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Interventions and Management

1. *Dev Med Child Neurol.* 2015 Nov 26. doi: 10.1111/dmcn.12991. [Epub ahead of print]

Validity and test-retest reliability of Children's Hand-use Experience Questionnaire in children with unilateral cerebral palsy.

Amer A, Eliasson AC), Peny-Dahlstrand M, Hermansson L.

AIM: To investigate the validity of the internet-based version of the Children's Hand-use Experience Questionnaire (CHEQ) by testing the new four-category rating scale, internal structure, and test-retest reliability. **METHOD:** Data were collected for 242 children with unilateral cerebral palsy (CP) (137 males and 105 females; mean age 9y 10mo, SD 3y 5mo, range 6-18y). Twenty children from the study sample (mean age 11y 8mo, SD 3y 10mo) participated in a retest within 7 to 14 days. Validity was tested by Rasch analysis based on a rating scale model and test-retest reliability by Kappa analysis and intraclass correlation coefficient (ICC). **RESULTS:** The four-category rating scale was within recommended criteria for rating scale structure. One item was removed because of misfit. CHEQ showed good scale structure according to the criteria. The effective operational range was >90% for two of the CHEQ scales. Test-retest reliability for the three CHEQ scales was: grasp efficacy, ICC=0.91; time taken, ICC=0.88; and feeling bothered, ICC=0.91. **INTERPRETATION:** The internet-based CHEQ with a four-category rating scale is valid and reliable for use in children with unilateral CP. Further studies are needed to investigate the validity of the internet-based version of CHEQ for children with upper limb reduction deficiency or obstetric brachial plexus palsy and the validity of the recommended improvements to the current version.

[PMID: 26610725](#)

2. *PLoS One.* 2015 Nov 24;10(11):e0142769. doi: 10.1371/journal.pone.0142769. eCollection 2015.

Evaluating Functional Outcomes of Botulinum Toxin Type A Injection Combined with Occupational Therapy in the Upper Limbs of Children with Cerebral Palsy: A9-Month Follow-Up from the Perspectives of Both Child and Caregiver.

Lin YC, Huang CY, Lin IL, Shieh JY, Chung YT, ChenKL.

OBJECTIVE: To assess the effectiveness of combining botulinum toxin type A (BoNT-A) with functional occupational therapy (OT) at 9-month follow-up in children with cerebral palsy (CP) with bilateral upper limb impairments from the perspectives of both child and caregiver. **METHODS:** Twelve children with CP and their caregivers were assessed across 5 time points over 9 months based on the ICF after BoNT-A injection and

functional OT in this open-label study. **RESULTS:** Significant differences were found across the 5 time points ($p < .05$) for both grasp and visual-motor integration with small effects (effect sizes = 0.12-0.24) and the self-care capability and performance of social function ($p < .05$). However, based on the effect sizes (0.02-0.14), no significant effects were found at the 4 post-test time points. Small effects were found on the psychological domain (effect sizes = 0.25-0.37) and environmental domains (effect size = 0.27) at follow-ups. **CONCLUSION:** Combining a BoNT-A injection with OT not only reduced the muscle tone and increased ROM but also improved the upper limb function and self-care capability in children with CP. More importantly, these effects persisted for up to 9 months. Functional OT extends the effectiveness of a BoNT-A injection.

[PMID: 26599003](#)

3. J Child Orthop. 2015 Nov 23. [Epub ahead of print]

Femoral derotation osteotomy with multi-level soft tissue procedures in children with cerebral palsy: Does it improve gait quality?

Saglam Y, Ekin Akalan N, Temelli, Y Kuchimov S

PURPOSE: Poor motor control and delayed thumb function and a delay in walking are the main factors which retard the natural decrease of the femoral anteversion (FA) with age. In addition, cerebral palsy (CP) patients usually have muscular imbalance around the hip as well as muscle contractures, both of which are main factors accounting for the increased FA which is commonly present in CP patients. The purpose of this retrospective study was to analyze the mid-term results of femoral derotational osteotomy (FDO) on the clinical findings, temporospatial and kinematic parameters of gait in children with CP. **METHODS:** We performed a retrospective review of all patients diagnosed with CP and increased FA who were treated with FDO with multi-level soft tissue surgeries at a single institution between 1992 and 2011. FA assessment was done in the prone position, and internal (IR) and external rotation (ER) of the hip was measured in the absence of pelvis rotation. Surgical procedures were performed on the basis of both clinical findings and video analysis. Clinical findings, Edinburgh Visual Gait Scores (EVGS) and results from three-dimensional gait analysis were analyzed preoperatively and last follow-up. **RESULTS:** A total of 93 patients with 175 affected extremities were included in this review. Mean age was 6.2 ± 3.1 (standard deviation) at initial surgery. The average length of the follow-up period was 6.3 ± 3.7 years. At the last follow-up, the postoperative hip IR had significantly decreased (73.9° vs. 46.2° ; $p < 0.0001$), the hip ER had significantly improved (23.8° vs. 37° ; $p < 0.0001$) and the popliteal angle had significantly decreased (64.2° vs. 55.8° ; $p < 0.0001$). The total EVGS showed significant improvement after FDO (35.2 ± 6.4 vs. 22.5 ± 6.1 ; $p < 0.001$). Computed gait analysis showed significant improvement in the foot progression angle (FPA; 8.1° vs. -16.9° ; $p = 0.005$) and hip rotation (-13.9° vs. 5.7° ; $p = 0.01$) at the last follow-up. Stance time was improved (60.2 vs. 65.1 %; $p = 0.02$) and swing time was decreased (39.9 vs. 35.2 %; $p = 0.03$). Double support time and cadence were both decreased ($p = 0.032$ and $p = 0.01$). **CONCLUSIONS:** Our data suggest that the FDO is an appropriate treatment strategy for the correction of FA and associated in-toeing gait in children with CP. Improvements in clinical and kinematic parameters were observed in both groups after FDO with multi-level soft tissue release. The most prominent effects of FDO were on transverse plane hip rotation and FPA.

[PMID: 26597935](#)

4. Skeletal Radiol. 2015 Nov 27. [Epub ahead of print]

Measuring physiological and pathological femoral anteversion using a biplanar low-dose X-ray system: validity, reliability, and discriminative ability in cerebral palsy.

Thépaut M, Brochard S, Leboucher J, Lempereur M, Stindel E, Tissot V, Borotikar BS.

OBJECTIVE: The aims of this study were to evaluate the concurrent validity and reliability of a low-dose biplanar X-ray system (Ld-BPR) for the measurement of femoral anteversion (FA) by comparing Ld-BPR-based three-dimensional measures with CT-scan-based measures and to assess the discriminative ability of this method in children with cerebral palsy. **MATERIALS AND METHODS:** Fifty dry femora were scanned using both a CT scan and the Ld-BPR system. Ten femora were artificially modified to mimic a range of anteversion from -30° to $+60^\circ$

and scanned by both modalities. FA was quantified using the images from both modalities and statistically compared for concurrent validity. Intra- and inter-observer reliability of the Ld-BPR system was also determined. Further, Ld-BPR data from 16 hemiplegic and 22 diplegic children were analyzed for its discriminative ability. RESULTS: The concurrent validity between the Ld-BPR and CT-scan measures was excellent ($R(2) = 0.83-0.84$) and no significant differences were found. The intra- and inter-trial reliability were excellent (ICCs = 0.98 and 0.97) with limits of agreement of $(-2.28^\circ; +2.65^\circ)$ and $(-2.76^\circ; +3.38^\circ)$ respectively. Further, no significant effects of angle or method were found in the sample of modified femora. Ld-BPR measures for FA were significantly different between healthy and impaired femora. CONCLUSIONS: The excellent concurrent validity with the CT scan modality, the excellent reliability, and the ability to discriminate pathological conditions evaluated by this study make this radiological method suitable for a validated use across hospitals and research institutes.'

[PMID: 26611255](#)

5. Disabil Rehabil. 2015 Nov 25:1-8. [Epub ahead of print]

Isometric muscle strength and mobility capacity in children with cerebral palsy.

Dallmeijer AJ, Rameckers EA, Houdijk H, de Groot S, Scholtes VA, Becher JG.

PURPOSE: To determine the relationship between isometric leg muscle strength and mobility capacity in children with cerebral palsy (CP) compared to typically developing (TD) peers. METHOD: Participants were 62 children with CP (6-13 years), able to walk with ($n = 10$) or without ($n = 52$) walking aids, and 47 TD children. Isometric muscle strength of five muscle groups of the leg was measured using hand-held dynamometry. Mobility capacity was assessed with the 1-min walk, the 10-m walk, sit-to-stand, lateral-step-up and timed-stair tests. RESULTS: Isometric strength of children with CP was reduced to 36-82% of TD. When adjusted for age and height, the percentage of variance in mobility capacity that was explained by isometric strength of the leg muscles was 21-24% (walking speed), 25% (sit-to-stand), 28% (lateral-step-up) and 35% (timed-stair) in children with CP. Hip abductors and knee flexors had the largest contribution to the explained variance, while knee extensors showed the weakest correlation. Weak or no associations were found between strength and mobility capacity in TD children. CONCLUSION: Isometric strength, especially hip abductor and knee flexor strength, is moderately related to mobility capacity in children with CP, but not in TD children. To what extent training of these muscle groups will lead to better mobility capacity needs further study. Implications for Rehabilitation Strength training in children with cerebral palsy (CP) may be targeted more specifically at hip abductors and knee flexors. The moderate associations imply that large improvements in mobility capacity may not be expected when strength increases.

[PMID: 26605427](#)

6. Res Dev Disabil. 2015 Nov 18;48:186-192. doi: 10.1016/j.ridd.2015.09.017. [Epub ahead of print]

The influence of timing of knee recurvatum on surgical outcome in cerebral palsy.

Klotz MC, Heitzmann DW, Wolf SI, Niklasch M, Maier MW, Dreher T.

Recent reports have shown that timing of genu recurvatum (GR) might be caused by different underlying factors and that equinus leads to GR especially during early stance. The purpose of this study was to investigate the reduction of GR after surgical correction of equinus in children with bilateral spastic cerebral palsy and whether the children with early and late type GR show differences in reduction of knee hyperextension after a surgery. In 24 limbs (mean age 10.3 years, GMFCS I-III) showing equinus and GR the kinematics of the knee and ankle as well as the kinetics of the knee were evaluated before and one year (mean follow up period: 12.8 months) after surgical correction of equinus. The study was approved by the local ethical committee. Limbs with early type GR showed a reduction by 11.1° ($p < 0.001$) and those with late type GR by 6.0° ($p < 0.049$) in GR after surgery. Before surgery limbs with early type GR showed increased external extending moments, which decreased significantly after surgery. In contrast limbs with late GR did not show a significant reduction of those moments.

The findings of this study underline the influence of equinus on early GR as an underlying factor. As equinus is attributed to early knee hyperextension and proximal factors are more important as underlying factors in late type GR, a classification into early and late onset GR is useful to identify underlying factors and to choose adequate treatment.

[PMID: 26599296](#)

7. PLoS One. 2015 Nov 23;10(11):e0142878. doi: 10.1371/journal.pone.0142878. eCollection 2015.

The Effects of Varying Ankle Foot Orthosis Stiffness on Gait in Children with Spastic Cerebral Palsy Who Walk with Excessive Knee Flexion.

Kerkum YL, Buizer A, van den Noort JC, Becher JG, Harlaar J, Brehm MA.

INTRODUCTION: Rigid Ankle-Foot Orthoses (AFOs) are commonly prescribed to counteract excessive knee flexion during the stance phase of gait in children with cerebral palsy (CP). While rigid AFOs may normalize knee kinematics and kinetics effectively, it has the disadvantage of impeding push-off power. A spring-like AFO may enhance push-off power, which may come at the cost of reducing the knee flexion less effectively. Optimizing this trade-off between enhancing push-off power and normalizing knee flexion in stance is expected to maximize gait efficiency. This study investigated the effects of varying AFO stiffness on gait biomechanics and efficiency in children with CP who walk with excessive knee flexion in stance. Fifteen children with spastic CP (11 boys, 10±2 years) were prescribed with a ventral shell spring-hinged AFO (vAFO). The hinge was set into a rigid, or spring-like setting, using both a stiff and flexible performance. At baseline (i.e. shoes-only) and for each vAFO, a 3D-gait analysis and 6-minute walk test with breath-gas analysis were performed at comfortable speed. Lower limb joint kinematics and kinetics were calculated. From the 6-minute walk test, walking speed and the net energy cost were determined. A generalized estimation equation ($p < 0.05$) was used to analyze the effects of different conditions. Compared to shoes-only, all vAFOs improved the knee angle and net moment similarly. Ankle power generation and work were preserved only by the spring-like vAFOs. All vAFOs decreased the net energy cost compared to shoes-only, but no differences were found between vAFOs, showing that the effects of spring-like vAFOs to promote push-off power did not lead to greater reductions in walking energy cost. These findings suggest that, in this specific group of children with spastic CP, the vAFO stiffness that maximizes gait efficiency is primarily determined by its effect on knee kinematics and kinetics rather than by its effect on push-off power. **TRIAL REGISTRATION:** Dutch Trial Register NTR3418.

[PMID: 26600039](#)

8. Foot Ankle Clin. 2015 Dec;20(4):657-68. doi: 10.1016/j.fcl.2015.07.008. Epub 2015 Oct 21.

Neuromuscular Foot: Spastic Cerebral Palsy.

Karamitopoulos MS, Nirenstein L.

Foot and ankle deformities in cerebral palsy can be effectively treated with surgery. Surgery should be considered in patients with significant deformity and those who have pain or difficulty with orthotic and shoe wear. Equinus contracture of both gastrocnemius and soleus can be treated with open tendoachilles lengthening; ankle valgus with medial epiphysiodesis. Equinovarus is more commonly seen in hemiplegic patients and this deformity can usually be treated with tendon transfers. Triple arthrodesis is an option in children with severe degenerative changes. It is important to address all aspects of the child's pathology at the time of surgical correction.

[PMID: 26589084](#)

9. Phys Occup Ther Pediatr. 2015 Nov 25:1-10. [Epub ahead of print]**Test-retest Reproducibility of the Assessment of Motor and Process Skills in Children with Unilateral Cerebral Palsy.**

James S, Ziviani J, Ware RS, Boyd RN

AIMS: To examine test-retest reproducibility of the Assessment of Motor and Process Skills (AMPS) in children aged 8-16 years with unilateral cerebral palsy (UCP). **METHODS:** Thirty children with mild to moderate UCP (mean age = 11y 7m, SD 2y 4m; males = 18; Manual Ability Classification System level I = 10, II = 20; Gross Motor Function Classification System level I = 9, II = 21) enrolled in a large randomized controlled trial were recruited via consecutive series sampling. Children carried out two AMPS tasks over two consecutive days according to standardized AMPS administration procedures. The standard error of measurement (SEM), smallest detectable change (SDC), 95% limits of agreement using the Bland-Altman method, and intraclass correlation coefficients (ICC; 2,1) were calculated. **RESULTS:** The SDC was 0.23 logits for the AMPS motor scale and 0.30 logits for the AMPS process scale. Test-retest reliability was excellent for both the AMPS motor scale (ICC = 0.93) and the AMPS process scale (ICC = 0.86). Intra-rater reliability (n = 10) was excellent for AMPS motor scale (ICC = 0.96) and AMPS process scale (ICC = 0.98). **CONCLUSIONS:** The AMPS can be used by therapists with 8- to 16-year-old children with UCP as an outcome measure with changes in scores reflecting real changes in performance or capacity.

[PMID: 26606274](#)**10. Dev Med Child Neurol. 2015 Nov 20. doi: 10.1111/dmcn.12962. [Epub ahead of print]****Injection frequency of botulinum toxin A for spastic equinus: a randomized clinical trial.**

Hastings-Ison T, Blackburn C, Rawicki B, Fahey M, Simpson P, Baker R, Graham K.

AIM: We compared two botulinum toxin A (BoNT-A) injection frequency regimens, 12-monthly versus 4-monthly, for spastic equinus in a randomized clinical trial. The primary outcome measure was passive ankle dorsiflexion. **METHOD:** Forty-two ambulant children with spastic equinus, secondary to cerebral palsy (23 males and 19 females; mean age 3y 6mo, SD 13mo; GMFCS levels I [n=20], II [n=19], III [n=3]) were randomized to receive either 12-monthly or 4-monthly BoNT-A injections to the calf, over a 26-month period. Twenty-one children had spastic hemiplegia, 21 children had spastic diplegia. A fixed 6U/kg dose of Botox was injected into the gastrocnemius muscle of both limbs in children with diplegia and the gastrocnemius of the affected limb in children with hemiplegia, under mask anaesthesia. **RESULTS:** Forty-two children entered the trial with 21 participants randomized to each group. There were three withdrawals and two children received serial casting midway through the trial. There was no significant difference in passive dorsiflexion between 12-monthly and 4-monthly regimens (p=0.41). There were also no significant between group differences on secondary outcome measures. There were no serious adverse events - the rate was 1.2 adverse events per child per year in the 12-monthly group and 2.2 adverse events per child per year in the 4-monthly group. Subgroup analysis revealed a significant difference in passive dorsiflexion between children with hemiplegia and diplegia (p=0.01). **INTERPRETATION:** There was no significant difference between 12-monthly and 4-monthly injection regimens on passive dorsiflexion or secondary outcome measures. BoNT-A injections for spastic equinus may be recommended on a 12-monthly basis.

[PMID: 26589633](#)

11. Ann Phys Rehabil Med. 2015 Oct 22. pii: S1877-0657(15)00533-3. doi: 10.1016/j.rehab.2015.09.001. [Epub ahead of print]

Planovalgus foot deformity in cerebral palsy corrected by botulinum toxin injection in the peroneus longus: Clinical and radiological evaluations in young children.

Boulay C, Jacquemier M, Castanier E, Giorgi H, Authier G, Pomero V, Chabrol B, Jouve JL, Bollini G, Viehweger E.

BACKGROUND: In children with cerebral palsy (CP), overactivity of the peroneus longus (PL) muscle is a major contributor to pes planovalgus. This retrospective study assessed whether abobotulinumtoxinA injections into a PL showing premature activity on electromyography (EMG) clinically improved foot morphology in children with CP. **METHODS:** Study participants were <6 years old, had a diagnosis of CP, good functional abilities (Gross Motor Function Classification System level 1 or 2), equinovalgus (initial contact with the hallux or head of the first metatarsal) and overactive PL on EMG. The fore-, mid- and hindfoot were evaluated clinically and radiologically before and after injection of abobotulinumtoxinA (6-7 U/kg) into the PL. Radiological data were compared with reference values for children without pes planovalgus. **RESULTS:** In total, 16 children (8 males; 10 hemiplegia, 6 diplegia; mean age: 3.2±1.5 years) received treatment. Mean pre- and post-treatment angles in clinical assessment of dorsiflexion of the talocrural articulation did not differ with both knees flexed (24.4±7.5 vs. 22.2±8.0 degrees; P=0.19) or extended (17.2±8.0 vs. 16.6±6.8 degrees; P=0.36). Radiographic data pre-treatment versus reference data revealed forefoot pronation (metatarsal stacking angle 2.1±8.3 vs. 8.0±2.9 degrees; P=0.002), midfoot planus (lateral talo-first metatarsal 28.5±15.0 vs. 13.0±7.5 degrees; P<0.001; talocalcaneal angle 54.6±8.6 vs. 49.0±6.9 degrees; P=0.004) and significantly decreased calcaneus dorsiflexion, without hindfoot equinus (calcaneal pitch angle 7.9±6.0 vs. 17.0±6.0 degrees; P<0.001). After treatment, the metatarsal stacking angle did not differ from reference values (P=0.15). As compared with before treatment, treatment improved mean angles for metatarsal stacking (2.1±8.3 vs. 7.1±3.9 degrees, respectively, P=0.002), lateral talo-first metatarsal and talocalcaneal (both P<0.001), with no change in the hindfoot. **CONCLUSION:** PL may be an early target for abobotulinumtoxinA treatment in pes planovalgus associated with premature PL activity in children with CP.

[PMID: 26608867](#)

12. Phys Occup Ther Pediatr. 2015 Nov 25:1-15. [Epub ahead of print]

Understanding Engagement in Home-Based Interactive Computer Play: Perspectives of Children With Unilateral Cerebral Palsy and Their Caregivers.

James S, Ziviani J, King G, Boyd RN.

AIMS: This study aimed to understand engagement of children in a home-based computer program, "Move it to improve it" (Mitii™), designed to enhance motor, cognitive and visual perceptual skills. **METHODS:** Participants were 10 children with unilateral cerebral palsy involved in the 20-week Mitii™ program (mean age = 11 years; 5 males) and their caregivers. Semi-structured interviews were audio recorded, transcribed verbatim and analyzed independently by two researchers. Themes were identified using an inductive approach to identify themes, and mapped against an engagement framework. (King et al., 2014). **RESULTS:** Key themes were: (1) Child/family characteristics: children's interest captured through novelty and technology, motivation declines as novelty wears off, children require "finely tuned" programs, strong family support facilitates engagement, and children develop confidence and ownership; (2) Intervention characteristics: increased therapy frequency with reduced caregiver involvement, Mitii™ "becomes therapy" and competes with other interests; convenience within family routine, lack of real-time feedback and technical issues, and therapist guidance is essential; and (3) Service provider characteristics: initial and ongoing therapist input, family-friendly therapy approach, and tailored strategies to sustain engagement. **CONCLUSIONS:** Therapists should be cognisant of factors that may impact on children's engagement in home-based computer programs and devise individual strategies with families to support sustained engagement.

[PMID: 26606419](#)

13. Acta Neurochir (Wien). 2015 Nov 23. [Epub ahead of print]**Unusual placement of intrathecal baclofen pumps: report of two cases.**

Devine O, Harborne A, Lo WB, Weinberg D, Ciras M, Price R.

Intrathecal baclofen delivery via implantable pump represents an important modality for symptomatic relief in patients with chronic spasticity. Pumps are routinely implanted subcutaneously in the anterior abdominal wall. We describe two unusual cases where skin-related complications necessitated revision surgery in order to relocate the pump to alternative sites. The first patient was an international power canoeist, whose strenuous exercise programme interfered with his pump's original siting. The second patient was a cachectic university student with a history of cerebral palsy, who maintained low body mass despite attempted weight gain. The relocation of these two intrathecal devices to the medial compartment of the right thigh and right iliac fossa, respectively, is described.

[PMID: 26592253](#)

14. Cochrane Database Syst Rev. 2015 Nov 24;11:CD005495. [Epub ahead of print]**Early developmental intervention programmes provided post hospital discharge to prevent motor and cognitive impairment in preterm infants.**

Spittle A, Orton J, Anderson PJ, Boyd R, Doyle LW.

BACKGROUND: Infants born preterm are at increased risk of developing cognitive and motor impairment compared with infants born at term. Early developmental interventions have been provided in the clinical setting with the aim of improving overall functional outcomes for these infants. Long-term benefits of these programmes remain unclear. **OBJECTIVES:** Primary objective To compare the effectiveness of early developmental intervention programmes provided post hospital discharge to prevent motor or cognitive impairment in preterm (< 37 weeks) infants versus standard medical follow-up of preterm infants at infancy (zero to < three years), preschool age (three to < five years), school age (five to < 18 years) and adulthood (\geq 18 years). Secondary objectives To perform subgroup analyses to determine the following. • Effects of gestational age, birth weight and brain injury (periventricular leukomalacia (PVL)/intraventricular haemorrhage (IVH)) on cognitive and motor outcomes when early intervention is compared with standard follow-up. ◦ Gestational age: < 28 weeks, 28 to < 32 weeks, 32 to < 37 weeks. ◦ Birth weight: < 1000 grams, 1000 to < 1500 grams, 1500 to < 2500 grams. ◦ Brain injury: absence or presence of grade III or grade IV IVH or cystic PVL (or both) or an abnormal ultrasound/magnetic resonance image (MRI) before initiation of the intervention. • Effects of interventions started during inpatient stay with a post-discharge component versus standard follow-up care. • Effects of interventions focused on the parent-infant relationship, infant development or both compared with standard follow-up care. To perform sensitivity analysis to identify the following. • Effects on motor and cognitive impairment when early developmental interventions are provided within high-quality randomised trials with low risk of bias for sequence generation, allocation concealment, blinding of outcome measures and selective reporting bias. **SEARCH METHODS:** The search strategy of the Cochrane Neonatal Review Group was used to identify randomised and quasi-randomised controlled trials of early developmental interventions provided post hospital discharge. Two review authors independently searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE Advanced, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO and EMBASE (1966 to August 2015). **SELECTION CRITERIA:** Studies included had to be randomised or quasi-randomised controlled trials of early developmental intervention programmes that began within the first 12 months of life for infants born before 37 weeks' gestational age. Interventions could commence on an inpatient basis but had to include a post-discharge component for inclusion in this review. Outcome measures were not prespecified, other than that they had to assess cognitive outcomes, motor outcomes or both. Rates of cerebral palsy were documented. **DATA COLLECTION AND ANALYSIS:** Two independent review authors extracted and entered data. Cognitive and motor outcomes were pooled by four age groups: infancy (zero to < three years), preschool age (three to < five years), school age (five to < 18 years) and adulthood (\geq 18 years). Meta-analysis using RevMan 5.1 was carried out to determine the effects of early developmental interventions at each age range. Subgroup analyses focused on gestational age, birth weight, brain injury, commencement of the intervention, focus of the intervention and study quality. **MAIN RESULTS:** Twenty-five studies met the inclusion criteria (3615 randomly assigned participants). Only 12 of these studies were randomised controlled trials with appropriate allocation concealment. Variability was evident with regard to focus and intensity of the intervention, participant characteristics and length of follow-up. Meta-analysis led to the conclusion that

intervention improved cognitive outcomes at infancy (developmental quotient (DQ): standardised mean difference (SMD) 0.32 standard deviations (SDs), 95% confidence interval (CI) 0.16 to 0.47; P value < 0.001; 16 studies; 2372 participants) and at preschool age (intelligence quotient (IQ); SMD 0.43 SDs, 95% CI 0.32 to 0.54; P value < 0.001; eight studies; 1436 participants). However, this effect was not sustained at school age (IQ: SMD 0.18 SDs, 95% CI -0.08 to 0.43; P value = 0.17; five studies; 1372 participants). Heterogeneity between studies for cognitive outcomes at infancy and at school age was significant. With regards to motor outcomes, meta-analysis of 12 studies showed a significant effect in favour of early developmental interventions at infancy only; however, this effect was small (motor scale DQ: SMD 0.10 SDs, 95% CI 0.01 to 0.19; P value = 0.03; 12 studies; 1895 participants). No effect was noted on the rate of cerebral palsy among survivors (risk ratio (RR) 0.82, 95% CI 0.52 to 1.27; seven studies; 985 participants). Little evidence showed a positive effect on motor outcomes in the long term, but only five included studies reported outcomes at preschool age (n = 3) or at school age (n = 2). **AUTHORS' CONCLUSIONS:** Early intervention programmes for preterm infants have a positive influence on cognitive and motor outcomes during infancy, with cognitive benefits persisting into preschool age. A great deal of heterogeneity between studies was due to the variety of early developmental intervention programmes tested and to gestational ages of included preterm infants; thus, comparisons of intervention programmes were limited. Further research is needed to determine which early developmental interventions are most effective in improving cognitive and motor outcomes, and to discern the longer-term effects of these programmes.

[PMID: 26597166](#)

15. Dev Med Child Neurol. 2015 Nov 25. doi: 10.1111/dmcn.12967. [Epub ahead of print]

Therapy for young children with cerebral palsy: what, when, where, and how?

Harvey A.

This commentary is on the original article by Kruijssen-Terpstra et al.

[PMID: 26604118](#)

16. J Paediatr Child Health. 2015 Nov 26. doi: 10.1111/jpc.13021. [Epub ahead of print]

Therapy service use in children and adolescents with cerebral palsy: An Australian perspective.

Meehan E, Harvey A, Reid SM, Reddihough DS, Williams K, Crompton KE, Omar S, Scheinberg A.

AIM: The aim of this study was to describe the patterns of therapy service use for a sample of children and adolescents with cerebral palsy over a 1 year period and to identify factors associated with frequency of therapy and parental satisfaction with therapy frequency. **METHODS:** Parents of 83 children completed a survey on their child's use of occupational therapy, physiotherapy and speech and language pathology services over the previous year. Participants were randomly selected from a sample stratified by age and Gross Motor Function Classification System (GMFCS) level. **RESULTS:** During the year prior to survey completion, 83% of children had received occupational therapy, 88% had received physiotherapy and 60% had received speech and language pathology services. Frequency of therapy was higher for younger children (P < 0.01), those classified at GMFCS levels IV-V (P < 0.05) and those attending schools specifically for children with disabilities. **CONCLUSIONS:** Current structures for therapy service delivery for children with cerebral palsy are systems-based, and age-based funding systems and the organisation of services around the education system are preventing the delivery of needs-based therapy. Paediatricians that care for children and young people with cerebral palsy need to pay particular attention to those that may miss out on therapy due to age or school type, and support these families in accessing appropriate therapy.

[PMID: 26607781](#)

17. Saudi Med J. 2015 Nov;36(11):1354-7. doi: 10.15537/smj.2015.11.12132.

Glutaric aciduria type 1 as a cause of dystonic cerebral palsy.

Mohamed S, Hamad MH, Hassan HH, Salih MA.

Glutaric aciduria type 1 (GA1) is an inherited inborn error of metabolism caused by a deficiency of the enzyme glutaryl Co-A dehydrogenase (GCDH). Here, we report a 14-month-old Saudi boy with GA1 who presented with severe dystonia and was mis-diagnosed as cerebral palsy (CP). He presented to our institute with encephalopathy following an episode of gastroenteritis. His physical examination showed dystonia and spastic quadriplegia. His investigations revealed elevated both urinary 3-hydroxy glutaric acid, and serum glutarylcarnitine. The DNA analysis confirmed homozygosity for a mutation in the GCDH-coding gene (c.482G greater than A; p.R161Q). This case alerts pediatricians to consider GA1 as a differential diagnosis of children presenting with dystonic CP.

[PMID: 26593172](#)

Prevention and Cure

18. J Matern Fetal Neonatal Med. 2015 Nov 23:1-5. [Epub ahead of print]

Prolonged latency of preterm premature rupture of membranes and risk of cerebral palsy.

Drassinower D, Friedman AM, Običan SG, Levin H, Gyamfi-Bannerman C.

OBJECTIVE: To determine whether prolonged latency after preterm premature rupture of membranes (PPROM) is associated with an increased risk of death or moderate-to-severe cerebral palsy (CP). STUDY DESIGN: This secondary analysis of the randomized controlled trial of magnesium sulfate for the prevention of CP evaluated whether the time interval between diagnosis of PPRM and delivery was associated with increased risk for CP. Prolonged latency was defined as an interval of ≥ 4 weeks, latency time was also categorized by week of latency for further analysis. The primary outcome was death or moderate-to-severe CP at 2 years of age. Logistic regression was used to control for confounders. RESULTS: In all, 1522 patients with PPRM were analyzed; of whom, 1328 had a < 4 -week interval and 194 had an interval of ≥ 4 weeks. In the unadjusted analysis, the primary outcome was less likely in the PPRM ≥ 4 weeks group 4.1% versus 8.4%, RR: 0.49, 95% CI: 0.24-0.98. After adjusting for possible confounders, there was no statistical difference associated with PPRM latency ≥ 4 weeks versus < 4 weeks for death or moderate-to-severe CP. CONCLUSION: Prolonged exposure to an intrauterine environment of PPRM does not increase risk for CP.

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Periventricular/Intraventricular Hemorrhage and Neurodevelopmental Outcomes: A Meta-analysis.

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CONTEXT: Periventricular/intraventricular hemorrhage (PIVH) is a common short-term morbidity in preterm infants, but its long-term neurodevelopmental impact, particularly with mild PIVH, remains unclear. OBJECTIVE: To systematically review and meta-analyze the neurodevelopmental outcomes of preterm infants ≤ 34 weeks' gestation with mild and severe PIVH, compared with no PIVH. DATA SOURCES: Medline, Embase, CINAHL, and PsychINFO databases from January 2000 through June 2014. STUDY SELECTION: Studies reporting long-term neurodevelopmental outcomes based on severity of PIVH were included. DATA EXTRACTION: Study characteristics, inclusion/exclusion criteria, exposures, and outcome assessment data extracted independently by 2 coauthors. RESULTS: The pooled unadjusted odds ratios of the primary outcome of death or moderate-severe neurodevelopmental impairment (NDI) were higher with both mild (1.48, 95% CI 1.26-1.73; 2 studies) and severe

PIVH (4.72, 4.21-5.31; 3 studies); no studies reported adjusted odds ratios. Among survivors, odds of moderate-severe NDI were higher with mild and severe PIVH in both unadjusted (1.75, 1.40-2.20; 3 studies; 3.36, 3.06-3.68; 5 studies) and adjusted (1.39, 1.09-1.77; 3 studies; 2.44, 1.73-3.42; 2 studies) pooled analyses. Adjusted odds of cerebral palsy and cognitive delay were higher with severe but not mild PIVH. LIMITATIONS: Only observational studies were included. Fifteen of 21 included studies had a moderate-high risk of bias. CONCLUSIONS: Mild and severe PIVH are associated with progressively higher odds of death or moderate-severe NDI compared with no PIVH, but no studies adjusted for confounders. Among survivors, mild PIVH was associated with higher odds of moderate-severe NDI compared with no PIVH.

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