NEWS
Cerebral Palsy Research

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Interventions and Management

1. Reproducibility of Task-Oriented Bimanual and Unimanual Strength Measurement in Children with Unilateral Cerebral Palsy.
Geijen M, Rameckers E, Schnackers M, Bastiaenen C, Gordon A, Speth L, Smeets R.

Phys Occup Ther Pediatr. 2018 Nov 13:1-13. doi: 10.1080/01942638.2018.1527426. [Epub ahead of print]

AIM: To examine reproducibility of the arm-hand strength measured while performing the bimanual crate task and the unimanual pitcher task. METHODS: 105 children diagnosed with unilateral Cerebral Palsy, aged between 6 and 18 years, participated in this study. The test-retest reliability of the force generated during bimanual crate task and unimanual pitcher task of the Task-oriented Arm-hAnd Capacity instrument was investigated using intraclass correlation two-way random model with absolute agreement. The intraclass correlations were calculated for two age groups (6-12 and 13-18 years old). RESULTS: The results showed good test-retest reliability for the crate and pitcher task with the non-affected hand for both age groups. The results of the pitcher task for the affected hand showed moderate test-retest reliability for both age groups. CONCLUSION: The Task-oriented Arm-hAnd Capacity instrument has moderate to good test-retest reliability. It is a simple and objective instrument to assess task-oriented strength in children with unilateral cerebral palsy.

PMID: 30422038

2. The Effect of Functional Home-Based Strength Training Programs on the Mechano-Morphological Properties of the Plantar Flexor Muscle-Tendon Unit in Children With Spastic Cerebral Palsy.
Kruse A, Schranz C, Svehlik M, Tilp M.

Pediatr Exerc Sci. 2018 Nov 14:1-10. doi: 10.1123/pes.2018-0106. [Epub ahead of print]

PURPOSE: The purpose of this study was to investigate the effects of functional progressive resistance training (PRT) and high-intensity circuit training (HICT) on the mechano-morphological properties of the plantar flexor muscle-tendon unit in children with spastic cerebral palsy. METHODS: Twenty-two children (12.8 [2.6] y old, Gross Motor Function Classification System levels I/II = 19/3) were randomly assigned to either a PRT group or an HICT group. The interventions consisted of functional lower limb exercises, which were performed at home 3 times per week for 8 weeks. Measurements at baseline, preintervention, postintervention, and follow-up were taken to assess ankle joint range of motion and the properties of the gastrocnemius medialis, vastus lateralis, rectus femoris, and Achilles tendon (eg, thickness, strength, stiffness). RESULTS: Despite a nonsignificant increase in active torque in the HICT group, neither gastrocnemius medialis morphology nor Achilles tendon properties were significantly altered after the interventions. Vastus lateralis thickness increased following PRT only.

CONCLUSIONS: Functional home-based strength training did not lead to significant changes at the muscular level in children with cerebral palsy. We therefore assume that a more specific stimulus of higher intensity combined with a longer training duration might be necessary to evoke changes in muscles and tendons in individuals with cerebral palsy.

PMID: 30424684

3. Outcome of Infants with Therapeutic Hypothermia after Perinatal Asphyxia and Early-Onset Sepsis.
Hakobyan M, Dijkman KP, Laroche S, Naulaers G, Rijken M, Steiner K, van Straaten HLM, Swarte RMC, Ter Horst HJ, Zecic A, Zonnenberg IA, Groenendaal F.

Neonatology. 2018 Nov 12;115(2):127-133. doi: 10.1159/000493358. [Epub ahead of print]

BACKGROUND: Animal models suggest that neuroprotective effects of therapeutic hypothermia (TH) after perinatal asphyxia are reduced in infants with early-onset sepsis. OBJECTIVES: To assess the outcome of infants with perinatal asphyxia, neonatal encephalopathy, and TH in the presence of early-onset sepsis. METHODS: In a retrospective cohort of 1,084 infants with perinatal asphyxia and TH, the outcome of 42 infants (gestational age 36.1-42.6 weeks and birth weight 2,280-5,240 g) with proven sepsis (n = 14) and probable sepsis (n = 28) was analyzed. Death, cerebral palsy, or a delayed development at 2 years was considered an adverse outcome. RESULTS: Sepsis was caused mostly by group B streptococci (n = 17), other Gram-positive bacteria (n = 5), and Candida albicans (n = 1). Of the 42 infants, 9 (21.4%) died, and 5 (11.9%) showed impairments on follow-up. The outcome is comparable to the previously reported outcome of infants with TH without early-onset sepsis. CONCLUSION: A good outcome was reported in the majority of infants with perinatal asphyxia, TH, and early-onset sepsis. Cooling should not be withheld from these infants.

PMID: 30419568

4. Greater Visceral Fat but No Difference in Measures of Total Body Fat in Ambulatory Children With Spastic Cerebral Palsy Compared to Typically Developing Children.
Whitney DG, Singh H, Zhang C, Miller F, Modlesky CM.

J Clin Densitom. 2018 Sep 22. pii: S1094-6950(18)30187-2. doi: 10.1016/j.jocd.2018.09.006. [Epub ahead of print]

BACKGROUND: Individuals with cerebral palsy (CP) are at increased risk for obesity and obesity-related complications. Studies of total body fat in those with CP are inconsistent and studies of abdominal fat are lacking in children with CP. The objective of this study was to determine if ambulatory children with spastic CP have greater central adiposity compared to typically developing children. METHODOLOGY: Eighteen ambulatory children with spastic CP (n = 5 girls; 8.6 ± 2.9 yr) and 18 age-, sex-, and race-matched typically developing children (controls; 8.9 ± 2.1 yr) participated in this cross-sectional study. Children with CP were classified as I or II using the Gross Motor Function Classification System. Dual-energy X-ray absorptiometry assessed body composition, including total body, trunk and abdominal fat mass, fat-free mass, fat mass index (FMI), and fat-free mass index (FFMI). RESULTS: There were no group differences in fat mass, fat-free mass, FMI, and FFMI in the total body, fat mass, fat-free mass, and FFMI in the trunk, or fat mass, visceral fat mass, and subcutaneous fat mass in the abdomen ($p > 0.05$). Compared to controls, children with CP had higher trunk FMI, abdominal FMI, and visceral FMI ($p < 0.05$). Although marginally insignificant ($p = 0.088$), children with CP had higher subcutaneous FMI. CONCLUSIONS: Ambulatory children with spastic CP have elevated central adiposity, especially in the visceral region, despite no differences in measures of total body fat. How this relates to cardiometabolic disease progression in those with CP requires further investigation.

PMID: 30425006

5. Registered nurses' knowledge and care practices regarding patients with dysphagia in Saudi Arabia.
Khoja MA.

Int J Health Care Qual Assur. 2018 Oct 8;31(8):896-909. doi: 10.1108/IJHCQA-06-2017-0106.

PURPOSE: The purpose of this paper is to assess the knowledge and practices of nursing staff caring for patients with dysphagia to determine any needs for further education programmes. DESIGN/METHODOLOGY/APPROACH: A self-administered questionnaire with close-ended questions was completed by nurses at a tertiary hospital in Saudi Arabia to

measure the depth of their dysphagia knowledge. FINDINGS: From 316 potential participants, a sample of 174 nurses completed the questionnaire. The results revealed that the participants had partial theoretical and practical knowledge about nursing care for patients with dysphagia. Of interest, 78 per cent of the nurses reported that they had received less than 1 h of training in dysphagia, and only 4 per cent were aware of speech and language pathologists' role in dysphagia management. PRACTICAL IMPLICATIONS: As the medical professionals who have the most contact with the patients, nurses have a central role in the care of patients with dysphagia. This study provides information that will guide strategies for in-service nurse education dysphagia programmes. ORIGINALITY/VALUE: The estimated Saudi prevalence of dysphagia is high due to increased incidence of medical conditions commonly associated with dysphagia, such as stroke, cerebral palsy and traumatic brain injuries from traffic accidents. Nurses play a pivotal role in caring for these patients. However, little is known about the level of care patients with dysphagia require in Saudi hospital settings.

PMID: 30415619

6. Long-term outcomes of antegrade continence enema in children with chronic encopresis and incontinence: what is the optimal flush to use?
Ayub SS, Zeidan M, Larson SD, Islam S.

Pediatr Surg Int. 2018 Nov 13. doi: 10.1007/s00383-018-4416-0. [Epub ahead of print]

PURPOSE: Severe constipation and encopresis are significant problems in the pediatric population. Medical management succeeds in 50-70%; however, surgical considerations are necessary for the remainder such as the antegrade continence enema (ACE). The purpose of this study is to assess the long-term outcomes following the ACE procedure. METHODS: All patients undergoing an ACE over a 14-year period were included. Data on clinical conditions, treatments, and outcomes were collected. A successful outcome was defined as remaining clean with ≤ 1 accident per week. Comparative data were analyzed using the Fisher's exact test, Mann-Whitney U test, or Student's t test. RESULTS: There were 42 ACE patients, and overall, 79% had improvement in their bowel regimens. Encopresis rates decreased from 79 to 5% ($P < 0.001$). Admissions for cleanouts decreased from 52 to 19% ($P = 0.003$). All cases of Hirschsprung's, functional constipation and spina bifida were successful. Rates of success varied for other diseases such as slow-transit constipation (60%) and cerebral palsy (33%). A majority (85%) required a change in the enema composition for improvement. CONCLUSION: In our study, ACE reduced soiling, constipation, and need for fecal disimpaction. Higher volume saline flushes used once a day was the optimal solution and most preferred option. LEVEL OF EVIDENCE: Level 4 (retrospective case series or cohort).

PMID: 30426223

7. Transcranial Direct Current Stimulation in Pediatric Motor Disorders: A Systematic Review and Meta-analysis.
Saleem GT, Crasta JE, Slomine B, Cantarero GL, Suskauer SJ.

Arch Phys Med Rehabil. 2018 Nov 7. pii: S0003-9993(18)31446-1. doi: 10.1016/j.apmr.2018.10.011. [Epub ahead of print]

OBJECTIVE: To systematically examine the safety and effectiveness of transcranial direct current stimulation (tDCS) interventions in pediatric motor disorders. DATA SOURCES: PubMed, EMBASE, Cochrane, CINAHL, Web of Science, and ProQuest databases were searched from inception to August 2018. STUDY SELECTION: tDCS randomized controlled trials (RCTs), observational studies, conference proceedings and dissertations in pediatric motor disorders were included. Two authors independently screened articles based on predefined inclusion criteria. DATA EXTRACTION: Data related to participant demographics, intervention, and outcomes were extracted by two authors. Quality assessment was independently performed by two authors. DATA SYNTHESIS: Twenty-three studies involving a total of 391 participants were included. There was no difference in drop-out rates between active (1/144) and sham (1/144) tDCS groups, risk difference 0.0, 95% CI [-.05, .04]. Across studies, the most common adverse effects in the active group were tingling (17.2%), discomfort (8.02%), itching (6.79%), and skin redness (4%). Across 3 studies in children with cerebral palsy, tDCS significantly improved gait velocity (MD = .23; 95% CI [0.13, 0.34], $p < .0005$), stride length (MD = 0.10; 95% CI [0.05, 0.15], $p < .0005$), and cadence (MD = 15.7; 95% CI [9.72, 21.68], $p < .0005$). Mixed effects were found on balance, upper-extremity function, and overflow movements in dystonia. CONCLUSION: Based on the studies reviewed, tDCS is a safe technique in pediatric motor disorders and may improve some gait measures and involuntary movements. Research to date in pediatric motor disorders shows limited effectiveness in improving balance and upper-extremity function. tDCS may serve as a potential adjunct to pediatric rehabilitation; to better understand if tDCS is beneficial for pediatric motor disorders, more well-designed RCTs are needed.

PMID: 30414398

8. Effects of High-Definition and Conventional Transcranial Direct-Current Stimulation on Motor Learning in Children.
Cole L, Giuffre A, Ciechanski P, Carlson HL, Zewdie E, Kuo HC, Kirton A.

Front Neurosci. 2018 Oct 31;12:787. doi: 10.3389/fnins.2018.00787. eCollection 2018.

Background: Transcranial direct current stimulation (tDCS) can improve motor learning in children. High-definition approaches (HD-tDCS) have not been examined in children. Objectives/Hypothesis: We hypothesized that primary motor cortex HD-tDCS would enhance motor learning but be inferior to tDCS in children. Methods: Twenty-four children were recruited for a randomized, sham-controlled, double-blinded interventional trial (NCT03193580, clinicaltrials.gov/ct2/show/NCT03193580) to receive (1) right hemisphere (contralateral) primary motor cortex (M1) 1 mA anodal conventional 1 × 1 tDCS (tDCS), (2) right M1 1 mA anodal 4 × 1 HD-tDCS (HD-tDCS), or (3) sham. Over five consecutive days, participants trained their left hand using the Purdue Pegboard Test (PPTL). The Jebsen-Taylor Test, Serial Reaction Time Task, and right hand and bimanual PPT were also tested at baseline, post-training, and 6-week retention time (RT). Results: Both the tDCS and HD-tDCS groups demonstrated enhanced motor learning compared to sham with effects maintained at 6 weeks. Effect sizes were moderate-to-large for tDCS and HD-tDCS groups at the end of day 4 (Cohen's d tDCS = 0.960, HD-tDCS = 0.766) and day 5 (tDCS = 0.655, HD-tDCS = 0.851). Enhanced motor learning effects were also seen in the untrained hand. HD-tDCS was well tolerated and safe with no adverse effects. Conclusion: HD-tDCS and tDCS can enhance motor learning in children. Further exploration is indicated to advance rehabilitation therapies for children with motor disabilities such as cerebral palsy. Clinical Trial Registration: clinicaltrials.gov, identifier NCT03193580.

PMID: 30429768

9. Children Born With Congenital Zika Syndrome Display Atypical Gross Motor Development and a Higher Risk for Cerebral Palsy.
Marques FJP, Teixeira MCS, Barra RR, de Lima FM, Dias BLS, Pupe C, Nascimento OJM, Leyser M.

J Child Neurol. 2018 Nov 13:883073818811234. doi: 10.1177/0883073818811234. [Epub ahead of print]

IMPORTANCE: Congenital Zika syndrome virus infection is said to interfere in children's development. OBJECTIVE: evaluate gross motor trajectories and the frequency of cerebral palsy in children with congenital Zika syndrome. DESIGN: Cohort study applying the Alberta Infant Motor Scale (AIMS) and the Bayley III Scales in infants from 6 to 18 months of age. SETTING: The SARAH network, Rio de Janeiro. PARTICIPANTS: Thirty-nine infants whose diagnoses were established through clinical history, serology tests, and neuroimaging findings. Main outcomes and measures: Congenital Zika syndrome is associated with severe motor delays and is a risk factor to the diagnosis of cerebral palsy. RESULTS: The Alberta Infant Motor Scale mean raw score at 6 months was 9.74 (SD 4.80) or equivalent to 2 to 3 months of motor developmental age. At the age of 12 months, 14.13 (SD 11.90), corresponding to 3 to 4 months of motor development age; the Bayley III Scales results correlated to the Alberta Infant Motor Scale ($P < .001$) at this age. At 18 months, 15.77 (SD 13.80) or a motor development equivalent to 4 to 5 months of age. Thirty-five of 39 children (89.7%) met criteria for the diagnosis of cerebral palsy. Conclusions and relevance: Gross motor development marginally progresses from 6 to 18 months of age. These individuals also displayed a high frequency of cerebral palsy.

PMID: 30421639

10. Predictors of caregiver burden in mothers of children with leukemia and cerebral palsy.
Boztepe H, Çınar S, Ay A, Kerimoğlu Yıldız G, Kılıç C.

J Psychosoc Oncol. 2018 Nov 13:1-10. doi: 10.1080/07347332.2018.1489441. [Epub ahead of print]

OBJECTIVE: Caring for a sick child can lead to considerable burden in the caregiver. Comparative studies of burden in mothers of children with different types of disorders are rare. METHODS: We assessed levels of and risk factors for burden in mothers of children with leukemia (n: 70) or with cerebral palsy (CP) (n: 69). Subjects were recruited from two hospitals in Ankara. RESULTS: Levels of burden or depression were not different between groups. Burden was predicted by the presence of depression in the mother and severity of illness in both groups. In the leukemia group, mothers reported higher burden if the child was male or younger; no such relationship was observed in the CP group. CONCLUSION: Our results show that type of illness has an effect on levels of burden. Mothers of children with leukemia should receive more attention, especially if their child is male or younger, to take preventive measures against burden.

PMID: 30422097

11. Decreasing prevalence of cerebral palsy in birth cohorts in South Carolina using Medicaid, disability service, and hospital discharge data, 1996 to 2009.
Li Q, Kinsman SL, Jenkins DD, Hovell MF, Ryan RM.

Dev Med Child Neurol. 2018 Nov 12. doi: 10.1111/dmcn.14085. [Epub ahead of print]

AIM: Since cross-sectional trends of 8-year-old cerebral palsy (CP) birth prevalence based on record review were stable from 1985 to 2002 in Metropolitan Atlanta, we examined birth cohort trends using administrative data sets promptly. METHOD: Among 755 433 live births from 1996 to 2009 in South Carolina, 2080 received CP diagnosis by age 4 years from linked Medicaid claims with International Classification of Diseases, Ninth Revision codes 343.X (contributing 1061 [51%] unique cases), hospital discharge data (57 [3%] unique cases), and Department of Disabilities and Special Needs program (64 [3%] unique cases). Trends were assessed using negative binominal regression. RESULTS: Including 3.7 percent of cases who died before age 4 years, CP prevalence per 1000 live births decreased significantly from 3.6 in 1996 to 2.1 in 2006 (-3.0% average annual change; 95% confidence interval -4.4 to -1.6). The overall prevalence was 2.8 per 1000 live births, 46.0 per 1000 very-low-birthweight (VLBW) live births, and 53.0 per 1000 VLBW 1-year survivors. Disparities and downward trends persisted across subgroups with higher rates among non-Hispanic black infants than non-Hispanic white and among males compared to females. INTERPRETATION: Downward CP prevalence rates and persistent disparities remain in South Carolina. Further research should validate this methodology, including early deaths, and develop broad surveillance systems to inform clinical practices and etiology. WHAT THIS PAPER ADDS: Birth cohort cerebral palsy (CP) prevalence decreased in South Carolina from 1996 to 2009. CP prevalence was higher in very-low-birthweight infants, non-Hispanic blacks, and males. Three administrative data sets captured 2080 patients with CP in South Carolina. Medicaid claims contributed 51% of unique cases of CP to the cohort. CP diagnoses included 76 patients who died before age 4 years.

PMID: 30417338

12. Cerebral palsy: not always what it seems.
Appleton RE, Gupta R.

Arch Dis Child. 2018 Nov 9. pii: archdischild-2018-315633. doi: 10.1136/archdischild-2018-315633. [Epub ahead of print]

Cerebral palsy (CP) is not a disease, but a neurological syndrome, a combination of signs and symptoms, some of which may occur in neurodegenerative or metabolic disorders, particularly those with an onset in the first 2 years of life. There are many different causes of the syndrome. All children with CP should undergo brain MRI, even with an identified antenatal or perinatal insult. Children with CP should be referred to a paediatric neurologist or a clinical geneticist, or both, if appropriate and particularly in the absence of a known perinatal cerebral insult, with brain MRI that is reported to be normal, a progression in, or new, signs or where there is a reported 'family history of CP'. Finally, a few of the CP syndromes may be readily treatable and potentially prevent irreversible neurological and cognitive impairment.

PMID: 30413492