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Interventions and Management

1. *Dev Med Child Neurol.* 2016 Apr 22. doi: 10.1111/dmcn.13135. [Epub ahead of print]

Should botulinum toxin A injections be repeated in children with cerebral palsy? A systematic review.

Kahraman A, Seyhan K, Değer Ü, Kutlutürk S, Mutlu A.

AIM: The aim of this study was to determine the effects of repeat botulinum toxin A (BoNT-A) injections in children with spastic cerebral palsy (CP) on the basis of a best evidence synthesis. **METHOD:** This study included 13 original articles after searching the literature to retrieve information. We used the critical review form produced by McMaster University to determine the methodological quality of the studies, and then confirmed the levels of evidence from Sackett. The studies were also evaluated using the International Classification of Function, Disability and Health - Children and Youth Version (ICF-CY). **RESULTS:** A total of 893 children with spastic CP who had been administered repeat BoNT-A injections were evaluated. The evidence level was II in four of the thirteen studies, III in four studies, and IV in five studies. The McMaster review form score was 14 in two studies, 13 in four studies, and 12 in seven studies. The results showed that repeat BoNT-A may be a safe and an effective approach. The first two injections/one repeat especially relieve spasticity and improve fine and gross motor activities. **INTERPRETATION:** Future studies to investigate the effectiveness of repeat BoNT-A in children with spastic CP may be planned within the framework of the ICF-CY to include well-designed randomized controlled trials and those conducted on larger homogenous groups.

[PMID: 27103334](#)

2. *Dev Med Child Neurol.* 2016 Apr 21. doi: 10.1111/dmcn.13126. [Epub ahead of print]

Dynamic motor control is associated with treatment outcomes for children with cerebral palsy.

Schwartz MH, Rozumalski A, Steele KM.

AIM: To estimate the impact of dynamic motor control on treatment outcomes in children with cerebral palsy. **METHOD:** We used multiple regression on a retrospective cohort of 473 ambulatory children with cerebral palsy who underwent conservative treatment, single-level orthopaedic surgery, single-event multi-level orthopaedic surgery, or selective dorsal rhizotomy. Outcomes included gait pattern, gait speed, energy cost of walking, and the Pediatric Outcomes Data Collection Instrument. Explanatory variables considered were pre-treatment levels of each outcome, treatment group, prior treatment, age, and dynamic motor control computed from surface electromyography using synergy analysis. Effect sizes were estimated from the adjusted response. **RESULTS:** Pre-treatment levels had effect sizes 2 to 13 times larger than the next largest variable. Individuals with milder pre-treatment involvement had smaller gains or actual declines. Dynamic motor control was significant in all domains except energy cost. The effect size of dynamic motor control was second only to pre-treatment level, and was substantially larger than the effect size of treatment group for outcomes where both were significant (gait pattern 2:1, gait speed 4:1). The effect of dynamic motor control was independent of treatment group. **INTERPRETATION:** Dynamic

motor control is an important factor in treatment outcomes. Better dynamic motor control is associated with better outcomes, regardless of treatment.

[PMID: 27097830](#)

3. IEEE Trans Neural Syst Rehabil Eng. 2016 Apr 14. [Epub ahead of print]

Estimating the Mechanical Behavior of the Knee Joint During Crouch Gait: Implications for Real-Time Motor Control of Robotic Knee Orthoses.

Lerner Z, Damiano D, Bulea T.

Individuals with cerebral palsy frequently exhibit crouch gait, a pathological walking pattern characterized by excessive knee flexion. Knowledge of the knee joint moment during crouch gait is necessary for the design and control of assistive devices used for treatment. Our goal was to 1) develop statistical models to estimate knee joint moment extrema and dynamic stiffness during crouch gait, and 2) use the models to estimate the instantaneous joint moment during weight-acceptance. We retrospectively computed knee moments from 10 children with crouch gait and used stepwise linear regression to develop statistical models describing the knee moment features. The models explained at least 90% of the response value variability: peak moment in early (99%) and late (90%) stance, and dynamic stiffness of weight-acceptance flexion (94%) and extension (98%). We estimated knee extensor moment profiles from the predicted dynamic stiffness and instantaneous knee angle. This approach captured the timing and shape of the computed moment (root-mean-squared error: 2.64 Nm); including the predicted early-stance peak moment as a correction factor improved model performance (root-mean-squared error: 1.37 Nm). Our strategy provides a practical, accurate method to estimate the knee moment during crouch gait, and could be used for real-time, adaptive control of robotic orthoses.

[PMID: 27101612](#)

4. J Neurosurg Pediatr. 2016 Apr 22:1-4. [Epub ahead of print]

Sudden falls as a persistent complication of selective dorsal rhizotomy surgery in children with bilateral spasticity: report of 3 cases.

Grootveld LR, van Schie PE, Buizer AI, Jeroen Vermeulen R, van Ouwkerk WJ, Strijers RL, Becher JJ.

Selective dorsal rhizotomy (SDR) surgery is a well-established treatment for ambulatory children with bilateral spastic paresis and is performed to eliminate spasticity and improve walking. The objective of this case report is to describe sudden falls as a persistent complication of SDR. The authors report on 3 patients with bilateral spastic paresis, aged 12, 6, and 7 years at the time of surgery. The percentage of transected dorsal rootlets was around 40% at the L2-S1 levels. Sudden falls were reported with a frequency of several a day, continuing for years after SDR. The falls were often triggered by performing dual tasks as well as occurring in the transition from sitting to standing, during running, after strenuous exercise, or following a fright. Patients also had residual hyperesthesia and dysesthesia of the foot sole. The authors hypothesize that the sudden falls are caused by a muscle inhibition reflex of the muscles in the legs, as an abnormal reaction to a sensory stimulus that is perceived with increased intensity by a patient with hyperesthesia. A favorable effect of gabapentin medication supports this hypothesis.

[PMID: 27104630](#)

5. Arch Phys Med Rehabil. 2016 Apr 13. pii: S0003-9993(16)30048-X. doi: 10.1016/j.apmr.2016.03.012. [Epub ahead of print]

Longitudinal association between gross motor capacity and neuromusculoskeletal function in children and youth with cerebral palsy.

Vos RC, Becher JG, Voorman JM, Gorter JW, van Eck M, van Meeteren J, Smits DW, Twisk JW, Dallmeijer AJ; PERRIN+ Study Group.

OBJECTIVE: To examine associations over longitudinal measurements between neuromusculoskeletal function and gross motor capacity in children and youth with Cerebral Palsy (CP). **DESIGN:** A prospective cohort study **SETTING:** Rehabilitation departments of university medical centers and rehabilitations centers in The Netherlands **PARTICIPANTS:** 148 children (5-9 2

years) and 179 youth (11-20 years) with CP, GMFCS I(n=180), II(n=44), III(n=36), IV(n=34) and V(n=33). INTERVENTIONS: not applicable OUTCOME MEASURES: Gross motor capacity was assessed with the Gross Motor Function Measure (GMFM-66) over a period of 2-4 years in different age cohorts. Neuromusculoskeletal function included selective motor control (SMC), muscle strength, spasticity and range of motion (ROM) of the lower extremities. RESULTS: Multi-level analyses showed that SMC was significantly associated with gross motor capacity in children and youth with CP, showing higher values and a more favourable course in those with better SMC. Strength was only associated to gross motor capacity in youth. Reduced ROM of hip (children) and knee extension (youth) and spasticity of the hip adductors (youth) were additionally - but more weakly- associated with lower values and a less favourable course of gross motor capacity. CONCLUSIONS: Results indicate that children and youth with more severely impaired SMC and youth with reduced muscle strength have a less favourable course of gross motor capacity, while spasticity and reduced ROM are less determinative.

[PMID: 27085848](#)

6. *Dev Med Child Neurol.* 2016 Apr 21. doi: 10.1111/dmcn.13132. [Epub ahead of print]

Medial gastrocnemius muscle volume in ambulant children with unilateral and bilateral cerebral palsy aged 2 to 9 years.

Barber LA, Read F, Lovatt Stern J, Lichtwark G, Boyd RN.

AIM: Calf muscle growth in children with unilateral cerebral palsy (UCP) and bilateral cerebral palsy (BCP) is unknown. This cross-sectional study examines the medial gastrocnemius growth rates of ambulatory children with UCP and BCP compared with children with typical development (CTD), aged 2 to 9 years. METHOD: Fifty children with UCP (mean age 66mo [SD 18], 29 males, Gross Motor Function Classification System [GMFCS] I=32, II=18), 50 children with BCP (age 64mo [SD 19], 31 males, GMFCS I=21, II=29), and 78 CTD (age 64mo [SD 16], 40 males) participated in the study. The medial gastrocnemius muscle volume was measured at rest using a validated freehand three-dimensional (3D) ultrasound method. RESULTS: Normalized medial gastrocnemius muscle growth rate was significantly less in the children with UCP (0.001 mL/kg/mo) compared with the BCP (0.015 mL/kg/mo, $p=0.001$) and CTD (0.014 mL/kg/mo, $p<0.001$) groups. Normalized medial gastrocnemius muscle growth rate was the same in the BCP and CTD groups ($p=0.77$). INTERPRETATION: The normalized growth rate of the medial gastrocnemius muscle in children aged 2 to 9 years with UCP is significantly lower compared with children with BCP and CTD. The growth rate differences in the children with UCP compared with BCP raises questions about the underlying mechanisms that lead to reduced growth in each cerebral palsy (CP) group and potential differences in muscle recovery response in UCP and BCP following treatment.

[PMID: 27098082](#)

7. *Pediatr Res.* 2016 Apr 20. doi: 10.1038/pr.2016.99. [Epub ahead of print]

Knee jerk responses in infants at high risk for cerebral palsy: an observational EMG study.

Hamer EG, Dijkstra LJ, Hooijsma SJ, Zijdewind I, Hadders-Algra M.

BACKGROUND: Following our clinical observation of tonic responses in response to the knee jerk in infants at very high risk for cerebral palsy (VHR infants), we systematically studied tonic responses, clonus and reflex irradiation. We questioned i) whether these responses occurred more often in VHR infants than in typically developing (TD) infants, and ii) whether they were associated with abnormal general movement quality. METHODS: 24 VHR and 26 TD infants were assessed around 3 months corrected age. Surface electromyograms of leg, trunk, neck and arm muscles were recorded while eliciting the knee jerk. All assessments were video-recorded. RESULTS: VHR infants more often than TD infants showed tonic responses in the ipsilateral quadriceps and hamstring (Mann-Whitney U; $p=0.0005$ and $p=0.0009$), clonus (Chi-square; $p=0.0005$) and phasic responses in the contralateral quadriceps and hamstring (Mann-Whitney U; $p=0.002$ and $p=0.0003$, respectively). Widespread reflex irradiation occurred in VHR and TD infants. Definitely abnormal general movements and stiff movements were associated with tonic responses (Mann-Whitney U; $p=0.0005$, $p=0.007$, respectively) and clonus (Mann-Whitney U; $p=0.003$ and $p=0.0005$) in the ipsilateral quadriceps. CONCLUSION: Similar to clonus, tonic responses may be regarded as a marker of a loss of supraspinal control. Reflex irradiation primarily is a neurodevelopmental phenomenon of early ontogeny. *Pediatric Research* (2016); doi:10.1038/pr.2016.99.

[PMID: 27096750](#)

8. *Pediatr Phys Ther.* 2016 Spring;28(1):117-25. doi: 10.1097/PEP.0000000000000223.

Intervention for an Adolescent With Cerebral Palsy During Period of Accelerated Growth.

Reubens R, Silkwood-Sherer DJ.

PURPOSE: The purpose of this case report was to describe changes in body functions and structures, activities, and participation after a biweekly 10-week program of home physical therapy and hippotherapy using a weighted compressor belt. **PARTICIPANT:** A 13-year-old boy with spastic diplegic cerebral palsy, Gross Motor Function Classification System level II, was referred because of accelerated growth and functional impairments that limited daily activities. **OUTCOME MEASURES:** The Modified Ashworth Scale, passive range of motion, 1-Minute Walk Test, Timed Up and Down Stairs, Pediatric Balance Scale, Pediatric Evaluation of Disability Inventory Computer Adaptive Test, and Dimensions of Mastery Questionnaire 17 were examined at baseline, 5, and 10 weeks. **OUTCOMES:** Data at 5 and 10 weeks demonstrated positive changes in passive range of motion, balance, strength, functional activities, and motivation, with additional improvements in endurance and speed after 10 weeks. **CLINICAL IMPLICATIONS:** This report reveals enhanced body functions and structures and activities and improved participation and motivation.

[PMID: 27088701](#)

9. *Int Arch Otorhinolaryngol.* 2016 Apr;20(2):132-7. doi: 10.1055/s-0035-1566093. Epub 2015 Oct 20.

Aspiration Pneumonia in Children with Cerebral Palsy after Videofluoroscopic Swallowing Study.

Lagos-Guimarães HN, Teive HA, Celli A, Santos RS, Abdulmassih EM, Hirata GC, Gallinea LF.

Introduction Dysphagia is a common symptom in children with cerebral palsy, either in oral or pharyngeal phases. Children who face such difficulties tend to show health problems such as food aspiration, malnutrition and respiratory infections. Videofluoroscopic swallowing study is the most recommended for these cases, as it reveals the real situation during swallowing. **Objective** The study aimed to verify the occurrence of aspiration pneumonia in children with cerebral palsy after videofluoroscopy. **Methods** The population for this prospective cross-sectional study involved 103 children with cerebral palsy, referred for videofluoroscopic who had returned for medical examination after a week to search for signs and symptoms of pneumonia. **Results** The study involved 46 girls (44.66%) and 57 boys (55.34%), aged between 0 and 14 years of age. Of the total, 84 (81.5%) had dysphagia, of which 24 (23.3%) were severe, 8 (7.7%) were moderate and 52 (50.4%) were mild dysphagia. None of the children presented aspiration pneumonia or infectious complications during the course of videofluoroscopy or after the procedure. **Conclusion** In the population studied, the authors found no cases of aspiration pneumonia, even with tracheal aspiration present in 32 (31.07%) cases.

[PMID: 27096017](#)

10. *Dev Med Child Neurol.* 2016 Apr 21. doi: 10.1111/dmcn.13139. [Epub ahead of print]

Measurement of visual ability in children with cerebral palsy: a systematic review.

Deramore Denver B, Froude E, Rosenbaum P, Wilkes-Gillan S, Imms C.

AIM: To identify and evaluate measures of visual ability used with children with cerebral palsy (CP). **METHOD:** Eight databases were searched for measures of visual ability. Key selection criteria for measures were: use with children with CP; focus of visual ability measurement at the Activities and Participation domain of the International Classification of Functioning, Disability and Health (ICF). The Consensus-based Standards for the Selection of Measurement Instruments (COSMIN) Checklist was used to assess psychometric properties. **RESULTS:** From 6763 papers retrieved, 25 were relevant and 19 measures of visual ability were identified. Only 10 measures were supported with evidence of validity or reliability. No discriminative measure analogous to existing CP functional classification systems was found. No outcome measure valid for evaluation of visual abilities of children with CP was found. **INTERPRETATION:** Vision impairment is recognized as relevant to the functioning of children with CP; however, measurement of vision is most often focused at 'Body Function' levels, for example visual acuity. Measuring visual abilities in the Activities and Participation domain is important in considering how a child with CP functions in vision-related activities. The lack of psychometrically strong measures for visual ability is a gap in current clinical practices and research.

[PMID: 27098366](#)

11. Dev Med Child Neurol. 2016 Apr 21. doi: 10.1111/dmcn.13138. [Epub ahead of print]

Differential item functioning in the Patient Reported Outcomes Measurement Information System Pediatric Short Forms in a sample of children and adolescents with cerebral palsy.

Coster WJ, Ni P, Slavin MD, Kisala PA, Nandakumar R, Mulcahey MJ, Tulskey DS, Jette AM.

AIM: The present study examined the Patient Reported Outcomes Measurement Information System (PROMIS) Mobility, Fatigue, and Pain Interference Short Forms (SFs) in children and adolescents with cerebral palsy (CP) for the presence of differential item functioning (DIF) relative to the original calibration sample. METHOD: Using the Graded Response Model we compared item parameter estimates generated from a sample of 303 children and adolescents with CP (175 males, 128 females; mean age 15y 5mo) to parameter estimates from the PROMIS calibration sample, which served as the reference group. DIF was assessed in a two-step process using the item response theory-likelihood ratio-differential item functioning detection procedure. RESULTS: Significant DIF was identified for four of eight items in the PROMIS Mobility SF, for two of eight items in the Pain Interference Scale, and for one item out of 10 on the Fatigue Scale. Impact of DIF on total score estimation was notable for Mobility and Pain Interference, but not for Fatigue. INTERPRETATION: Results suggest differences in the responses of adolescents with CP to some items on the PROMIS Mobility and Pain Interference SFs. Cognitive interviews about the PROMIS items with adolescents with varying degrees of mobility limitations would provide better understanding of how they are interpreting and selecting responses to the PROMIS items and thus help guide selection of the most appropriate way to address this issue.

[PMID: 27098277](#)

12. Dev Med Child Neurol. 2016 Apr 17. doi: 10.1111/dmcn.13124. [Epub ahead of print]

Development and reliability of the Functional Communication Classification System for children with cerebral palsy.

Barty E, Caynes K, Johnston LM.

AIM: This paper describes the development, validation, and reliability of the Functional Communication Classification System (FCCS), designed to classify expressive communication skills of children with cerebral palsy (CP) aged 4 years and 5 years (between their fourth and sixth birthdays). METHOD: The Functional Communication Classification System (FCCS) was developed in 2006 using a literature review, client file audit, and expert consultative committee process in order to devise scale content, structure, and check clinical validity and utility. Interrater reliability was examined between speech-language pathologists (SLPs), other allied health professionals (AHPs), and parents of 48 children with CP. The scale was revised and a clinical reasoning prompt sheet added, then trialled again for 42 children. The result was a five-level system with descriptors and decision-making guides for classification of functional expressive communication for children with CP. RESULTS: Overall interrater reliability was excellent for the final FCCS, intraclass correlation coefficient=0.97 (95% confidence interval 0.95 to 0.98). Kappa values were 0.94 between SLPs and AHPs, 0.59 between SLPs and parents, and 0.60 between AHPs and parents. INTERPRETATION: The FCCS is a reliable tool for describing functional communication in young children with CP, appropriate for use by SLPs, other AHPs, and parents of children with CP.

[PMID: 27087436](#)

13. J Paediatr Child Health. 2016 Apr 18. doi: 10.1111/jpc.13163. [Epub ahead of print]

Medical service use in children with cerebral palsy: The role of child and family factors characteristics.

Meehan EM, Reid SM, Williams KJ, Freed GL, Sewell JR, Reddihough DS.

AIM: The aim of the study was to investigate the patterns of medical service use in children with cerebral palsy (CP), taking into account child and family characteristics. METHODS: Nine hundred and one parents and carers of children registered with the Victorian CP Register were invited to complete a survey. Participants were asked about their child's appointments with general practitioners and public and private paediatric medical specialists over the preceding 12 months. Information on family characteristics and finances was also collected. Data on CP severity and complexity were extracted from the CP Register. RESULTS: Three hundred and fifty parents and carers (39%) participated. Of these, 83% reported that their child had ≥ 1 appointment with a general practitioner over the preceding 12 months, while 84% had ≥ 1 appointment with a public or private paediatric medical specialist. Overall, 58% of children saw 2-5 different paediatric medical specialists, while 9% had appointments with ≥ 6 clinicians. Children with severe and complex CP were more likely to have had ≥ 1 appointment with a

publically funded paediatric medical specialist and had seen a greater number of different clinicians over the study period. Family characteristics were not associated with service use. CONCLUSIONS: Children with CP are managed by a number of paediatric medical specialists, and they continue to see a range of specialists throughout adolescence. In Victoria, differences in service use are not based on family characteristics; instead the highest service users are those with severe and complex CP. For this group, care co-ordination and information sharing between treating clinicians are important, if gaps in care are to be avoided.

[PMID: 27088437](#)

14. *Pediatr Phys Ther.* 2016 Spring;28(1):70. doi: 10.1097/PEP.000000000000218.

Commentary on "Comparative Effectiveness Research and Children With Cerebral Palsy: Identifying a Conceptual Framework and Specifying Measures".

Wright FV, Dalziel B.

[PMID: 27088689](#)

15. *Pediatr Phys Ther.* 2016 Spring;28(1):58-69. doi: 10.1097/PEP.000000000000203.

Comparative Effectiveness Research and Children With Cerebral Palsy: Identifying a Conceptual Framework and Specifying Measures.

Gannotti ME, Law M, Bailes AF, O'Neil ME, Williams U, DiRezze B; Expert Panel.

PURPOSE: A step toward advancing research about rehabilitation service associated with positive outcomes for children with cerebral palsy is consensus about a conceptual framework and measures. **METHODS:** A Delphi process was used to establish consensus among clinicians and researchers in North America. **RESULTS:** Directors of large pediatric rehabilitation centers, clinicians from large hospitals, and researchers with expertise in outcomes participated (N = 18). Andersen's model of health care utilization framed outcomes: consumer satisfaction, activity, participation, quality of life, and pain. Measures agreed upon included Participation and Environment Measure for Children and Youth, Measure of Processes of Care, PEDI-CAT, KIDSCREEN-10, PROMIS Pediatric Pain Interference Scale, Visual Analog Scale for pain intensity, PROMIS Global Health Short Form, Family Environment Scale, Family Support Scale, and functional classification levels for gross motor, manual ability, and communication. **CONCLUSIONS:** Universal forms for documenting service use are needed. Findings inform clinicians and researchers concerned with outcome assessment.

[PMID: 27088688](#)

Prevention and Cure

16. Ann Epidemiol. 2016 Mar 22. pii: S1047-2797(16)30068-0. doi: 10.1016/j.annepidem.2016.02.012. [Epub ahead of print]

Population impact of preterm birth and low birth weight on developmental disabilities in US children.

Schieve LA, Tian LH, Rankin K, Kogan MD, Yeargin-Allsopp M, Visser S, Rosenberg D.

PURPOSE: Although previous studies demonstrate associations between adverse perinatal outcomes and developmental disabilities (DDs), study of population impacts is limited. **METHODS:** We computed relative risks adjusted (aRRs) for sociodemographic factors and component and summary population attributable fractions (PAFs) for associations between very low birth weight (VLBW, all preterm births), moderately low birth weight (MLBW) + Preterm, MLBW at term, and normal birth weight (NBW) + Preterm and seven DDs (cerebral palsy [CP], autism spectrum disorder [ASD], intellectual disability [ID], behavioral-conduct disorders, attention-deficit-hyperactivity disorder [ADHD], learning disability [LD], and other developmental delay) among children aged 3-17 years in the 2011-2012 National Survey of Children's Health. **RESULTS:** VLBW-Preterm, MLBW-Preterm and NBW-Preterm were strongly to moderately associated with CP (aRRs: 43.5, 10.1, and 2.2, respectively; all significant) and also associated with ID, ASD, LD, and other developmental delay (aRR ranges: VLBW-Preterm 2.8-5.3; MLBW-Preterm 1.9-2.8; and NBW-Preterm 1.6-2.3). Summary PAFs for preterm birth and/or LBW were 55% for CP, 10%-20% for ASD, ID, LD, and other developmental delay, and less than 5% for ADHD and behavioral-conduct disorders. Findings were similar whether we assessed DDs as independent outcomes or within mutually exclusive categories accounting for DD co-occurrence. **CONCLUSIONS:** Preterm birth has a sizable impact on child neurodevelopment. However, relative associations and population impacts vary widely by DD type.

[PMID: 27085382](#)

17. Dev Med Child Neurol. 2016 May;58(5):424. doi: 10.1111/dmcn.13121.

Stem cell therapy for cerebral palsy.

Dan B.

[PMID: 27103186](#)

18. Dev Med Child Neurol. 2016 Apr 21. doi: 10.1111/dmcn.13137. [Epub ahead of print]

Sex differences in cerebral palsy on neuromotor outcome: a critical review.

Romeo DM, Sini F, Brogna C, Albamonte E, Ricci D, Mercuri E.

Sex differences have been reported in children with cerebral palsy (CP), with males having a higher risk of developing CP, but it is not entirely clear whether sex may also affect the severity of motor impairment. The aim of the present study was to critically review the existing literature on sex influence on neuromotor outcome in children with CP. The published papers confirm that CP occurs more frequently in males than in females. Within different types of CP or individual level of impairment, however, there was limited evidence that sex also had an effect on their performance.

[PMID: 27098195](#)

19. *Pediatr Int.* 2016 Apr 16. doi: 10.1111/ped.13012. [Epub ahead of print]

Neurodevelopment of preterms born after IVF and spontaneous multiple pregnancies.

Ramoğlu M, Kavuncuoğlu S, Aldemir E, Yazar C, Eras Z.

AIM: To compare perinatal, neonatal characteristics and neurodevelopmental prognosis of preterm infants born after in vitro fertilization (IVF) and spontaneous multiple pregnancies, and to evaluate the factors affecting the neurodevelopmental outcome at 24-36 months. **METHODS:** A total of 125 preterm infants, 65 from spontaneous and 60 from IVF multiple pregnancies were evaluated in terms of neurodevelopmental outcome at the age of 24-36 months. The mean maternal age, chronic maternal disease, birth weight, gestational week, gender, APGAR score, neonatal intensive care unit admission, presence of congenital anomalies, referral to follow-ups, rehospitalization and socioeconomic levels were investigated. The neurological examination, Gross Motor Function Classification System and Denver II Developmental Screening Test were performed. Local ethics committee approved the study (12.10.2010; no: 305). **RESULTS:** The mean maternal age, chronic maternal illness, pregnancy related diseases, 5th minute APGAR score, the rate of cesarean delivery and referral to follow-ups were significantly higher in the IVF group ($p < 0.05$). Neurological examination revealed increased muscle tone in 2 (1.6%) children and only one case in the IVF group had cerebral palsy. A total of 26 (20.8%) subjects, 17 (26.2%) and 9 (15%) from spontaneous and IVF group had abnormal Denver II findings respectively; mostly in language (8.8%) and personal-social (8.0%) development. **CONCLUSION:** Morbidity, length of hospitalization and neurodevelopmental outcomes of preterm infants born after spontaneous and IVF multiple pregnancies are comparable. Delays in language and personal-social development were the most common neurodevelopmental abnormalities. Even in similar socioeconomic conditions; parents in IVF group were more compliant to follow-ups.

[PMID: 27083992](#)

20. *Pediatr Phys Ther.* 2016 Spring;28(1):7-14. doi: 10.1097/PEP.0000000000000221.

Description of Primary and Secondary Impairments in Young Children With Cerebral Palsy.

Jeffries L, Fiss A, McCoy SW, Bartlett DJ.

PURPOSE: We describe primary and secondary impairments in young children with cerebral palsy (CP); report differences in impairments on the basis of Gross Motor Function Classification System (GMFCS), age, and sex; and examine the extent that individual impairments account for the construct of primary and secondary impairments. **METHODS:** Participants included 429 children with CP (242 [56%] male; 1½ to 5 years) representing all GMFCS levels. Reliable assessors collected primary and secondary impairment data using clinical measures. Analyses included descriptive statistics, comparisons among GMFCS, age, and sex, and factor analysis. **RESULTS:** Young children with CP present with primary and secondary impairments. Significant differences in impairments occur among some GMFCS levels and age groups but not sex groups. Postural stability contributed most to primary impairments and strength to secondary impairments. **CONCLUSION:** Young children with CP across GMFCS levels may have already developed secondary impairments that should be addressed within therapy services.

[PMID: 27088676](#)