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Interventions and Management

1. *Acta Orthop Bras.* 2015 Jul-Aug;23(4):219-22. doi: 10.1590/1413-78522015230400967.

SHUEE on the evaluation of upper limb in cerebral palsy.

Tedesco AP, Nicolini-Panisson RD, de Jesus A.

OBJECTIVE: To demonstrate the use of the tool for evaluation of spastic upper limb SHUEE (Shriners Hospital Upper Extremity Evaluation) in the evaluation of upper limb in cerebral palsy (CP) and its ability to detect changes after surgical treatment of identified deformities. **METHODS:** 19 patients with spastic hemiplegic CP had their upper limb evaluated by SHUEE. Five patients underwent surgical treatment of deformities detected and performed the test at one year postoperatively.

RESULTS: The mean age was 9.02 years old; 18 patients were classified as level I GMFCS and one patient as level II. At baseline, the mean spontaneous functional analysis was 59.01; dynamic positional analysis was 58.05 and grasp-and-release function, was 91.21. In the postoperative period the scores were, respectively, 65.73, 69.62 and 100, showing an improvement of 3.5% in the spontaneous functional analysis and of 44.8% in dynamic positional analysis. **CONCLUSIONS:** SHUEE is a tool for evaluation of spastic upper limb in cerebral palsy that helps in the specific diagnosis of deformities, indication of treatment and objective detection of results after surgical treatment. Level of Evidence IV, Case Series.

[PMID: 26327806](#)

2. *Gait Posture.* 2015 Aug 18. pii: S0966-6362(15)00795-X. doi: 10.1016/j.gaitpost.2015.08.003. [Epub ahead of print]

Self-paced versus fixed speed walking and the effect of virtual reality in children with cerebral palsy.

Sloot LH, Harlaar J, van der Krogt MM.

While feedback-controlled treadmills with a virtual reality could potentially offer advantages for clinical gait analysis and training, the effect of self-paced walking and the virtual environment on the gait pattern of children and different patient groups remains unknown. This study examined the effect of self-paced (SP) versus fixed speed (FS) walking and of walking with and without a virtual reality (VR) in 11 typically developing (TD) children and nine children with cerebral palsy (CP). We found that subjects walked in SP mode with twice as much between-stride walking speed variability ($p < 0.01$), fluctuating over multiple strides. There was no main effect of SP on kinematics or kinetics, but small interaction effects between SP and group (TD versus CP) were found for five out of 33 parameters. This suggests that children with CP might need more time to familiarize to SP walking, however, these differences were generally too small to be clinically relevant. The VR environment did not affect the kinematic or kinetic parameters, but walking with VR was rated as more similar to overground walking by

both groups ($p=0.02$). The results of this study indicate that both SP and FS walking, with and without VR, can be used interchangeably for treadmill-based clinical gait analysis in children with and without CP.

[PMID: 26338532](#)

3 Dev Med Child Neurol. 2015 Aug 28. doi: 10.1111/dmcn.12892. [Epub ahead of print]

Identification of joint patterns during gait in children with cerebral palsy: a Delphi consensus study.

Nieuwenhuys A, Öunpuu S, Van Campenhout A, Theologis T, De Cat J, Stout J, Molenaers G, De Laet T, Desloovere K.

AIM: This study aims to achieve an international expert consensus on joint patterns during gait for children with cerebral palsy (CP) by means of Delphi surveys. METHOD: In Stage 1, seven local experts drafted a preliminary proposal of kinematic patterns for each lower limb joint in the sagittal, coronal, and transverse plane. In Stage 2, 13 experts from eight gait laboratories (four in the USA and four in Europe), participated in a Delphi consensus study. Consensus was defined by a pre-set cut-off point of 75% agreement among participants. RESULTS: After the first stage, 44 joint patterns were presented in a first survey and 29 patterns reached consensus. Consensus improved to 47 out of 48 patterns in the third survey. Only one pattern, 'abnormal knee pattern during loading response', did not reach consensus. The expert panel agreed to define six patterns for the knee during swing, most of them representing characteristics of a stiff knee pattern. INTERPRETATION: The defined joint patterns can support clinical reasoning for children with CP as joint patterns during gait might be linked to different treatment approaches. Automating the classification process and incorporating additional trunk, foot, and electromyography features should be prioritized for the near future.

[PMID: 26330338](#)

4. Bone Joint J. 2015 Sep;97-B(9):1291-5. doi: 10.1302/0301-620X.97B9.35655.

The head-shaft angle of the hip in early childhood: a comparison of reference values for children with cerebral palsy and normally developing hips.

van der List JP, Witbreuk MM, Buizer AI, A van der Sluijs J.

The recognition of hips at risk of displacement in children with cerebral palsy (CP) is a difficult problem for the orthopaedic surgeon. The Gross Motor Function Classification System (GMFCS) and head-shaft angle (HSA) are prognostic factors for hip displacement. However, reference values for HSA are lacking. This study describes and compares the development of HSA in normal hips and children with CP. We selected 33 children from a retrospective cohort with unilateral developmental dysplasia of the hip (DDH) (five boys, 28 girls) and 50 children (35 boys, 15 girls) with CP with GMFCS levels II to V. HSA of normal developing hips was measured at the contralateral hip of unilateral DDH children (33 hips) and HSA of CP children was measured in both hips (100 hips). Measurements were taken from the radiographs of the children at age two, four and seven years. The normal hip HSA decreased by 2° per year ($p < 0.001$). In children with CP with GMFCS levels II and III HSA decreased by 0.6° ($p = 0.046$) and 0.9° ($p = 0.049$) per year, respectively. The HSA did not alter significantly in GMFCS levels IV and V. Between the ages of two and eight years, the HSA decreases in normal hips and CP children with GMFCS level, II to III but does not change in GMFCS levels IV to V. As HSA has a prognostic value for hip displacement, these reference values may help the orthopaedic surgeon to predict future hip displacement in children with CP. Cite this article: Bone Joint J 2015;97-B:1291-5.

[PMID: 26330599](#)

5. J Biomech. 2015 Aug 14. pii: S0021-9290(15)00443-1. doi: 10.1016/j.jbiomech.2015.07.046. [Epub ahead of print]

Kinetic comparison of walking on a treadmill versus over ground in children with cerebral palsy.

van der Krogt MM, Sloot LH, Buizer AI, Harlaar J.

Kinetic outcomes are an essential part of clinical gait analysis, and can be collected for many consecutive strides using instrumented treadmills. However, the validity of treadmill kinetic outcomes has not been demonstrated for children with cerebral palsy (CP). In this study we compared ground reaction forces (GRF), center of pressure, and hip, knee and ankle moments, powers and work, between overground (OG) and self-paced treadmill (TM) walking for 11 typically developing (TD) children and 9 children with spastic CP. Considerable differences were found in several outcome parameters. In TM, subjects demonstrated lower ankle power generation and more absorption, and increased hip moments and work. This shift from ankle to hip strategy was likely due to a more backward positioning of the hip and a slightly more forward trunk lean. In mediolateral direction, GRF and hip and knee joint moments were increased in TM due to wider step width. These findings indicate that kinetic data collected on a TM cannot be readily compared with OG data in TD children and children with CP, and that treadmill-specific normative data sets should be used when performing kinetic gait analysis on a treadmill.

[PMID: 26315918](#)

6. Res Dev Disabil. 2015 Aug 25;47:39-47. doi: 10.1016/j.ridd.2015.08.012. [Epub ahead of print]

Reliability and validity of the Four Square Step Test in children with cerebral palsy and Down syndrome.

Bandong AN, Madriaga GO, Gorgon EJ.

Little is known about the measurement properties of clinical tests of stepping in different directions for children with cerebral palsy (CP) and Down syndrome (DS). The ability to step in various directions is an important balance skill for daily life. Standardized testing of this skill can yield important information for therapy planning. This observational methodological study was aimed at defining the relative and absolute reliability, minimal detectable difference, and concurrent validity with the Timed Up-&-Go (TUG) of the Four Square Step Test (FSST) for children with CP and DS. Thirty children, 16 with CP and 14 with DS, underwent repeat testing 2 weeks apart on the FSST by 3 raters. TUG was administered on the second test occasion. Intraclass correlation coefficients (ICC [1,1] and [3,1]) with 95% confidence intervals, standard error of measurement (SEM), minimal detectable difference (MDD) and the Spearman rank correlation coefficient were computed. The FSST demonstrated excellent interrater reliability (ICC=.79; 95% CI: .66, .89) and high positive correlation with the TUG ($r=.74$). Test-retest reliability estimates varied from moderate to excellent among the 3 raters (.54, .78 and .89 for raters 1, 2 and 3, respectively). SEM and MDD were calculated at 1.91s and 5.29s, respectively. Scores on the FSST of children with CP and DS between 5 and 12 years of age are reliable and valid.

[PMID: 26318393](#)

7. Am J Phys Med Rehabil. 2015 Sep 2. [Epub ahead of print]

Efficacy of Predicting Videofluoroscopic Results in Dysphagic Patients with Severe Cerebral Palsy Using the Mann Assessment of Swallowing Ability.

Su CL, Chen SL, Tsai SW, Tseng FF, Chang SC, Huang YH, Lin YH.

BACKGROUND: The aim of this study was to evaluate the efficacy of the Mann Assessment of Swallowing Ability (MASA) to predict the results of videofluoroscopic swallowing studies. **METHOD:** Children with cerebral palsy with suspicion of aspiration were enrolled. The Functional Dysphagia Scale (FDS) was used to quantify the swallowing dysfunction in videofluoroscopic swallowing studies. Correlation between MASA and FDS scores and differences in these two scores between aspirators and nonaspirators and between silent and overt aspirators were analyzed. **RESULTS:** Sixteen patients, level IV or V according the Gross Motor Function Classification System, were included. Thirteen patients (81.3%) had aspiration, and 9 (69.2%) were silent aspirators. The MASA scores between aspirators and nonaspirators were not different (median values of total scores, 107.0 and 94.0). The aspirators had higher FDS pharyngeal subtotal scores ($P = 0.024$) and slightly higher total FDS scores ($P = 0.059$). The differences in these two scales between silent and overt

aspirators were not significant. Correlation coefficients between oral phase subtotal FDS scores and MASA subtotal scores in oral preparation, oral phase, and oral phase total were -0.713 ($P < 0.05$), -0.428 ($P = 0.098$), and -0.665 ($P < 0.05$), respectively. No correlation was found between the pharyngeal subtotal scores in these two scales. **CONCLUSION:** MASA was not useful in differentiating aspirators and nonaspirators and between silent and overt aspirators in severely disabled cerebral palsy, but it could predict oral dysfunction in videofluoroscopic swallowing studies.

[PMID: 26334418](#)

8. Arch Phys Med Rehabil. 2015 Aug 27. pii: S0003-9993(15)01100-4. doi: 10.1016/j.apmr.2015.08.417. [Epub ahead of print]

Effectiveness of oral baclofen for spasticity in children with cerebral palsy.

Navarrete-Opazo A, Gonzalez W, Nahuelhual P.

OBJECTIVE: To systematically review the effectiveness of oral baclofen versus placebo or other antispastic oral medication in the areas of body function, activity, and quality of life in children with spastic CP ≤ 18 years. **STUDY SELECTION:** randomized or not randomized controlled clinical trials (RCT) and cohort studies were selected, comparing the effect of any dose of oral baclofen with no treatment, placebo, or another antispastic medication in children with spastic CP. **DATA SOURCES:**

The Cochrane library, Health Science Databases, DARE, Lilacs, Embase, Medline, OTSeeker, PEDro, PsycINFO, SpeechBITE, ScienceDirect, Scopus, Trip, clinicaltrial.gov, Google scholar, OpenGrey and manual search. **DATA**

EXTRACTION: Following the Cochrane Handbook for Systematic Reviews of Interventions Guidelines, two reviewers independently classified articles through October 2014.

DATA SYNTHESIS: Six RCT were selected involving 130 participants. Studies show a great variability in motor classification, dosage of baclofen, and outcomes measurements. There is conflicting evidence regarding the effectiveness of oral baclofen in reducing muscle tone, improving motor function or the level of activity. The overall methodological quality of the studies was low. Main qualitative deficiencies correspond to serious risk of bias, inconsistency of results, unpowered sample size, and publication bias. **CONCLUSIONS:** There are insufficient data to support or refute the use of oral baclofen in children with spastic CP. **PROSPERO 2014: CRD42014013658.**

[PMID: 26321489](#)

9. Braz J Phys Ther. 2015 Sep 1:0. [Epub ahead of print]

Moderating effect of the environment in the relationship between mobility and school participation in children and adolescents with cerebral palsy.

Furtado SR, Sampaio RF, Kirkwood RN, Vaz DV, Mancini MC.

BACKGROUND: The literature demonstrates that the social participation of children with disabilities is influenced by both their functional skills repertoire and environmental factors. However, it is not yet known whether the effect of functional limitations on social participation is minimized or enhanced by the environmental facilitators and barriers. This study aimed to test this hypothesis.

OBJECTIVE: To investigate the moderating effect of environmental factors in the relationship between mobility and school participation of children and adolescents with cerebral palsy (CP).

METHOD: Participants were 102 elementary school children and adolescents with CP, aged 6 to 17 years, classified as levels I, II, and III according to the Gross Motor Classification System, along with their parents or caregivers and teachers. School participation and parents' perceptions of barriers were evaluated using the School Function Assessment and the Craig Hospital Inventory of Environmental Factors (CHIEF), respectively. **RESULTS:** The regression model failed to reveal a moderating effect of environmental factors in the relationship between mobility and school participation. While mobility was a strong predictor of participation, environmental factors demonstrated a weak predictive effect on the latter. The CHIEF subscale school/work showed the factors which were greatest barrier to children's participation, while the subscale attitude/support had the least impact. **CONCLUSION:** The absence of moderation on the tested relationship suggests that, when investigated under the negative perspective of environmental barriers, the contextual factors do not modify the relationship between mobility and school participation.

Factors specific to the school environment might add to the present study's results regarding the effect of school participation in this population.

[PMID: 26331738](#)

10. Dev Med Child Neurol. 2015 Aug 28. doi: 10.1111/dmcn.12865. [Epub ahead of print]

Decreasing prevalence in cerebral palsy: a multi-site European population-based study, 1980 to 2003.

Sellier E, Platt M, Andersen GL, Krägeloh-Mann I, De La Cruz J, Cans C; Surveillance of Cerebral Palsy Network. Collaborators (35)

AIM: To monitor the trends in prevalence of cerebral palsy (CP) by birthweight in Europe, 1980 to 2003. METHOD: Data were collated from 20 population-based registers contributing to the Surveillance of Cerebral Palsy in Europe database. Trend analyses were conducted in four birthweight groups: <1000g (extremely low birthweight [ELBW]); 1000 to 1499g (very low birthweight [VLBW]); 1500 to 2499g (moderately low birthweight [MLBW]); and >2499g (normal birthweight [NBW]). RESULTS: The overall prevalence of CP decreased from 1.90 to 1.77 per 1000 live births, $p < 0.001$, with a mean annual fall of 0.7% (95% confidence interval [CI] -0.3% to -1.0%). Prevalence in NBW children showed a non-significant trend from 1.17 to 0.89 per 1000 live births ($p = 0.22$). Prevalence in MLBW children decreased from 8.5 to 6.2 per 1000 live births ($p < 0.001$), but not linearly. Prevalence in VLBW children also declined from 70.9 to 35.9 per 1000 live births ($p < 0.001$) with a mean annual fall of 3.4% (95% CI -2.4% to -4.3%). Prevalence in ELBW children remained stable, at a mean rate of 42.4 per 1000 live births. INTERPRETATION: The decline in prevalence of CP in children of VLBW continues, and confirms that previously reported. For the first time, there is also a significant decline among those of MLBW, resulting in a significant overall decrease in the prevalence of CP.

[PMID: 26330098](#)

11. Dev Med Child Neurol. 2015 Sep 2. doi: 10.1111/dmcn.12885. [Epub ahead of print]

Declining prevalence of cerebral palsy in Europe: good news?

Smithers-Sheedy H

This commentary is on the original article by Sellier et al.

[PMID: 26331792](#)

12. BMC Pediatr. 2015 Sep 4;15(1):111.

Introduction of the gross motor function classification system in Venezuela - a model for knowledge dissemination.

Löwing K, Arredondo YC, Tedroff M, Tedroff K.

BACKGROUND: A current worldwide common goal is to optimize the health and well-being of children with cerebral palsy (CP). In order to reach that goal, for this heterogeneous group, a common language and classification systems are required to predict development and offer evidence based interventions. In most countries in Africa, South America, Asia and Eastern Europe the classification systems for CP are unfamiliar and rarely used. Education and implementation are required. The specific aims of this study were to examine a model in order to introduce the Gross Motor Function Classification System (GMFCS-E&R) in Venezuela, and to examine the validity and the reliability. METHODS: Children with CP, registered at a National child rehabilitation centre in Venezuela, were invited to participate. The Spanish version of GMFCS-E&R was used. The Wilson mobility scale was translated and used to examine the concurrent validity. A structured questionnaire, comprising aspects of mobility and gross motor function, was constructed. In addition, each child was filmed. A paediatrician in Venezuela received supervised self-education in GMFCS-E&R and the Wilson mobility scale. A Swedish student was educated in GMFCS-E&R and the Wilson mobility scale prior to visiting Venezuela. In Venezuela, all children were classified and scored by the paediatrician and student independently. An experienced paediatric physiotherapist (PT) in Sweden made independent

GMFCS-E&R classifications and Wilson mobility scale scorings, accomplished through merging data from the structured questionnaire with observations of the films. Descriptive statistics were used and reliability was presented with weighted Kappa (Kw). Spearman's correlation coefficient was calculated to explore the concurrent validity between GMFCS-E&R and Wilson mobility scale. RESULTS: Eighty-eight children (56 boys), mean age 10 years (3-18), with CP participated. The inter-rater reliability of GMFCS-E&R between; the paediatrician and the PT was Kw = 0.85 (95 % CI: 0.75-0.88), the PT and student was Kw = 0.91 (95 % CI: 0.86-0.95) and the paediatrician and student was Kw = 0.85 (95 % CI: 0.79-0.90). The correlations between GMFCS-E&R and Wilson mobility scale were high $r_s = 0.94-0.95$ ($p < 0.001$). CONCLUSIONS: In a setting with no previous knowledge of GMFCS-E&R, the model with education, supervised self-education and practice was efficient and resulted in very good reliability and validity.

[PMID: 26341265](#)

Prevention and Cure

13. J Gynecol Obstet Biol Reprod (Paris). 2015 Aug 27. pii: S0368-2315(15)00169-6. doi: 10.1016/j.jgyn.2015.06.022. [Epub ahead of print]

[Intrapartum asphyxia: Risk factors and short-term consequences]. [Article in French]

Bouiller JP, Dreyfus M, Mortamet G, Guillois B, Benoist G.

Intrapartum asphyxia is a rare yet serious complication during labor with immediate consequences and possible long-term neurological impairment. The international Cerebral Palsy Task Force established criteria that attribute a cerebral palsy to intrapartum asphyxia: metabolic acidemia measured at birth with $pH < 7$ and base deficit ≥ 12 mmol/L. OBJECTIVE: To determine the risk factors of an intrapartum asphyxia occurring in term live births, to evaluate the short-term consequences. METHODS: Our retrospective study included all births between 2002 and 2010 in a level 3 maternity of a university hospital center. Inclusion criteria were those of the Cerebral Palsy Task Force associated with a gestational age ≥ 34 weeks of gestation. We studied the conventional markers of intrapartum asphyxia: Apgar score at 5 minutes, abnormal cardiotocographic recordings whether they occurred after a sentinel hypoxic event or not before and during labor. The duration of expulsive efforts, the amniotic fluid aspects, the delivery mode as well as the preexisting pregnancy pathologies were also evaluated. On the other hand, we studied the short-term consequences at the newborns: death, multiorgan failure and especially the occurring of a neonatal encephalopathy using Sarnat and Sarnat staging. RESULTS: One hundred and twenty-nine newborns (0.43%) out of 29,416 live births had a $pH < 7$ of whom only 82 (0.27%) presented a real intrapartum asphyxia and were included in this study. A preexisting pregnancy pathology was found in 22% of the women. Hypoxic events were noted in only 9/82 of the cases. Abnormal cardiotocographic recordings were present in 97.6% of the cases. The duration of expulsive efforts as well as the amniotic fluid aspects did not interfere with the occurring of a metabolic acidemia. Caesarean rate was at 46.3% and instrumental extraction rate was at 34.1%. Thirty-eight newborns (46.3%) were admitted in neonatal intensive care in which we noted 3 deaths (3.65%), 2 multiorgan failures (2.4%) and 17 neonatal encephalopathy (20.7%). The pH value seemed to influence the occurring of an encephalopathy: 50% when $pH < 6.9$ vs. 13.6% when $pH \geq 6.9$ ($P = 0.0013$), as well as for the base deficit: 50% when $BD < -18$ vs. 15.7% when $BD \geq -18$ ($P = 0.0068$). Apgar score at 5 minutes also seemed predictive for a neonatal encephalopathy: 100% when < 4 , 46% between 4 and 6 and 11% when > 6 ($P < 0.001$). CONCLUSIONS: Our results showed an intrapartum asphyxia rate half the one widely recorded of 0.5% of total live births. Our study also validates the commonly used markers to evaluate a high risk of an early neonatal encephalopathy. This study should be continued with the evaluation of hypoxia long-term consequences on the psychomotor development of these kids and especially the occurring of cerebral palsy.

[PMID: 26321609](#)

14. J Obstet Gynaecol Can. 2015 Jun;37(6):508-16.

Perinatal Outcome in 1515 Cases of Prolonged Second Stage of Labour in Nulliparous Women.

Hunt JC, Menticoglou SM.

OBJECTIVE: To examine perinatal outcomes among nulliparous women with a second stage of labour lasting more than three hours. METHODS: We conducted a retrospective review of all nulliparous women over a 14-year period who had a term, live, singleton, cephalic fetus ≥ 2500 g and who had a second stage of labour lasting at least three hours. Outcome measures

included five-minute Apgar score < 7, cord arterial pH < 7.10, admission to the NICU, neonatal seizures, and neonatal death. Rates of serious long-term neurologic morbidity were also analyzed. Outcomes were compared with those of a similar cohort of women who delivered after less than three hours in the second stage.

RESULTS: During the study period, 1515 women met the inclusion criteria. The majority of women (67%) delivered vaginally, after up to 10 hours in the second stage of labour. The overall rate of Caesarean section was low (15.7%). The rate of permanent neurologic impairment was 2.6 per 1000 deliveries. **CONCLUSION:** Among nulliparous women, 84% were spared a possibly difficult Caesarean section in the second stage of labour or a potentially difficult operative vaginal delivery by allowing a longer second stage. However, surviving neonates had a higher risk of permanent neurologic handicap. Our study indicates that the optimal management of the second stage of labour remains controversial. Résumé.

[PMID: 26334603](#)

15. N Engl J Med. 2015 Sep 3;373(10):946-53. doi: 10.1056/NEJMra1505261.

Prenatal Factors in Singletons with Cerebral Palsy Born at or near Term.

Nelson KB, Blair E.

No Abstract Available

[PMID: 26332549](#)