Cerebral palsy research news

Monday 1 February 2021

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Professor Nadia Badawi AM
Macquarie Group Foundation Chair of Cerebral Palsy

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Interventions and Management

1. Arm Muscle Strength in Children with Bilateral Spastic CP
Meta N Eek, Git Lidman

Phys Occup Ther Pediatr. 2021 Jan 25;1-11. doi: 10.1080/01942638.2021.1872757. Online ahead of print.

Aims: To assess arm-muscle strength related to motor function in children with bilateral spastic cerebral palsy, 5-15 years old. Methods: Muscle strength was measured for shoulder abductors, elbow extensors and flexors, wrist extensors, and grip strength. The children were grouped according to the Manual Ability Classification Scale (MACS). Results: Forty-two children were included. The majority of the children at MACS levels I-II were within the normal range; shoulder abductors were weakest (mean 60-80% of predicted value), and variation was greatest for wrist extensors. Children at MACS level II showed lower values than children at level I, with significant differences for shoulder abductors (p=.028) and wrist extensors (p<.001). Differences between the dominant and non-dominant side was greater in children at MACS level II and statistically significant for wrist extensors (p=.024). Of 15 children tested for grip strength, nine were within the 2 SD range. The three children at MACS level II, all walking with a walker, had a higher mean value than those at MACS level I. Conclusions: Muscle strength was lower and differences were greater between sides in children at MACS level II. Wrist extensors showed a decreasing trend with age as compared with normal development.

PMID: 33487084

2. Intermittent serial casting for wrist flexion deformity in children with spastic cerebral palsy: a randomized controlled trial
Nigar Dursun, Tugba Gokbel, Melike Akarsu, Marcin Bonikowski, Weronika Pyrzanowska, Erbil Dursun

Dev Med Child Neurol. 2021 Jan 22. doi: 10.1111/dmcn.14765. Online ahead of print.

Aim: To assess the efficacy of intermittent serial casting in conjunction with occupational therapy and botulinum neurotoxin A (BoNT-A) in children with cerebral palsy (CP) presenting spastic wrist flexion deformity. Method: This was a controlled, prospective study in which 34 children (19 females, 15 males; mean [SD] 11y [4y 6mo]) were randomly allocated to casting or control groups in a ratio of 2:1. Both groups were subjected to BoNT-A treatment and occupational therapy. The casting group additionally received a series of progressive casts intermittently for three consecutive weekends. Outcome measures consisted of passive range of motion (PROM) as assessed by goniometer, muscle tone by Modified Ashworth scale (MAS), and spasticity by Tardieu Scale. Assessments were done at baseline, week 4, and week 12. Results: Baseline characteristics of casting and control groups were comparable. PROM, MAS, and Tardieu angle of catch (XV3) of the casting and control groups significantly improved after treatment (p<0.001 for all). Nevertheless the mean change from baseline MAS at week 12, mean changes from baseline PROM, Tardieu XV3, and the spasticity grade (Y) at week 4 and week 12 of the casting group showed statistical superiority over those of the control group (p<0.05 for all). Interpretation: Children with CP presenting

spastic wrist flexion deformity might gain additional benefits from supplementary intermittent serial casting as well as BoNT-A injections and occupational therapy. Serial casting could be considered as a complementary treatment to BoNT-A and occupational therapy in children with clinically significant PROM limitations.

PMID: 33483965

3. Postural control performance on the Functional Reach Test: validity of the Kids-Balance Evaluation Systems Test (Kids-BESTest) criteria
Rosalee M Dewar, Kylie Tucker, Andrew P Claus, Robert S Ware, Leanne M Johnston

Arch Phys Med Rehabil. 2021 Jan 25;S0003-9993(21)00086-1. doi: 10.1016/j.apmr.2020.12.018. Online ahead of print.

Objective: Evaluate the validity of the Kids-BESTest clinical criteria for the Functional Reach Test (FRT) forward and lateral with laboratory measures of postural control in children with cerebral palsy (CP). Design: Psychometric study of face, concurrent and content validity SETTING: Clinical laboratory PARTICIPANTS: Fifty-eight children aged 7-18 years (ambulant CP n=17, typically developing [TD] n=41). Intervention: Not applicable MAIN OUTCOME MEASURES: Stability limits in standing were assessed using the Kids-BESTest items for FRT forwards [FRTFORWARD], FRT lateral preferred [FRTLATERAL(P)] and FRT lateral non-preferred [FRTLATERAL(NP)]. Force platforms and kinematic markers were used to collect information on centre-of-pressure (CoP) and joint movement during reach. Analyses included: face validity (Kids-BESTest scores compared between CP and TD groups); concurrent validity (agreement between Kids-BESTest scores and digitally-derived scores); and content validity (relationships between Kids-BESTest scores with kinematic and CoP data). Results: Face validity of Kids-BESTest criteria was demonstrated with lower scores for CP compared to TD groups for FRTFORWARD ($p<0.001$) and FRTLATERAL(NP) ($p=0.03$) and equal scores for FRTLATERAL(P) ($p=0.12$). For concurrent validity, agreement between Kids-BESTest scores and digitally-derived scores was good to excellent for FRTLATERAL(both P/NP) (88-100%) and good for FRTFORWARD (86-88%) for both groups. For content validity, the CP group Kids-BESTest scores were correlated with CoP-RangeFORWARD during FRTFORWARD ($rs=0.68$) and CoP-RangeLATERAL during FRTLATERAL(NP) ($rs=0.57$). For kinematic data, correlations were moderate-high between Kids-BESTest scores and range of hip flexion ($rs=0.51$) and ankle plantar flexion ($rs=0.75$) during FRTFORWARD, and trunk lateral flexion ($rs= 0.66$) during FRTLATERAL(NP). Conclusion: The FRTFORWARD demonstrated face, concurrent and content validity. The FRTLATERAL(P/NP) demonstrated concurrent validity, but partial face and content validity. To improve validity of Kids-BESTest FRT criteria, additional descriptors have been added under the scoring criteria to enable clinicians to quantify observed reach strategies.

PMID: 33508337

4. Combined Anterior-Posterior Fusion Versus Posterior Alone Fusion for Cervical Myelopathy in Athetoid-Cerebral Palsy
Gang-Un Kim, Myun-Whan Ahn, Gun Woo Lee

Global Spine J. 2021 Jan 25;2192568220987535. doi: 10.1177/2192568220987535. Online ahead of print.

Study design: Retrospective comparative study. Objectives: Although some studies have discussed the use of lateral mass screws (LMSs) in patients with cerebral palsy (CP), it is unclear whether posterior LMS fixation alone is a suitable method. We aimed to compare the clinical, radiological, and surgical outcomes of 2 surgical modalities, namely, combined anterior-posterior (A-P) instrumented fusion and posterior fusion alone, in athetoid-type CP patients with cervical myelopathy (CM). Methods: We analyzed 63 patients with athetoid-CP and CM who underwent posterior fusion only with LMS (group A, 35 patients) and A-P fusion (group B, 28 patients). The primary outcome was the 1- and 3-year fusion rates for the surgical segments. The secondary outcomes included the clinical outcomes based on pain intensity determined using the visual analog scale score, neck disability index, and 17-point Japanese Orthopedic Association score, radiological, and surgical outcomes. Results: Fusion was achieved at 3 years postoperatively in 22 of 35 patients (63%) in group A and in 26 of 28 patients (93%) in group B ($P = 0.02$). The posterior neck pain intensity was also significantly lower in group B than in group A 2 and 3 years postoperatively ($P = 0.02$ and 0.01, respectively). The incidence of screw loosening and implant-related problems was higher in group A (60%) than in group B (21%) ($P = 0.01$). The other clinical and radiological parameters were similar between the groups. Conclusions: For athetoid CP-induced CM, combined A-P fusion would result in superior clinical and radiological outcomes compared to posterior fusion alone.

PMID: 33487049

5. Is there a relationship between muscle-tendon properties and a variety of functional tasks in children with spastic cerebral palsy?
Christian Schranz, Annika Kruse, Markus Tilp, Martin Svehlik

Gait Posture. 2021 Jan 14;85:14-19. doi: 10.1016/j.gaitpost.2021.01.009. Online ahead of print.

Background: Cerebral palsy (CP) is the most common motor and movement disability in childhood. The mechano-morphological alterations of the spastic muscle itself as well as the functional limitations in CP are well documented. However, the relationship between muscle tendon properties and functional tests in CP remains unknown. Research question: The aim of this study was to explore the relationship between spastic muscle mechano-morphological properties and functional performance in children with CP. Methods: This study included retrospective data from 22 children with spastic cerebral palsy with a mean age of 12.8 years (19 GMFCS I/3 GMFC II, 15 male/7 female, 8 unilateral involved/14 bilateral). Mechano-morphological properties of gastrocnemius (GM) and Achilles tendon (AT) were correlated with a variety of functional measures, maximal isometric strength, the Muscle Power Sprint test (MPST), 6-minute walk test (6MWT) and 3D-gait analysis using the Pearson Coefficient. Results: Muscle-tendon properties were normalized to remove anthropometric dimensions because of strong associations with anthropometric data. Higher isometric muscle strength was related to longer normalized GM fascicle lengths ($r = 0.67$, $p < 0.01$). The distance reached in the 6MWT positively correlated with normalized GM fascicle lengths ($r = 0.61$, $p < 0.01$). Higher AT stiffness was associated with faster performance in the MPST ($r = 0.77$, $p < 0.01$). Finally, there was an association between ankle power and both longer normalized AT length and shorter muscle belly ($r = 0.60$ and $r = 0.54$, $p < 0.01$). Significance: The findings of this study give more insight into the function specific adaptations of a spastic muscle-tendon unit. While walking, assessed through the 6MWT, was related to normalized gastrocnemius fascicle length, sprint performance was associated with an increased AT stiffness. These results provide a better understanding of the relationship between functional tasks and spastic muscle-tendon properties, which offers potential for improved and targeted interventions in CP.

PMID: 33487525

6. An investigation of the effect of the lower extremity sensation on gait in children with cerebral palsy
Kamile Uzun Akkaya, Bulent Elbasan

Gait Posture. 2020 Dec 28;85:25-30. doi: 10.1016/j.gaitpost.2020.12.026. Online ahead of print.

Background: Sensory disorders frequently accompany the motor disorders in children with cerebral palsy (CP). Research question: Do children with CP have sensory disturbances in their lower extremities? If there are sensory impairments, do these impairments affect gait? Methods: In total, 45 children (18 females, 27 males) in an age range between 5 and 18 years were included in the study: 15 typically developing children, 15 unilaterally affected children with cerebral palsy, and 15 bilaterally affected children with cerebral palsy. They could walk independently at the levels of I or II according to the gross motor function classification. After the demographic data of the children were recorded, their tactile sense, vibration sense, two-point discrimination, and proprioception were evaluated, and the Edinburgh Visual Gait Score (EVGS) was used for gait assessment. Results: Failures were discovered in lower extremity tactile ($p = 0.001$), two-point discrimination ($p = 0.001$), and proprioceptive senses of the children with CP ($p = 0.001$), and the loss of tactile sense was found to be related to gait disorders ($p = 0.02$, $r = 0.41$). Significance: There were deficiencies in the lower extremity senses, and deficiencies in the tactile sense negatively affected gait. Performing sensory assessments, which are considered to be fundamental for gait training in the rehabilitation of children with CP, and providing support for the lacking parameters in the intervention programs may create positive effects on gait.

PMID: 33508563

7. The gait is less stable in children with cerebral palsy in normal and dual-task gait compared to typically developed peers
Harri Piitulainen, Juha-Pekka Kulmala, Helena Mäenpää, Timo Rantalainen

J Biomech. 2021 Jan 15;117:110244. doi: 10.1016/j.jbiomech.2021.110244. Online ahead of print.

There is limited evidence about gait stability and its alteration by concurrent motor and cognitive tasks in children with cerebral palsy (CP). We examined gait stability and how it is altered by constrained cognitive or motor task in CP and their typically developed (TD) controls. Gait kinematics were recorded using inertial-measurement units (IMU) from 18 patients with hemiplegia (13.5 ± 2.4 years), 12 with diplegia (13.0 ± 2.1 years), and 31 TD controls (13.5 ± 2.2 years) during unconstrained gait, and motor (carrying a tray) and cognitive (word naming) task constrained gait at preferred speed (~400 steps/task). Step duration, its standard deviation and refined-compound-multiscale entropy (RCME) were computed independently for vertical and resultant horizontal accelerations. Gait complexity was higher for patients with CP than TD in all tasks and directions ($p < 0.001$-0.01), being pronounced in vertical direction, cognitive task and for diplegic patients ($p < 0.05$-0.001). The gait complexity increased more (i.e. higher dual-task cost) from the unconstrained to the constrained gait in CP compared to TD ($p < 0.05$). Step duration was similar in all groups ($p > 0.586$), but its variation was higher in CP than TD ($p < 0.001$-0.05), and during the constrained than unconstrained gait in all groups ($p < 0.01$-0.001). The gait in children with CP was more complex and the dual-task cost was higher primarily for children with diplegic CP than TD during cognitive task, indicating that attentional load hinders their gait more. This raises the hypothesis that more attention and cortical resources are needed to compensate for the impaired gait in children with CP.

PMID: 33493716

8. Associations of hamstring and triceps surae muscle spasticity and stance phase gait kinematics in children with spastic diplegic cerebral palsy
N Bowal, A Nettel-Aguirre, G Ursulak, E Condliffe, I Robu, S Goldstein, C Emery, J L Ronsky, G Kuntze

J Biomech. 2021 Jan 16;117:110218. doi: 10.1016/j.jbiomech.2020.110218. Online ahead of print.

Clinical decisions on interventions to improve function in children with cerebral palsy (CP) are based, in part, on hypothesized interactions amongst physical signs of CP and functional deficits. However, a knowledge gap exists regarding associations between spasticity and gait function. This study quantified associations of hamstring and triceps surae spasticity with hip, knee and ankle CP gait patterns. This is a cohort study of children and adolescents [n = 51; 31 male; 20 female; spastic diplegia; Gross Motor Function Classification System I (n = 23) and II (n = 28)] who participated in a clinical consult including gait (Motion Analysis, USA) and modified Tardieu scale (MTS) testing (hamstrings, triceps surae). Shape-based clustering was performed on stance phase sagittal hip, knee and ankle patterns using z-normalized and non-normalized data. Linear regression (R, v3.5.0, R Core Team, Austria) was conducted to assess associations between MTS measures and data clusters ($\alpha = 0.05$). Shape-clustering revealed two hip and three knee and ankle clusters for z-normalized and non-normalized data. Significant associations of hamstring spasticity and joint patterns were observed for z-normalized knee clusters (CKnee A $p = 0.002$; CKnee B $p = 0.006$) and interactions amongst non-normalized hip and knee clusters (CHipA:CKnee B $p = 0.033$). Trends were observed for soleus spasticity and gastrocnemius range of motion angle and non-normalized ankle clusters (CAnkle B $p = 0.051$; CAnkle B $p = 0.053$ respectively). Significant associations of early knee extension and hamstring spasticity, observed using shape-clustering of z-normalized data, provide unique information that may inform the identification of individuals most likely to benefit from spasticity management and targets for spasticity management assessment.

PMID: 33486260

9. Three-Dimensional Gait Analysis in Children Undergoing Gastrocsoleus Lengthening for Equinus Secondary to Cerebral Palsy
Norine Ma, Nicholas Sclavos, Elyse Passmore, Pam Thomason, Kerr Graham, Erich Rutz

Review Medicina (Kaunas). 2021 Jan 22;57(2):98. doi: 10.3390/medicina57020098.

Background and Objectives: Equinus is the most common deformity in children with cerebral palsy, and surgical lengthening of the gastrocsoleus muscle-tendon unit is the most commonly performed operation for children with cerebral palsy. Treatment outcomes of orthopaedic surgery can be measured objectively with three-dimensional gait analysis. This study examined the quality of evidence for gastrocsoleus lengthening surgery based on objective measures. Materials and Methods: A search was performed with Medline, Embase and PubMed from 1990 to 25 August 2020 using the keywords "cerebral palsy", "equinus", "surgery" and "gait analysis". Only studies of gastrocsoleus lengthening surgery using three-dimensional gait analysis were included, yielding 34 studies. Results: Fourteen studies reported swing phase kinematics and all studies reported a significant

improvement. Rates of recurrent equinus and calcaneus were reported in 21 studies and varied widely based on follow-up period and surgical technique. Conclusions: Poor study quality and marked variability in study samples and interventions made comparison difficult. Future studies should consider prospective design, controls or comparison groups and more detailed breakdowns of outcomes by cerebral palsy subtype, sagittal gait pattern, and equinus type in order to allow more rigorous treatment recommendations to be made.

PMID: 33499373

10. Improvement of Gait Dysfunction after Applying a Hinged Ankle-Foot Orthosis in a Hemiplegic Cerebral Palsy Patient with Disrupted Medial Lemniscus: A Case Report
Su Min Son, Min Cheol Chang

Case Reports Children (Basel). 2021 Jan 25;8(2):81. doi: 10.3390/children8020081.

We describe the successful application of hinged ankle-foot orthoses (AFOs) in a cerebral palsied (CP) patient with gait instability due to a disrupted medial lemniscus (ML). The patient was a 27-month-old male CP child with gait instability who presented with reduced knee flexion and ankle dorsiflexion, with severe genu recurvatum on his right lower extremity during gait. The patient had no motor weakness or spasticity. Conventional magnetic resonance imaging (MRI) revealed no definite abnormal lesion. However, diffusion tensor tractography (DTT) showed disruption of the left ML, consistent with right hemiplegic symptoms. The integrity of the major motor-related neural tracts, including the corticospinal and corticoreticulospinal tracts, was preserved. We considered that the patient's abnormal gait pattern was related to the disrupted ML state. We applied hinged AFOs, which immediately resulted in a significantly stabilized gait. The angles of knee flexion and ankle dorsiflexion increased. Our findings indicate that the application of hinged AFOs could be a useful therapeutic option for CP patients with gait instability related to ML disruption. In addition, we showed that DTT is a useful tool for identifying the causative brain pathology in CP patients, especially when conventional brain MRIs show no specific lesion.

PMID: 33503801

11. Visual Impairment and Functional Classification in Children with Cerebral Palsy
M Rauchenzauner, K Schiller, M Honold, I Baldissera, R Biedermann, B Tschiderer, U Albrecht, C Arnold, K Rostasy

Neuropediatrics. 2021 Jan 28. doi: 10.1055/s-0040-1722679. Online ahead of print.

Background: Cerebral palsy (CP) is the most common motor impairment in childhood and often accompanied by a broad spectrum of comorbidities. Data are sparse concerning visual impairment (VI) and functional classification among CP children. Objective: The objective of this study was to analyze the prevalence of VI among children with CP and to investigate a possible association between VI and Gross Motor Function Classification System (GMFCS) and the Bimanual Fine Motor Function (BFMF). Methods: In this hospital-based study, records of 200 children with CP aged 2 to 17 years were reviewed. Results: Overall, VI was found in 59.5% of children with CP. Prevalence of VI was higher when compared with non-CP children. A correlation between GMFCS as well as BFMF and severity of VI was found. Children with severe CP were at greater risk for severe VI, especially cerebral VI compared with children with mild CP. Conclusion: VI is a significant problem in children with CP and is correlated with motor function. Children with CP should undergo detailed ophthalmologic and orthoptic assessment to enable early intervention.

PMID: 33511594

12. Diagnosis and patterns of hearing loss in children with severe developmental delay
Stephen Trudeau, Samantha Anne, Todd Otteson, Brandon Hopkins, Rachael Georgopoulos, Carissa Wentland

Am J Otolaryngol. 2021 Jan 13;42(3):102923. doi: 10.1016/j.amjoto.2021.102923. Online ahead of print.

Introduction & objective: Children with cognitive delay often experience challenges with obtaining hearing thresholds through behavioral audiometry (BA). This necessitates sedated Auditory Brainstem Response (sABR) testing. This study aimed to evaluate diagnostic and hearing patterns in children with Down Syndrome (DS), Autism Spectrum Disorder (ASD), Global Developmental delay (GDD), and Cerebral Palsy (CP) who were unable to complete reliable BA testing due to severe cognitive delay. Methods: Retrospective chart review on a cohort of children aged 0.5-18 years with a diagnosis of DS, ASD, GDD, or CP who underwent sABR due to unsuccessful BA testing. This was performed at a tertiary care institution from 2014 to 2019. Testing patterns and audiometric data were collected. Results: Across 15 DS, 39 ASD, 10 GDD, and 11 CP patients, the average time from first nondiagnostic BA to sABR ranged from 8.6 months (in GDD) to 21.8 months (in DS). The average number of BAs performed before sABR ranged from 1.6 (in ASD and GDD) to 2.7 (in DS). Hearing loss (HL) was diagnosed in 10%, 13%, 36% and 46% of patients with GDD, ASD, CP and DS respectively. Up to 75% of the HL was sensorineural (in CP patients). Conclusion: In children with significant cognitive delays, a high incidence of HL (especially SNHL) was identified, therefore high suspicion for HL should be held in these patients. Multiple unsuccessful BAs contribute to prolonged time to diagnosis and treatment, thus prompt sABR should be performed in patients whose severe cognitive delay inhibits reliable testing with BA.

PMID: 33486206

13. Pain and its relationship with postural asymmetry in adults with cerebral palsy: A preliminary exploratory study
Carlee Holmes, Kim Brock, Prue Morgan

Disabil Health J. 2021 Jan 19;101063. doi: 10.1016/j.dhjo.2021.101063. Online ahead of print.

Background: Pain in adults with cerebral palsy (CP) is commonly reported, with muscular and skeletal dysfunction resulting in postural asymmetry as potential contributors to multifactorial causes of pain. The relationship between pain and postural asymmetry of the thoracic cage, pelvis and hips in non-ambulatory adults with CP however is unknown, particularly in those with cognitive and communication limitations. Objective: The primary aim of this study was to describe and quantify day and night pain in non-ambulatory adults with CP. Secondary aims were to investigate any relationship between pain and postural asymmetry and to describe current pain management strategies utilised. Methods: Pain was measured using the Non Communicating Adult Pain Checklist (NCAPC). Posture was measured using the Goldsmith Indices of Body Symmetry (GIofBS) and radiographs. Correlations between pain scores and posture (GIofBS and radiographs) were assessed using non-parametric analysis. Information regarding pain management strategies was gained from medical records and carer interviews. Results: Seventeen non-ambulatory adults with CP were recruited. High levels of day pain were experienced by ≥ 50% of participants with a high incidence of prescribed medications targeting pain. Strong positive correlations between day and night NCAPC scores, chest right left ratio and night pain, Cobb angle and day pain and between Cobb angle and night pain were evident. Conclusion: The incidence and severity of pain in non-ambulatory adults with CP is high with postural asymmetry a potential contributor. Pain remains difficult to assess and manage in adults with significant cognitive and communication impairments and warrants further investigation.

PMID: 33509734

14. Oral health status and parental perception of child oral health-related quality of life among children with cerebral palsy in Bangalore city: A cross-sectional study
K S Sruthi, R Yashoda, Manjunath P Puranik

Spec Care Dentist. 2021 Jan 29. doi: 10.1111/scd.12568. Online ahead of print.

Aim: To assess and compare the oral health status and parental perception of child oral health-related quality of life (OHRQoL) among children with and without cerebral palsy (CP). Methods and results: A cross-sectional comparative study was conducted among 300 children aged 5-15 years with and without CP in Bangalore city. Oral health status was assessed using WHO 2013 criteria, and malocclusion was assessed using Angle's classification of malocclusion. Parental perception of child OHRQoL was assessed using parental caregivers perceptions questionnaire. Chi-square test, Student's t-tests and logistic regression were applied. Majority of the study participants were males with a mean age of 10 years. Caries experience, gingivitis, dental trauma, and dental erosion were significantly higher among children with CP than the comparison group. Mean parental perception of child OHRQoL score among CP was significantly higher than that of comparison group ($P < .001$). Odds of having caries experience, gingivitis, dental trauma, and Angle's Class II/III malocclusion were significantly higher among CP children with poor OHRQoL compared to those without these conditions. Conclusion: Oral health status among children with

CP was poor than the children without CP. Parents perceived poor OHRQoL among children with CP when compared to those without CP. Hence CP has an impact on oral health necessitating preventive care.

PMID: 33512001

15. Association Between Dental Caries and Obesity among Children with Special Health Care Needs
Roshan Noor Mohamed, Sakeenabi Basha, Yousef Al-Thomali, Fatma Salem AlZahrani, Amal Adnan Ashour, Nada Eid Almutair

Oral Health Prev Dent. 2021;19(1):101-106. doi: 10.3290/j.ohpd.b927717.

Purpose: Obesity and dental caries constitute an important public health problem worldwide. Special-needs children are at higher risk of developing dental caries and obesity because of their physical, neurological, or behavioural impairment or due to side effects of the medications they take. The present study was conducted to assess the association between dental caries and obesity among children with special health care needs in Taif City, Saudi Arabia. Materials and methods: A descriptive cross-sectional study was conducted among 400 (220 girls and 180 boys) special-needs children. Body mass index (BMI) was determined by using height and weight measurements. Dental caries was recorded according to World Health Organization criteria. The association between caries and obesity was assessed using multivariable logistic regression analysis. Results: 289 (72.3%) children presented with caries with mean dmft and DMFT of 3.9 ± 2.7 and 4.8 ± 2.3, respectively. Regression analysis showed specials needs children were at a greater risk of having dental caries: 1.69 times (CI: 0.18-2.62, $p < 0.05$) greater with obesity; 2.01 (CI: 0.18-3.09, $p < 0.05$) times greater with sugar consumption; 2.21 times (CI: 1.27-4.12, $p < 0.001$) greater with cerebral palsy; and 2.27 (CI: 1.29-5.12, $p < 0.001$) times greater with intellectual disability. Conclusion: The present study showed a positive association between dental caries and obesity among children of special health care needs. Hence, a focused approach towards the common risk factors is essential to prevent both obesity and dental caries in special-needs children.

PMID: 33511824

16. Risk of dementia in adults with cerebral palsy: a matched cohort study using general practice data
Kimberley J Smith, Mark D Peterson, Christina Victor, Jennifer M Ryan

BMJ Open. 2021 Jan 25;11(1):e042652. doi: 10.1136/bmjopen-2020-042652.

Objectives: Determine the risk of incident dementia in adults with cerebral palsy (CP) compared with age, sex and general practice (GP) matched controls. Design: Retrospective cohort study. Setting: UK GPs linked into the Clinical Practice Research Datalink (CPRD). Participants: CPRD data were used to identify adults aged 18 or older with a diagnosis of CP. Each adult with CP was matched to three controls who were matched for age, sex and GP. In total, 1703 adults with CP and 5109 matched controls were included in the analysis. The mean baseline age of participants was 33.30 years (SD: 15.48 years) and 46.8% of the sample were female. Primary outcome: New diagnosis of dementia during the follow-up period (earliest date of 1987 to latest date of 2015). Results: During the follow-up, 72 people were identified with a new diagnosis of dementia. The overall proportion of people with and without CP who developed dementia was similar (CP: n=19, 1.1%; matched controls n=54, 10.0%). The unadjusted HR suggested that people with CP had an increased hazard of being diagnosed with dementia when compared with matched controls (HR 2.69, 95% CI 1.44 to 5.00). This association was attenuated when CP comorbidities (sensory impairment, intellectual disability and epilepsy) were accounted for (HR 1.92, 95% CI 0.92 to 4.02). Conclusions: There was no difference in the proportion of people with CP and matched controls who were diagnosed with dementia during the follow-up. Furthermore, while there was evidence for an increased hazard of dementia among people with CP, the fact that this association was attenuated after controlling for comorbidities indicates that this association may be explained by comorbidities rather than being a direct result of CP. Findings should be interpreted with caution due to the low number of incident cases of dementia.

PMID: 33495255

17. Validity and reliability of smartphone-based pelvic rotation evaluations of children with cerebral palsy while sitting, standing, and standing on one leg

Do Hyun Kim

J Pediatr Rehabil Med. 2021 Jan 11. doi: 10.3233/PRM-190621. Online ahead of print.

Purpose: We explored the test-retest reliability of pelvic rotation measured using a smartphone and established criterion-related validity by analyzing simple linear regression between pelvic rotation data obtained using the smartphone and those measured by a palpation meter. Methods: We recruited 12 children with cerebral palsy (CP) (7 boys and 5 girls) and measured pelvic rotation using a smartphone application and a palpation meter in the sitting, standing, and one-leg standing positions. Test-retest reliability was evaluated by calculating intraclass correlation coefficients (ICCs); simple linear regression was analyzed to explore the relationships between smartphone and palpation meter data. Results: In terms of the test-retest reliability of pelvic rotation measured by the smartphone, the ICCs ranged from 0.85 to 0.95. A positive linear correlation was found between smartphone and palpation meter data. Conclusions: We confirmed that measurement of pelvic rotation using a smartphone was reliable when children with CP were in the sitting, standing, and one-leg standing positions. In addition, pelvic rotation measured using the smartphone correlated significantly with that measured using a palpation meter.

PMID: 33492250

18. Reliability and Validity of Ultrasound Elastography for Evaluating Muscle Stiffness in Neurological Populations: A Systematic Review and Meta-Analysis

Tiev Miller, Michael Ying, Charlotte Sau Lan Tsang, Meizhen Huang, Marco Y C Pang

Phys Ther. 2021 Jan 4;101(1):pzaa188. doi: 10.1093/ptj/pzaa188.

Objective: Ultrasound elastography is an emerging diagnostic technology used to investigate the biomechanical properties of the musculoskeletal system. The purpose of this study was to systematically review the psychometric properties of ultrasound elastography techniques for evaluating muscle stiffness in people with neurological conditions. Methods: A systematic search of MEDLINE, EMBASE, CINAHL, and Cochrane Library databases was performed in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Using software, reviewers independently screened citations for inclusion. Peer-reviewed studies that evaluated in vivo muscle stiffness in people with neurological conditions and reported relevant psychometric properties were considered for inclusion. Twenty-one articles were included for final review. Data relevant to measurement technique, site, and neurological condition were extracted. The Consensus-Based Standards for the Selection of Health Measurement Instruments checklist was used to rate the methodological quality of included studies. The level of evidence for specific measurement outcomes was determined using a best-evidence synthesis approach. Results: Reliability varied across populations, ultrasound systems, and assessment conditions (ie, joint/body positions, active/passive muscle conditions, probe orientation), with most studies indicating moderate to good reliability (ICC = 0.5-0.9, n = 13). Meta-analysis results showed a good overall correlation across studies (r = 0.78, 95% confidence interval = 0.64-0.86), with no between-group difference based on population (Q1 = 0.00). Convergent validity was demonstrated by strong correlations between stiffness values and measures of spasticity (n = 5), functional motor recovery or impairment (n = 5), and grayscale or color histogram pixel intensities (n = 3). Discriminant or known-groups validity was also established for multiple studies and indicated either significant between-group differences in stiffness values (n = 12) or within-group differences between more and less affected limbs (n = 6). Responsiveness was observed in all intervention studies reporting posttreatment stiffness changes (n = 6). Conclusions: Overall, ultrasound elastography techniques showed moderate reliability in evaluating in vivo muscle stiffness, good convergent validity with relevant clinical assessments, and good divergent validity in discriminating tissue changes within and between groups. Impact: Ultrasound elastography has clinical utility in assessing muscle stiffness, monitoring its temporal changes, and measuring the response to intervention in people with neurological conditions.

PMID: 33508855

19. Look Around Me: Environmental and Socio-Economic Factors Related to Community Participation for Children with Cerebral Palsy in Québec

Jinan Zeidan, Lawrence Joseph, Chantal Camden, Michael Shevell, Maryam Oskoui, Patricia Lamotte, Keiko Shikako-Thomas

Phys Occup Ther Pediatr. 2021 Jan 25;1-18. doi: 10.1080/01942638.2020.1867693. Online ahead of print.

Aims: This study aimed at gaining a deeper understanding of the environmental and socio-economic factors affecting participation outcomes in community and leisure activities for children with disabilities, as well as the trajectories of participation for these children to promote their health and guarantee their rights are respected. Methods: A participatory action research (PAR) approach and linear regression analysis were employed to identify contextual factors associated with the community participation of children with cerebral palsy (CP) living in Quebec, Canada. Stakeholders engaged through the entire research process supported the development of questionnaires, data collection, analysis and interpretation of results. Results: Neighborhood outings were ranked among the most practiced activities by children with CP. Only in a few cases (9%) did children participate in more than two types of activities outside of school. Factors limiting children's participation were predominantly extrinsic in origin, including financial burden and lack of information about existing opportunities. Conclusions: There is a serious need for communities and local governments to inform parents about available resources, programs and policies that can support their child's participation. Rehabilitation professionals could partner with stakeholders to inform the development of public policies that target the identified barriers and promote children's integration and fulfillment.

PMID: 33487079

20. Quality of Life among Primary Caregivers of Children with Cerebral Palsy Living in Sarlahi and Rautahat Districts of Nepal

Bina Pandit, Jitendra Kumar Singh, Ananda Kumar Karn, Rina Pandit

J Nepal Health Res Counc. 2021 Jan 21;18(4):619-625. doi: 10.33314/jnhrc.v18i4.2282.

Background: The objective of this study was to determine the quality of life and factors associated with quality of life among primary caregivers of children with Cerebral palsy. Methods: A cross-sectional study was carried between primary caregivers of children with cerebral palsy in rehabilitation group and non-rehabilitation group. Purposive sampling technique was used to collect data Results: Median age of caregivers was 34 years (age 20-70 years), and there was significant difference between age in two groups (p=0.028). 83 (86.5%) caregivers were female with significant difference between gender in rehabilitation and non-rehabilitation group (p=0.03). Majority of primary caregivers were mother 71 (74%) in both groups. Among all 96 caregivers, 78.1% of caregivers had poor quality of life (Score in questionnaire below 75% taken as poor quality of life).There was no significant difference between quality of life in rehabilitation and non-rehabilitation group (p=0.42). Factors associated with quality of life in rehabilitation groups was illiteracy (p=0.005), aggressive nature of child (p=0.050), uncooperative nature of child (p=0.025), poor knowledge about child condition (p<0.001), and low financial support (p=0.051). Similarly, factor associated with quality of life in non-rehabilitation group was gross motor function classification system level of child (p< 0.001) and more perceived stress (p=0.048). Conclusions: Majority of primary caregivers was mother and had poor quality of life and there was no significant difference between overall quality of life of caregivers in rehabilitation and non-rehabilitation group.

PMID: 33510499

21. Cross-cultural adaptation of the Arabic version of Self-Care Domain of Child Engagement in Daily Life and Ease of Caregiving for Children measures

Mohammed S Alghamdi, Lisa A Chiarello, Ehab M Abd-Elkafy, Robert J Palisano, Margo Orlin, Sarah W McCoy

Res Dev Disabil. 2021 Jan 22;110:103853. doi: 10.1016/j.ridd.2021.103853. Online ahead of print.

Purpose: To cross-culturally adapt the Self-Care Domain of Child Engagement in Daily Life and the Ease of Caregiving for Children to Arabic language and Saudi culture and to examine the reliability of the Arabic version of both measures. Methods: A modified cross-cultural adaptation procedure was employed. A total 36 children with cerebral palsy (aged 1.5-11 years) and their parents participated in the pilot and final testing steps. A committee of 7 stakeholders evaluated cross-cultural equivalence of both measures. Cronbach's alpha, intra-class correlation coefficient, and minimal detectable change were used to establish internal consistency, test-retest reliability, and distribution-based index, respectively. Results: Minor linguistic, not cultural, adaptations were made in the Arabic version of both measures. Conceptual, item, semantic, and operational types of equivalences were supported. The Arabic version of Self-Care Domain of Child Engagement in Daily Life and Ease of Caregiving for Children demonstrated high internal consistency (0.97 and 0.91, respectively), excellent test-retest reliability (0.99 and 0.96, respectively), and appropriate minimal detectable change values (0.29, 0.43, respectively). Conclusions: The Arabic version of Self-Care Domain of Child Engagement in Daily Life and Ease of Caregiving for Children are reliable and culturally appropriate for use with parents of children with cerebral palsy in Saudi Arabia.

PMID: 33486394

22. Assessing state level variation in signature authority and cause of death accuracy, 2005-2017
J Dalton Stevens, Scott D Landes

Prev Med Rep. 2021 Jan 4;21:101309. doi: 10.1016/j.pmedr.2020.101309. eCollection 2021 Mar.

This study utilized a convergent mixed-methods design to examine whether variation in death certificate certifier type predicts the accuracy of cause of death reporting in the US. We analyzed the content of state statutes, amendments, and policies concerning cause of death signature authority in 2005-2017 to create the Cause of Death Signature Authority (CoDSA) database. After merging the CoDSA data with 2005-2017 National Vital Statistics System Multiple Cause of Death Mortality files for adults with cerebral palsy (CP) (N = 29,996), we employed logistic regression models to determine the likelihood that different certifier groups made one particular type of death certification error - inaccurately reporting CP as the underlying cause of death (UCOD). The content analysis provided evidence of significant liberalization of cause of death signature authority, with 23 states expanding signature authority to include physician extenders. Logistic regression analysis revealed differences in UCOD accuracy based on certifier type. Compared to medical examiners, the likelihood of CP being reported as the UCOD, was: 41% higher (CI 1.12, 1.78) for coroners; 25% higher (1.05, 1.49) for mixed-system death investigators; 24% higher (1.08, 1.42) for physicians; and 16% higher (1.00, 1.34) for physician extenders. Inaccuracies limit public health efforts aimed at improving the health and longevity for disadvantaged populations, such as people with CP. Poor performance among cause of death certifiers may indicate systemic problems with death certification that should be addressed with more robust training for all professional groups with signature authority.

PMID: 33511026

23. White matter injury in infants with intraventricular haemorrhage: mechanisms and therapies
Praveen Ballabh, Linda S de Vries

Review Nat Rev Neurol. 2021 Jan 27. doi: 10.1038/s41582-020-00447-8. Online ahead of print.

Intraventricular haemorrhage (IVH) continues to be a major complication of prematurity that can result in cerebral palsy and cognitive impairment in survivors. No optimal therapy exists to prevent IVH or to treat its consequences. IVH varies in severity and can present as a bleed confined to the germinal matrix, small-to-large IVH or periventricular haemorrhagic infarction. Moderate-to-severe haemorrhage dilates the ventricle and damages the periventricular white matter. This white matter injury results from a constellation of blood-induced pathological reactions, including oxidative stress, glutamate excitotoxicity, inflammation, perturbed signalling pathways and remodelling of the extracellular matrix. Potential therapies for IVH are currently undergoing investigation in preclinical models and evidence from clinical trials suggests that stem cell treatment and/or endoscopic removal of clots from the cerebral ventricles could transform the outcome of infants with IVH. This Review presents an integrated view of new insights into the mechanisms underlying white matter injury in premature infants with IVH and highlights the importance of early detection of disability and immediate intervention in optimizing the outcomes of IVH survivors.

PMID: 33504979

24. The utility of the fronto-temporal horn ratio on cranial ultrasound in premature newborns: a ventriculomegaly marker
Rawad Obeid, Marni Jacobs, Taeun Chang, An N Massaro, Eresha Bluth, Jonathan G Murnick, Dorothy Bulas, Anjum Bandarkar, Chima Oluigbo, Anna A Penn

Pediatr Res. 2021 Jan 27. doi: 10.1038/s41390-020-01337-x. Online ahead of print.

Background: The aims of this study were to find the normal value of fronto-temporal horn ratio (FTHR) as a marker of ventriculomegaly on cranial ultrasound (CUS) in premature newborns and the relation to white matter injury (WMI) and cerebral palsy (CP). Methods: This is a retrospective study of newborns admitted between 2011 and 2014. Inclusion criteria were: (1) gestation <29 weeks, (2) birth weight ≤1500 g, (3) referred within 7 days of life, (4) at least two CUS preformed, (5) brain magnetic resonance imaging (MRI) at term age-equivalent. Intraventricular hemorrhage (IVH) grade was identified and FTHR was measured on all CUS. WMI on MRI was evaluated through (1) injury score (Kidokoro 2013) and (2) fractional anisotropy (FA) on the MRI diffusion tensor imaging. CP was estimated using the gross motor function classification system (GMFCS). Results: One hundred neonates met the inclusion criteria: 37 with no IVH, 36 with IVH grade 1-2, and 27 with IVH grade 3-4. The FTHR cut-point of 0.51 had the highest sensitivity and specificity for moderate-to-severe WMI. In the IVH grade 3-4 group, the elevated FTHR correlated with lower FA and higher GMFCS. Conclusions: FTHR is a useful quantitative biomarker of ventriculomegaly in preterm newborns. It may help standardize ventricular measurement and direct intervention. Impact: The fronto-temporal horn ratio has the potential to become a standardized tool that can provide an actionable measure to direct intervention for post-hemorrhagic ventricular dilation. This current study will provide the basis of a future clinical trial to optimize intervention timing to decrease the risk of white matter injury in this vulnerable population.

PMID: 33504959

25. Mid forceps did not cause "compromised babies" - "compromise" caused forceps: an approach toward safely lowering the cesarean delivery rate
Mark I Evans, David W Britt, Shara M Evans

J Matern Fetal Neonatal Med. 2021 Jan 25;1-9. doi: 10.1080/14767058.2021.1876657. Online ahead of print.

Objective: Over 5 decades, Cesarean Delivery rates (CDR) have risen 6-fold while vaginal operative deliveries [VODs] decreased from >20% to ~3%. Poor outcomes (HIE and cerebral palsy) haven't improved. Potentiating the virtual abandonment of forceps (F), particularly midforceps (Mid), were allegations about various poor neonatal outcomes. Here, we evaluate VOD and CDR outcomes controlling for prior fetal risk metrics (PR) ascertained an hour before birth. Methods: Our 45-year-old database from a labor research unit of moderate/high risk laboring patients (288 NSVDs, 120 Lows, 30 Mids, and 32 CDs) had multiple fetal scalp samples for base excess (BE), pH, cord blood gases (CB), and umbilical artery bloods. ANOVA established relationships between birth methods and outcomes (Cord blood BE and pH and 1 and 5 min Apgar scores); correlations, and two-step multiple regression assessed PR for delivery method and neonatal outcomes. The main outcome measures were correlations of outcome measures with fetal scalp sample BE and pH up to an hour before delivery and fetal reserve index scores scored concurrently. Results: NSVDs had the best immediate neonatal outcomes with significantly higher CB pH and BE as compared to forceps and CDs. However, controlling for PR revealed: (1) PR at 1 h before delivery correlated with delivery mode, i.e. the decrements in outcomes were already present before the delivery was performed; and (2) The presumed deleterious effects of interventional deliveries, per se, were significantly reduced, and (3) Fetal Reserve Index predicted neonatal outcomes better than fetal scalp sample BE, pH, or delivery mode. Conclusion: The historical belief that MF deliveries caused poorer outcomes than NSVDs seems mostly backwards. Appreciating PR's impact on delivery routes, and when appropriate, properly performing VODs could safely reduce CDR. If our approach lowered CDR by only ~2%, in the United States about 80,000 CDs might be avoided, saving ~$750 Million yearly. In the post pandemic world, safely apportioning medical expenses will be even more critical than previously.

PMID: 33494634

26. Commonalities in biomarkers and phenotypes between mild cognitive impairment and cerebral palsy: a pilot exploratory study
Ted Kheng Siang Ng, Alex Tagawa, Roger Chun-Man Ho, Anis Larbi, Ee Heok Kua, Rathi Mahendran, James J Carollo, Patricia C Heyn

Aging (Albany NY). 2021 Jan 26;13. doi: 10.18632/aging.202563. Online ahead of print.

Clinically, individuals with cerebral palsy (CP) experience symptoms of accelerated biological aging. Accumulative deficits in both molecular underpinnings and functions in young adults with CP can lead to premature aging, such as heart disease and mild cognitive impairment (MCI). MCI is an intermediate stage between healthy aging and dementia that normally develops at old age. Owing to their intriguingly parallel yet "inverted" disease trajectories, CP might share similar pathology and phenotypes with MCI, conferring increased risk for developing dementia at a much younger age. Thus, we examined this

hypothesis by evaluating these two distinct populations (MCI= 55, CP = 72). A total of nine measures (e.g., blood biomarkers, neurocognition, Framingham Heart Study Score (FHSS) were compared between the groups. Compared to MCI, upon controlling for covariates, delta FHSS, brain-derived neurotrophic factor (BDNF) levels, and systolic blood pressure were significantly lower in CP. Intriguingly, high-sensitivity CRP, several metabolic outcomes, and neurocognitive function were similar between the two groups. This study supports a shared biological underpinning and key phenotypes between CP and MCI. Thus, we proposed a double-hit model for the development of premature aging outcomes in CP through shared biomarkers. Future longitudinal follow-up studies are warranted to examine accelerated biological aging.

PMID: 33497355