. 2019 Feb 15. doi: 10.1097/BPB.0000000000000608. [Epub ahead of print]

This laboratory study evaluates head shaft angle (HSA) reliability using ranges of simulated femoral orientation often seen in children with cerebral palsy. A dry femur was mounted in a jig that enabled the bone to be positioned in a range of internal and external rotation (-40° to +40°) and flexion (0°-60°), alone or in combination. A metal wire was placed as a surrogate physis to give two HSA angles of 140° and 160°. Radiographs were taken of the femur in differing combinations of rotation, flexion and the two HSA angles. The HSA was measured by four independent observers on two separate occasions. Intraclass correlation coefficients (ICCs) were used to assess interobserver and intraobserver reliability. The HSA was accurately measured within  $\pm 5^\circ$  when the femur was positioned between 20° internal rotation and 40° external rotation. Flexion up to 60° did not affect the accuracy of the measurement. The interobserver reliability for the HSA was excellent with an ICC of 0.9970 [95% confidence interval (CI): 0.9995-0.9983] for the first measurement and 0.9988 for the second (95% CI: 0.9979-0.9993, all  $P < 0.01$ ). The intraobserver reliability was also excellent with an ICC of not less than 0.990 for all four observers (95% CI: 0.9806-0.9986, all  $P < 0.01$ ). There was excellent interobserver and intraobserver reliability when measuring the HSA in an experimental model provided femoral rotation lay within 20° internal and 40° external rotation and less than 60° of flexion.

PMID: [30789536](#)**6. Characterization of torque generating properties of ankle plantar flexor muscles in ambulant adults with cerebral palsy.**

Frisk RF1,2,3, Lorentzen J4,5, Barber L6,7, Nielsen JB4,5.

Eur J Appl Physiol. 2019 Feb 18. doi: 10.1007/s00421-019-04102-z. [Epub ahead of print]

**PURPOSE:** Weakness of plantar flexor muscles is related to reduced push-off and forward propulsion during gait in persons with cerebral palsy (CP). It has not been clarified to what an extent altered muscle contractile properties contribute to this muscle weakness. Here, we investigated the torque generating capacity and muscle fascicle length in the triceps surae muscle throughout ankle range of motion (ROM) in adults with CP using maximal single muscle twitches elicited by electrical nerve stimulation and ultrasonography. **METHODS:** Fourteen adults with CP (age 36, SD 10.6, GMFCS I-III) and 17 neurological intact (NI) adults (age 36, SD 4.5) participated. Plantar flexor torque during supramaximal stimulation of the tibial nerve was recorded in a dynamometer at 8 ankle angles throughout ROM. Medial gastrocnemius (MG) fascicle length was tracked using ultrasonography. **RESULTS:** Adults with CP showed reduced plantar flexor torque and fascicle shortening during supramaximal stimulation throughout ROM. The largest torque generation was observed at the ankle joint position where the largest shortening of MG fascicles was observed in both groups. This was at a more plantarflexed position in the CP group. **CONCLUSION:** Reduced torque and fascicle shortening during supramaximal stimulation of the tibial nerve indicate impaired contractile properties of plantar flexor muscles in adults with CP. Maximal torque was observed at a more plantarflexed position in adults with CP indicating an altered torque-fascicle length/ankle angle relation. The findings suggest that gait rehabilitation in adults with CP may require special focus on improvement of muscle contractility.

PMID: [30778762](#)**7. [Long-term results of chronic intrathecal baclofen treatment in patients with spasticity and secondary dystonia].**

Dekopov AV, Pashin DL, Tomski AA, Isaguljan ED, Salova EM, Kamchatnov PR.

Zh Nevrol Psikhiatr Im S S Korsakova. 2019;119(1):38-43. doi: 10.17116/jnevro201911901138. [Article in Russian; Abstract available in Russian from the publisher]

**AIM:** To estimate the efficacy of intrathecal treatment with baclofen (ITB) in spasticity and dystonia. **MATERIAL AND METHODS:** Two groups of patients have been operated: 19 patients with spinal spasticity and 33 patients with cerebral spasticity (cerebral palsy). After baclofen screening test, the Synchroned2 (Medtronic) was implanted. The level of muscle tone was assessed by the Ashworth scale. The locomotion was assessed by GMFM 88 and Arens scale. The dystonia was assessed by the BFM scale. Follow-up was performed 3, 6 and 12 months after the operation and yearly after that. The duration of the follow-up ranged from 2 to 9 years. **RESULTS:** ITB led to a significant decrease in leg spasticity in both groups of patients ( $p < 0.001$ ). The dynamics of spasticity was more significant in the first group compared to the second group (2.77 and 2.07 points, respectively ( $p < 0.0031$ )). The dynamics of muscle tone in arms was lesser than in legs ( $p < 0.0022$ ). The positive

clinical dynamics in patients with secondary dystonia was minimal (BFM from 65±17 to 60±19). Increasing of ITB daily dose was required to maintenance the clinical effect in most patients. The loss of ITB effect was noted in 5% of patients. CONCLUSION: ITB was more effective in patients with spinal spasticity. The influence of ITB on the secondary dystonia was lesser then on the spasticity. The dynamic of the muscle tone was more significant in legs than in arms. The loss of ITB effect can be observed in some cases after the operation despite the positive result of baclofen screening-test.

PMID: [30778029](#)

### 8. Morphofunctional characteristics of skeletal muscle in rats with cerebral palsy.

Buratti P1, Covatti C1, Centenaro LA2, Brancalhão RMC1, Torrejais MM1.

Int J Exp Pathol. 2019 Feb 17. doi: 10.1111/iep.12304. [Epub ahead of print]

Knowledge of skeletal muscle adaptations is important to understand the functional deficits in cerebral palsy (CP). This study aimed to investigate the morphofunctional characteristics of skeletal muscle in a CP animal model. Initially, pregnant Wistar rats were injected intraperitoneally with saline or lipopolysaccharide over the last five days of pregnancy. The control group (n = 8) consisted of male pups born to females injected with saline. The CP group (n = 8) consisted of male pups born to females injected with lipopolysaccharide, which were submitted to perinatal anoxia [day of birth, postnatal day 0 (P0)] and sensorimotor restriction (P1-P30). The open-field test was undertaken on P29 and P45. On P48, the animals were weighed, and the plantaris muscle was collected and its weight and length were measured. Transverse sections were stained with haematoxylin-eosin, NADH-TR, Masson's trichrome and non-specific esterase reaction for analysis. and transmission electron microscopy was performed. In the CP group, reductions were observed in mobility time, number of crossings and rearing frequency, body weight, muscle weight and length, and nucleus-to-fibre and capillary-to-fibre ratios. There was a statistically significant increase in the percentage area of the muscle section occupied by collagen; reduction in the area and increase in the number of type I muscle fibres; increase in myofibrillar disorganization and Z-line disorganization and dissolution; and reduction in the area and largest and smallest diameters of neuromuscular junctions. Thus this animal model of CP produced morphofunctional alterations in skeletal muscle, that were associated with evidence of motor deficits as demonstrated by the open-field test.

PMID: [30773727](#)

### 9. Inter-rater reliability of activity questionnaires after an intensive motor-skill learning intervention for children with cerebral palsy (CP).

Paradis J, Dispa D, De Montpellier A, Ebner D, Araneda R, Saussez G, Renders A, Arnould C, Bleyenheuft Y.

Arch Phys Med Rehabil. 2019 Feb 18. pii: S0003-9993(19)30088-7. doi: 10.1016/j.apmr.2018.12.039. [Epub ahead of print]

OBJECTIVE: To investigate the reliability of parents-reported activity questionnaires after a motor-skill learning intervention for children with cerebral palsy (CP). We hypothesize that the intervention process might influence parental judgment. DESIGN: Double-blind randomized trial. SETTING: Conventional therapy was delivered in the usual context while intensive intervention was provided at the Université Catholique de Louvain. PARTICIPANTS: 41 children with CP (age 5-18, GMFCS I-IV) were randomized to a control group (CG, n=21, 2 drop-outs) receiving conventional therapy or an intervention group (IG, n=20) receiving HABIT-ILE. INTERVENTIONS: Conventional therapy (mostly neurodevelopmental) was delivered as ongoing treatment (1-5 times/week). HABIT-ILE, based on motor-skill learning, was delivered over 2-weeks. All children were assessed at T1 (baseline), T2 (3 weeks after baseline) and T3 (4 months after baseline). MAIN OUTCOMES MEASURE (S): ABILHAND-Kids and ACTIVLIM-CP questionnaires rated by parents (perception) and two examiners (videotapes). RESULTS: Agreement (level/range) between examiners was systematically almost perfect ( $p \leq 0.001$ ). At baseline, moderate to almost perfect agreement (level/range) were observed between parents and examiners ( $p \leq 0.001$ ). At T2 and T3, a similar agreement (level/range) was observed for the CG. For the IG, a similar level of agreement was observed but the range of agreement varied from poor to almost perfect ( $p \leq 0.001$ ), with parents estimating higher performance measures compared to examiners after intervention. Higher performance was associated with higher satisfaction scores of the child's functional goals at T3. CONCLUSION: Parents and examiners have a similar perception of the child's performance at baseline and during conventional therapy. Their perceptions are less congruent after a motor-skill learning intervention, probably due to the goal-oriented process of the intervention. Therefore, our results favor the use of blind observations of home-videotaped items after intensive motor-skill learning interventions.

PMID: [30790557](#)

### 10. Analysis of motor performance in individuals with cerebral palsy using a non-immersive virtual reality task - a pilot study.

Martins FPA, Massetti T, Crocetta TB, Lopes PB, da Silva AA, Figueiredo EF, de Abreu LC, da Silva TD, Monteiro CBM.

Neuropsychiatr Dis Treat. 2019 Feb 4;15:417-428. doi: 10.2147/NDT.S184510. eCollection 2019.

**PURPOSE:** To evaluate the performance improvement of individuals with hemiparesis cerebral palsy (CP) using a virtual task. **PARTICIPANTS AND METHODS:** Twenty individuals were selected and distributed into two groups. The experimental group (CP group) comprised ten individuals with a medical diagnosis of CP, and ten individuals with typical development (sex- and age-matched) composed the control group (TD group). Both groups followed the same intervention protocol, which included a virtual coincident timing task: the participants performed upper limb movements in front of a computer's webcam and interacted with the task with the aim of virtually intercepting spheres that fell in four rows following the rhythm of a pre-selected song during an 8-minute period. To verify the influence on a real task, pre- and posttests were performed in a similar task, but with physical contact (using the spacebar on the keyboard of a computer). To analyze the data, we evaluated the variable, constant, and absolute errors during the task and in the pre- and posttests. **RESULTS:** The results showed that there was an improvement in performance between the pre- and posttests; that is, after practicing the task in an environment without physical contact, there was a performance improvement in posttests in the real task, but only for the CP group. Moreover, there were significant differences in precision and accuracy between the two groups, with worse performance in the CP group. **CONCLUSION:** Individuals with CP presented better performance in the real task after practice in a virtual reality task, albeit with worse performance compared with individuals with TD. This is an interesting result that supports the possible use of virtual tasks for the rehabilitation of individuals with CP.

PMID: [30787616](#)

### 11. Volitional control of single-electrode high gamma local field potentials (LFPs) by people with paralysis.

Milekovic T, Bacher D, Sarma AA, Simeral JD, Saab J, Pandarinath C, Yvert B2, Sorice BL, Blabe C, Oakley EM, Tringale KR, Eskandar E, Cash SS, Shenoy KV, Henderson JM, Hochberg LR, Donoghue JP.

J Neurophysiol. 2019 Feb 20. doi: 10.1152/jn.00131.2018. [Epub ahead of print]

Intracortical brain-computer interfaces (BCIs) can enable individuals to control effectors, such as a computer cursor, by directly decoding the user's movement intentions from action potentials and local field potentials (LFPs) recorded within the motor cortex. However, the accuracy and complexity of effector control achieved with such "biomimetic" BCIs will depend on the degree to which the intended movements used to elicit control modulate the neural activity. In particular, channels that do not record distinguishable action potentials and only record LFP modulations may be of limited use for BCI control. In contrast, a biofeedback approach may surpass these limitations by letting the participants generate new control signals and learn strategies that improve the volitional control of signals used for effector control. Here, we show that, by using a biofeedback paradigm, three individuals with tetraplegia achieved volitional control of gamma LFPs (40-400Hz) recorded by a single microelectrode implanted in the precentral gyrus. Control was improved over a pair of consecutive sessions up to three days apart. In all but one session, the channel used to achieve control lacked distinguishable action potentials. Our results indicate that biofeedback LFP-based BCIs may potentially contribute to the neural modulation necessary to obtain reliable and useful control of effectors.

PMID: [30785814](#)

### 12. Demographics and Risk Factors for Non-Accidental Orthopedic Trauma.

Sivasundaram L, Trivedi NN, Gatta J, Ning AY, Kim CY, Mistovich RJ.

Clin Pediatr (Phila). 2019 Feb 16;99:22819829045. doi: 10.1177/0009922819829045. [Epub ahead of print]

Childhood non-accidental trauma (NAT) is the second most common cause of death in children. Despite its prevalence, NAT is frequently unreported due to provider misdiagnosis or unawareness. The purpose of this study was to determine current risk factors and injury patterns associated with NAT. A retrospective review of the Kids' Inpatient Database was performed for the years 2009 and 2012. Univariate and multivariate analyses were used to determine the statistically significant risk factors for NAT. In 2009 and 2012, 174 442 children were hospitalized for fractures. Of these, 2.07% (3614) were due to NAT. Lower extremity (femur, tibia/fibula, foot), hand/carpus, clavicle, pelvis, and spine fractures were more likely to result from NAT; tibia/fibula fractures were most predictive of NAT. Children with anxiety, attention-deficit, conduct, developmental, and mood

disorders were more likely to experience NAT. Those with cerebral palsy and autism were not at an increased risk for NAT.

PMID: [30773927](#)

### **13. Effect of electrical stimulation on aspiration in children with cerebral palsy and dysphagia.**

Ma SR, Choi JB.

J Phys Ther Sci. 2019 Jan;31(1):93-94. doi: 10.1589/jpts.31.93. Epub 2019 Jan 29.

[Purpose] This study aims to investigate the effect of electrical stimulation on aspiration in children with cerebral palsy and dysphagia. [Participants and Methods] Five children with cerebral palsy and dysphagia were recruited. Electrical stimulation was applied to the submental region targeting submental muscles. All participants received electrical stimulation 30 min/day, 5 days/week, for 4 weeks. Evaluation was performed using the penetration-aspiration scale (PAS), based on a videofluoroscopic swallowing study. [Results] PAS scores showed a statistically significant decrease from  $3.8 \pm 1.5$  to  $2.1 \pm 1.2$  and from  $6.4 \pm 2.1$  to  $4.3 \pm 2.5$  for semisolids type and liquids respectively. [Conclusion] The use of electrical stimulation is effective in reducing aspiration in children with cerebral palsy and dysphagia.

PMID: [30774213](#)

### **14. Ultrasound-Guided Botulinum Toxin Injections into the Salivary Glands for the Treatment of Drooling.**

Abboud WA, Nadel S, Hassin-Baer S, Arad A, Dobriyan A, Yahalom R.

Isr Med Assoc J. 2019 Feb;21(2):116-119.

**BACKGROUND:** Drooling is the unintentional loss of saliva from the mouth, usually caused by poor coordination of the swallowing mechanism. It is commonly seen in patients with chronic neurologic disorders, such as Parkinson's disease, amyotrophic lateral sclerosis (ALS), cerebral palsy, and stroke, as well as in patients with cognitive impairment and dementia. **OBJECTIVES:** To evaluate the efficacy and safety of ultrasound-guided botulinum toxin injections into the parotid and submandibular salivary glands for the treatment of drooling. **METHODS:** We conducted a retrospective analysis of the medical records of 12 consecutive patients treated with botulinum toxin injections into the parotid and submandibular glands for the first time. The primary outcome variable was the subjective improvement of drooling on a 5-point scale. Secondary outcome variables were duration of the therapeutic effect, request to undergo additional treatment, and adverse events. **RESULTS:** Of 12 patients, 8 (67%) reported considerable improvement after treatment, 3 reported slight improvement, and 1 reported development of dry mouth. All patients stated that they felt the effects 1 week after the injections; the mean duration of the therapeutic effect was 4.5 months (range 3-9 months). One patient suffered from local hematoma and ecchymosis that did not require medical care. Another patient complained of difficulty swallowing, which did not require medical treatment and resolved spontaneously within 1 month. **CONCLUSIONS:** Ultrasound-guided botulinum toxin injections into the parotid and submandibular glands seem to be a safe and effective therapy for the treatment of drooling. Further long-term prospective studies with varying doses are warranted.

PMID: [30772963](#)

### **15. Food intake, nutritional status and gastrointestinal symptoms in children with cerebral palsy.**

Caramico-Favero DCO, Guedes ZCF, Morais MB.

Arq Gastroenterol. 2018 Oct-Dec;55(4):352-357. doi: 10.1590/S0004-2803.201800000-78.

**BACKGROUND:** Cerebral palsy may be associated with comorbidities such as undernutrition, impaired growth and gastrointestinal symptoms. Children with cerebral palsy exhibit eating problems due to the effect on the anatomical and functional structures involved in the eating function resulting in malnutrition. **OBJECTIVE:** The aim of this study was to investigate the association between food intake, nutritional status and gastrointestinal symptoms in children with cerebral palsy. **METHODS:** Cross-sectional study that included 40 children with cerebral palsy (35 with spastic tetraparetic form and 5 with non-spastic choreoathetoid form of cerebral palsy, all requiring wheelchairs or bedridden) aged from 4 to 10 years. The dietary assessment with the parents was performed using the usual household food intake inquiry. Anthropometric data were collected. Gastrointestinal symptoms associated with deglutition disorders, gastroesophageal reflux and chronic constipation were also recorded. **RESULTS:** The median of height-for-age Z-score ( $-4.05$ ) was lower ( $P < 0.05$ ) than the median of weight-for-age (-

3.29) and weight-for-height (-0.94). There was no statistical difference between weight-for-age and weight-for-height Z-scores. Three patients with cerebral palsy (7.5%) exhibited mild anemia, with normal ferritin levels in two. Symptoms of dysphagia, gastroesophageal reflux, and constipation were found in 82.5% (n=33), 40.0% (n=16), and 60.0% (n=24) of the sample, respectively. The patients with symptoms of dysphagia exhibited lower daily energy (1280.2±454.8 Kcal vs 1890.3±847.1 Kcal, P=0.009), carbohydrate (median: 170.9 g vs 234.5 g, P=0.023) and fluid intake (483.1±294.9 mL vs 992.9±292.2 mL, P=0.001). The patients with symptoms of gastrointestinal reflux exhibited greater daily fluid intake (720.0±362.9 mL) than the patients without symptoms of gastroesophageal reflux (483.7±320.0 mL, P=0.042) and a greater height-for-age deficit (Z-score: -4.9±1.7 vs 3.7±1.5, P=0.033). The patients with symptoms of constipation exhibited lower daily dietary fiber (9.2±4.3 g vs 12.3±4.3 g, P=0.031) and fluid (456.5±283.1 mL vs 741.1±379.2 mL, P=0.013) intake. **CONCLUSION:** Children with cerebral palsy exhibited wide variability in food intake which may partially account for their severe impaired growth and malnutrition. Symptoms of dysphagia, gastroesophageal reflux, and constipation are associated with different food intake patterns. Therefore, nutritional intervention should be tailored considering the gastrointestinal symptoms and nutritional status.

PMID: [30785518](#)

#### **16. Neurodevelopmental Outcomes of Very Low Birth Weight Infants at 18-24 Months, Corrected Gestational Age in a Tertiary Health Centre: A Prospective Cohort Study.**

Oommen SP, Santhanam S, John H, Roshan R, Swathi TO, Padankatti C, Grace H, Beulah R, Jana AK, Kumar M, Thomas N, Yadav B.

J Trop Pediatr. 2019 Feb 21. pii: fmz006. doi: 10.1093/tropej/fmz006. [Epub ahead of print]

**OBJECTIVE:** To determine the prevalence and risk factors for poor neurodevelopmental outcome in a cohort of very low birth weight (VLBW) infants. **SUBJECTS AND METHODS:** Four hundred and twenty-two infants of a total of 643 VLBW survivors from a teaching hospital in South India were followed up to assess their neurodevelopmental outcomes. **RESULTS:** Among the 422 children who completed the assessment, results of 359 children whose assessments were done between 18 and 24 months were analysed. Thirty-seven children (10.31%) had poor neurodevelopmental outcome, six children [1.67%] had cerebral palsy, one child had visual impairment and another had hearing impairment. Poor post-natal growth was independently associated with poor neurodevelopmental outcomes in the multivariate analysis ( $p = 0.045$ ). Neonatal complications were not associated with the developmental outcome. **CONCLUSION:** Despite lower rates of neonatal complications compared with Western cohorts, significant proportion of VLBW infants had poor neurodevelopmental outcomes. Poor post-natal growth was an important determinant of the developmental outcome.

PMID: [30793756](#)

#### **17. [Follow-up recommendations for the late preterm infant].**

García Reymundo M, Hurtado Suazo JA, Calvo Aguilar MJ, Soriano Faura FJ, Ginovart Galiana G, Martín Peinador Y, Jiménez Moya A, Demestre Guasch X.

An Pediatr (Barc). 2019 Feb 15. pii: S1695-4033(19)30025-6. doi: 10.1016/j.anpedi.2019.01.008. [Epub ahead of print] [Article in Spanish]

The population of late preterm infants (PT), those born between 34+0 and 36+6 weeks of gestation, accounts for 70-74% of all premature infants, and is not specifically included in most of the follow-up protocols for preterm infants. For many years, PTs have been handled as if they were term newborns, which has led to a limited knowledge of their outcome in the medium and long term. Their neonatal morbidity is associated with a higher incidence of postnatal complications, with an increased rate of hospital re-admissions due to malnutrition, hyperbilirubinaemia, and respiratory problems, when compared to term infants. Cerebral immaturity may be the main cause of the deficits observed in the long-term neurodevelopment of this population, making them more vulnerable. Several issues have been described, such as delays or disabilities in the pre-school stage, cerebral palsy, mental retardation, intellectual disability, schizophrenia, and psychological development of behavioural and emotional disorders. The SEN34-36 Group of the Spanish Society of Neonatology, in collaboration with the Spanish Association of Primary Care Paediatrics, have developed these follow-up recommendations with the main objective of reducing the impact of prematurity on PT development. The secondary objectives of the document are to make neonatologists and paediatricians aware of the risks of sequelae of PTs, to determine and unify the evaluations and / or interventions that should be carried out, to offer clinical follow-up tools for the early detection of developmental delays, and to coordinate the care by all the professionals involved.

PMID: [30777715](#)

### 18. Associations between use of macrolide antibiotics during pregnancy and adverse child outcomes: A systematic review and meta-analysis.

Fan H, Li L, Wijlaars L, Gilbert RE.

PLoS One. 2019 Feb 19;14(2):e0212212. doi: 10.1371/journal.pone.0212212. eCollection 2019.

**BACKGROUND:** Evidence on adverse effects of maternal macrolide use during pregnancy is inconsistent. We conducted a systematic review and meta-analysis to investigate the association between macrolide use during pregnancy and adverse fetal and child outcomes. **METHODS AND FINDINGS:** We included observational studies and randomised controlled trials (RCTs) that recorded macrolide use during pregnancy and child outcomes. We prioritized comparisons of macrolides with alternative antibiotics (mainly penicillins or cephalosporins) for comparability of indication and effect. Random effects meta-analysis was used to derive pooled odds ratios (OR) for each outcome. Subgroup analyses were performed according to specific types (generic forms) of macrolide. Of 11,186 citations identified, 19 (10 observational, 9 RCTs) studies were included (21 articles including 228,556 participants). Macrolide prescribing during pregnancy was associated with an increased risk of miscarriage (pooled ORs 1.82, 95% CI 1.57-2.11, three studies,  $I^2 = 0\%$ ), cerebral palsy and/or epilepsy (ORs 1.78, 1.18-2.69; one study), epilepsy alone (ORs 2.02, 1.30-3.14, one study; ORRCT 1.03, 0.79-1.35, two studies), and gastrointestinal malformations (ORs 1.56, 1.05-2.32, two studies) compared with alternative antibiotics. We found no evidence of an adverse effect on 12 other malformations, stillbirth, or neonatal death. Results were robust to excluding studies with high risk of bias. **CONCLUSIONS:** Consistent evidence of an increased risk of miscarriage in observational studies and uncertain risks of cerebral palsy and epilepsy warrant cautious use of macrolide in pregnancy with warnings in drug safety leaflets and use of alternative antibiotics where appropriate. As macrolides are the third most commonly used class of antibiotics, it is important to confirm these results with high quality studies.

PMID: [30779772](#)

### 19. Cerebral palsy among children of immigrants in Denmark and the role of socioeconomic status.

Petersen TG, Forthun I, Lange T, Villadsen SF, Nybo Andersen AM, Uldall P, Strandberg-Larsen K.

Eur J Paediatr Neurol. 2019 Feb 4. pii: S1090-3798(18)30455-0. doi: 10.1016/j.ejpn.2019.01.007. [Epub ahead of print]

**BACKGROUND:** Children of immigrants in Denmark have excess risk for some of the most well-established risk factors for cerebral palsy (CP). **OBJECTIVES:** To study differences in risk of CP between children of immigrants and children of Danish-born mothers, and explore whether socioeconomic status drives any potential association. **METHODS:** A register-based cohort study including 1,274,616 children born in Denmark between 1981 and 2007. Of these, 2807 had a validated CP diagnosis in the Danish CP Register. We estimated the risk of CP as odds ratios (OR) using logistic regression and assessed mediation through socioeconomic status using natural effect models. **RESULTS:** In children of Danish-born mothers, 2.2/1000 had CP overall and the prevalence was similar for children of immigrants. However, children of immigrants had lower risk of unilateral spastic CP than children of Danish native-born mothers; OR = 0.59 (95% CI:0.38-0.91) for Western and OR = 0.79 (95% CI:0.61-1.03) for Non-Western immigrants. By contrast, the risk of bilateral spastic CP was higher in children of Non-Western immigrants (OR = 1.27 (95% CI:1.05-1.53)), especially from Turkey and Pakistan compared with children of Danish native-born mothers. The mediation analysis revealed an indirect effect (through maternal educational level and household income) with an OR of 1.06 (95% CI:0.99-1.14) for children of Non-Western immigrants. **CONCLUSIONS:** While children of immigrants had lower risk of unilateral spastic CP than children of Danish-born mothers, the risk of bilateral spastic CP was increased in children of Non-Western immigrants. Socioeconomic status did not appear to be a significant contributor to the increased risk of bilateral spastic CP.

PMID: [30777617](#)

## Prevention and Cure

### 20. Erythropoietin in perinatal hypoxic-ischemic encephalopathy: a systematic review and meta-analysis.

Razak A, Hussain A.

J Perinat Med. 2019 Feb 21. pii: /j/jpme.ahead-of-print/jpm-2018-0360/jpm-2018-0360.xml. doi: 10.1515/jpm-2018-0360. [Epub ahead of print]

**Background** Erythropoietin (EPO) appears to confer neuroprotection to the injured brain. Randomized clinical trials (RCTs) have demonstrated its safety in neonates with hypoxic-ischemic encephalopathy (HIE); however, the evidence is unclear. The objective of this study was to examine the role of EPO in perinatal HIE by a systematic review and meta-analysis. **Methods** Database search included Embase, MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Cochrane Central Register of Controlled Trials (CENTRAL). RCTs reporting a death, neurodevelopmental outcomes or brain injury were included. Two authors extracted the data independently from included studies and assessed the level of evidence (LOE). **Results** Six RCTs (EPO=5 and darbepoetin  $\alpha$ =1) involving 454 neonates were included. A trend toward a lower risk of death was identified in infants treated with EPO [EPO with or without hypothermia: five RCTs, 368 participants, relative risk (RR) 0.74, 95% confidence interval (CI) 0.47-1.19, LOE-low; EPO without hypothermia: four RCTs, 318 participants, RR 0.89, 95% CI 0.49-1.32, LOE-low]. EPO treatment without hypothermia compared to placebo resulted in a reduced risk of cerebral palsy (two RCTs, 230 participants, RR 0.47, 95% CI 0.27-0.80, LOE-moderate) and moderate to severe cognitive impairment (two RCTs, 226 participants, RR 0.49, 95% CI 0.28-0.85, LOE-moderate). A reduced risk of brain injury was identified in EPO treated infants (EPO with or without hypothermia, two RCTs, 148 participants, RR 0.70, 95% CI 0.53-0.92, LOE-moderate). **Conclusion** EPO administration in neonates with perinatal HIE reduces the risk of brain injury, cerebral palsy and cognitive impairment. The evidence is limited to suggest its role as an adjuvant to hypothermia. Larger powered trials are underway to overcome this limitation.

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