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Cerebral palsy research news

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Interventions and Management

1. Effect of different durations of using a standing frame on the rate of hip migration in children with moderate to severe cerebral palsy: a feasibility study for a randomised controlled trial
R Rapson, T King, C Morris, R Jeffery, J Mellhuish, C Stephens, J Marsden

Physiotherapy. 2022 Jan 29;116:42-49. doi: 10.1016/j.physio.2022.01.001. Online ahead of print.

Aim: To assess the feasibility of a randomised controlled trial (RCT) to evaluate the effect of different doses of standing time on hip migration rate in children with cerebral palsy (CP). Method: Children aged 1-12 years with CP GMFCS levels III-V were recruited and randomised to either doubling or continuing with their usual time in their standing frame. Caregivers kept a standing time diary. The primary outcome measure was Reimers hip migration percentage, measured at baseline, 12 and 24 months. A blinded assessor measured secondary clinical outcomes at baseline, 6 and 12 months. Feasibility results are reported following CONSORT guidelines. Results: Twenty-five children were recruited. Nineteen were randomised and 10 completed the 12-month intervention. The mean daily standing time in the intervention group was 49minutes (SD 39.1) (Monday-Sunday) and 58.1 (SD 44.1) minutes during weekdays. In children remaining in the trial, primary and secondary clinical outcome measures were available in 54% and 90% of children respectively. There were three serious adverse events, unrelated to standing. Conclusions: It may be feasible to conduct an RCT to assess the effect of duration of standing on hip migration in children with CP with an altered protocol. The suggested target dose is 60minutes five times per week compared to a control group standing for 30minutes three times per week, over twelve months. Use of botulinum toxin need not be a criterion for exclusion and radiography should be included as a research cost. NHS Health Research Committee, South West ethics approval (ref 13/SW/0228).

PMID: 35550486

2. A Review of Radiology Reports From Hip Surveillance Radiographs for Children With Cerebral Palsy
Stacey D Miller, Jaimy Coates, Jeffrey N Bone, Jennifer Farr, Kishore Mulpuri

J Pediatr Orthop. 2022 May 13. doi: 10.1097/BPO.0000000000002183. Online ahead of print.

Background: Measurement of migration percentage (MP) is fundamental to successful hip surveillance for children with cerebral palsy (CP). In British Columbia, Canada, children enrolled in the province's hip surveillance program get radiographs at the province's tertiary care pediatric hospital or their local community hospital. This study aimed to review the radiology reporting of images completed as part of hip surveillance. Methods: Pelvis radiographs completed between September 2015 and December 2019 of 960 children enrolled in the province's hip surveillance program were included. MP values measured by the program coordinator and corresponding value measured by the facility's radiologist, when present, were retrieved. Agreement in MP between the program coordinator and the radiologist was measured using Bland-Altman plots and intraclass

correlation coefficients. Radiology reports for images completed at community facilities that prompted a referral to a pediatric orthopaedic surgeon, when reviewed by the hip surveillance team, were further reviewed for qualitative comments. Results: In total, 1849 radiographs were reviewed with 69.3% (1282) completed at the pediatric hospital and 30.7% (567) at 64 different hospitals or clinics. MP was reported for 20.6% (264/1282) of radiographs completed at the pediatric hospital and 3.0% (17/567) of the radiographs completed at community hospitals. Bland-Altman plot analyses found a MP mean difference of 1.2% (95% confidence interval=0.6%-1.8%) between the program coordinator and all radiologist reports with an intraclass correlation coefficient of 0.88 (95% confidence interval=0.86-0.90). There were 47 radiographs completed at community hospitals that resulted in a referral to a pediatric orthopaedic surgeon after review by the hip surveillance team. Eleven of these reports stated normal or unremarkable findings. Conclusions: Radiologic reporting of images completed for hip surveillance for children with CP was inadequate to allow for the detection of hip displacement. Reporting of MP was rare, particularly in community hospitals. If radiology reporting will be utilized for hip surveillance in children with CP, education of radiologists is required.

PMID: 35550421

3. Assessment of gait quality and efficiency after undergoing a single-event multilevel surgery in children with cerebral palsy presenting an intoeing gait pattern
Gabriel Moisan, Alice Bonnefoy-Mazure, Géraldo De Coulon, Anne Tabard-Fougère, Stéphane Armand, Katia Turcot

Childs Nerv Syst. 2022 May 12. doi: 10.1007/s00381-022-05548-x. Online ahead of print.

Purpose: The biomechanical impact of undergoing a single-event multilevel surgery (SEMLS) for children with cerebral palsy (CP) presenting an intoeing gait pattern has been widely documented. However, past studies mostly focused on gait quality rather than efficiency. Thus, there is a need to determine the impact of undergoing a SEMLS on gait quality and efficiency in children with CP presenting an intoeing gait pattern. Methods: Data from 16 children with CP presenting an intoeing gait pattern who underwent a SEMLS were retrospectively selected. Gait kinematics was quantified before (baseline) and at least 1 year after the surgery (follow-up). Gait quality was investigated with the Gait Profile Score (GPS), hip internal rotation angle and foot progression angle (FPA). Gait efficiency was analysed using clinically accessible variables, namely the normalised gait speed and medio-lateral and vertical centre of mass excursions (COMp). Dependent variables were compared between sessions with paired t-tests. Results: At the follow-up, children with CP exhibited a more outward FPA and GPS as well as a decreased hip internal rotation angle. No changes in normalised gait speed and vertical COMp excursion were observed, and medio-lateral COMp excursion was slightly decreased. Conclusion: Children with CP presenting an intoeing gait pattern who underwent a SEMLS exhibited an increased gait quality, but gait efficiency was only minimally improved at the follow-up compared to baseline. Further studies are needed to identify contributors of gait efficiency in children with CP, and the best treatment modalities to optimise both their gait quality and efficiency.

PMID: 35552497

4. Short-term causal effects of common treatments in ambulatory children and young adults with cerebral palsy: three machine learning estimates
Michael H Schwartz, Andrew J Ries, Andrew G Georgiadis

Sci Rep. 2022 May 12;12(1):7818. doi: 10.1038/s41598-022-11875-5.

Orthopedic and neurological impairments (e.g., muscle contractures, spasticity) are often treated in children and young adults with cerebral palsy (CP). Due to challenges arising from combinatorics, research funding priorities, and medical practicalities, and despite extensive study, the evidence base is weak. Our goal was to estimate the short-term effectiveness of 13 common orthopedic and neurological treatments at four different levels of outcome in children and young adults diagnosed with CP. The outcome levels considered were body structures, specific gait kinematic deviations, overall gait kinematic deviations, and functional mobility. We used three well-establish causal inference approaches (direct matching, virtual twins, and Bayesian causal forests) and a large clinical gait analysis database to estimate the average treatment effect on the treated (ATT). We then examined the effectiveness across treatments, methods, and outcome levels. The dataset consisted of 2851 limbs from 933 individuals (some individuals underwent multiple treatment episodes). Current treatments have medium effects on body structures, but modest to minimal effects on gait and functional mobility. The median ATT of 13 common treatments in children and young adults with CP, measured as Cohen's D, bordered on medium at the body structures level (median [IQR] = 0.42 [0.05, 0.60]) and became smaller as we moved along the causal chain through specific kinematic deviations (0.21 [0.01,

0.33]), overall kinematic deviations (0.09 [0.03, 0.19]), and functional mobility (-0.01 [-0.06, 0.13]). Further work is needed to understand the source of heterogeneous treatment effects, which are large in this patient population. Replication or refutation of these findings by other centers will be valuable to establish the generalizability of these results and for benchmarking of best practices.

PMID: 35551496

5. A statistical shape model of soleus muscle morphology in spastic cerebral palsy
Salim G Bin Ghouth, Sian A Williams, Siobhan L Reid, Thor F Besier, Geoffrey G Handsfield

Sci Rep. 2022 May 11;12(1):7711. doi: 10.1038/s41598-022-11611-z.

This study investigated morphological characteristics of the soleus muscle in cerebral palsy (CP) and typically developing (TD) cohorts using a statistical shape model and differentiated dominant features between the two cohorts. We generated shape models of CP and TD cohorts to characterize dominant features within each. We then generated a combined shape model of both CP and TD to assess deviations of the cohorts' soleuses from a common mean shape, and statistically analysed differences between the cohorts. The shape models revealed similar principal components (PCs) with different variance between groups. The CP shape model yielded a distinct feature (superior-inferior shift of the broad central region) accounting for 8.1% of the model's cumulative variance. The combined shape model presented two PCs where differences arose between CP and TD cohorts: size and aspect ratio of length-width-thickness. The distinct appearance characteristic in the CP model-described above -may implicate impaired muscle function in children with CP. Overall, children with CP had smaller muscles that also tended to be long, thin, and narrow. Shape modelling captures dominant morphological features of structures, which was used here to quantitatively describe CP muscles and further probe our understanding of the disease's impact on the muscular system.

PMID: 35546597

6. Analysis of the Relationship Between Regulation Disorders of Sensory Processing (RDSP) and the Development of the Gait Function and Motor Learning Processes in Children and Adolescents with Cerebral Palsy
Bartosz Bagrowski, Joanna Kraśny, Marek Jóźwiak

Ortop Traumatol Rehabil. 2022 Apr 30;24(2):107-119. doi: 10.5604/01.3001.0015.8268.

1. These results correlate with the outcomes of other studies on the relationship between sensory impairment and motor skills. 2. The study may contribute to the identification of more predictors of the effectiveness of rehabilitation of patients with CP, which can be used in the longer term to forecast the effects of therapy and the development of personalized medicine, as manifested in comprehensive therapeutic approaches (e.g. supplemented with sensory integration therapy).

PMID: 35550360

7. Effects of artificially induced bilateral internal rotation gait on gait kinematics and kinetics
Mirjam Thielen, Dorothea Waible, Britta K Krautwurst, Sebastian I Wolf, Thomas Dreher

Gait Posture. 2022 May 4;95:204-209. doi: 10.1016/j.gaitpost.2022.05.003. Online ahead of print.

Background: Bilateral internal rotation gait is a common gait abnormality in children with bilateral cerebral palsy, but still not fully understood. Research question: The aim of this clinical study was to analyze the effects of artificially induced bilateral internal rotation gait on kinematics and kinetics. Our hypothesis was, that the internal rotation gait defined as increased dynamic internal hip rotation itself causes significant alterations in gait kinematics and kinetics. Methods: 30 typically developing children with a mean age of 12 (SD 3) years (range 8 - 16) performed three-dimensional gait analysis in two different conditions: with unaffected gait and with artificially induced bilateral internal rotation gait with two rotation bandages worn in order to internally rotate the hips. Kinematic and kinetic changes between these two conditions were calculated and compared using a mixed linear model with "gait condition" as fixed effect and both "limb" and "patient" as random effects. Results: The rotation bandages induced a significant increase in internal hip rotation and foot progression angle towards

internal without affecting pelvic rotation. The peak hip internal rotator moment during loading response and the peak hip external rotator moment during the first half of stance phase increased significantly and the peak hip internal rotator moment during the second half of stance phase decreased significantly. Anterior pelvic tilt, hip flexion, knee flexion and ankle dorsiflexion increased significantly. The first peak of the frontal hip moment decreased, and the second increased significantly. The second peak of the frontal knee moment decreased significantly, while the first didn't change significantly. Significance: The data suggest, that the bilaterally increased dynamic internal hip rotation itself has a relevant impact on frontal hip moments. The increased anterior pelvic tilt, hip and knee flexion may be either induced by the pull of the rotation bandage or a secondary gait deviation.

PMID: 35533614

8. Effect of a structured aqua-plyometric exercise program on postural control and functional ability in children with hemiparetic cerebral palsy: A two-arm randomized controlled trial
Ragab K Elnaggar, Mshari Alghadier, Mohamed S Abdrabo, Asmaa A Abonour

NeuroRehabilitation. 2022 Apr 29. doi: 10.3233/NRE-220020. Online ahead of print.

Background: Individuals with hemiparetic cerebral palsy (h-CP) encounter postural control issues that largely interfere with activity and participation. So, there might be a need for improved, clearly effective rehabilitation protocols that target postural control dysfunction, which may, then, reduce activity limitations and participation restrictions. Objective: This trial was undertaken to examine the effect of a structured, 12-week aqua-plyometric (Aqua-PLYO) exercise program on postural control and functional ability in children with h-CP. Methods: Fifty-six children with h-CP took part in a two-arm, randomized single-blind controlled trial. They were randomly assigned to either receive the standard physical therapy (Control group; n = 28) or the Aqua-PLYO training program (Aqua-PLYO group; n = 28), three times/week over 12 consecutive weeks. The dynamic limit of stability [i.e., movement directional control (M-DC), reaction time (ReT), movement velocity (M-Vel), endpoint excursion (EP-Exc), and maximum excursion (M-Exc)] and functional ability [i.e., 30-second sit-to-stand test (30sec-STS), timed up and down stairs test (TUDS), and the dynamic gait index (DGI)] were assessed pre- and post-treatment. Results: From the pre- to post-treatment occasion, the Aqua-PLYO group achieved greater improvement for the M-DC (P = 0.013), ReT (P = 0.004), M-Vel (P = 0.03), EP-Exc (P = 0.002), and M-Exc (P = 0.006), compared to controls. Besides, the Aqua-PLYO group showed more conducive changes in functional ability [as evidenced by the 30sec-STS (P = 0.005), TUDS (P = 0.002), and DGI (P = 0.004) scores]. Conclusion: Aqua-PLYO training is likely an effective training paradigm for enhancing postural control and functional ability in children with h-CP. Further studies are, however, recommended to substantiate the current evidence.

PMID: 35527579

9. [Effect of intradermal needling combined with oral motor therapy for salivation in children with cerebral palsy: a randomized controlled trial][Article in Chinese]
Na Zhang, Ying Lu, You-Hong Xiong, Ke-Juan Ge, Yi-Mei Liu

Zhongguo Zhen Jiu. 2022 May 12;42(5):515-9. doi: 10.13703/j.0255-2930.20210508-0001.

Objective: To compare the effect of combination of intradermal needling with oral motor therapy and simple oral motor therapy on salivation in children with cerebral palsy. Methods: A total of 60 children with salivation in cerebral palsy were randomized into an observation group and a control group, 30 cases in each group. The observation group was treated with intradermal needling (kept for 24 hours each time at Jiache [ST 6], Dicang [ST 4], tongue three needles, etc.) and oral motor therapy, while the control group was only given oral motor therapy. The intradermal needling was performed 3 times a week, and oral motor therapy was performed 5 times a week, 4 weeks as a course, totally 3 courses of treatment were required. The classification of teacher drooling scale (TDS), drooling severity and Kubota water swallow test, dysphagia disorders survey (DDS) score were compared before treatment and after 4, 8 and 12 weeks of treatment in both groups, and the clinical efficacy was evaluated. Results: After 8 weeks of treatment in the observation group and after 12 weeks of treatment in the two groups, the classification of TDS and drooling severity were improved (P<0.05), and the observation group was better than the control group after 12 weeks of treatment (P<0.05). After 8 and 12 weeks of treatment, the DDS scores of oral period in the observation group were lower than those before treatment (P<0.05). The total effective rate in the observation group was 83.3% (25/30), which was higher than 53.3% (16/30) in the control group (P<0.05). Conclusion: The combination of intradermal needling with oral motor therapy can improve salivation symptoms and swallowing function in children with cerebral palsy, the effect is better than oral motor therapy alone, and the effect is earlier.

PMID: 35543942

10. Pain burden in children with cerebral palsy (CPPain) survey: Study protocol
Randi Dovland Andersen, Lara Genik, Ann I Alriksson-Schmidt, Agneta Anderzen-Carlsson, Chantel Burkitt, Sindre K Bruflot, Christine T Chambers, Reidun B Jahnsen, Ira Jeglinsky-Kankainen, Olav Aga Kildal, Kjersti Ramsta, Jordan Sheriko Frank J Symons, Lars Wallin, Guro L Andersen

Paediatr Neonatal Pain. 2021 May 4;4(1):12-22. doi: 10.1002/pne2.12049. eCollection 2022 Mar.

Pain is a significant health concern for children living with cerebral palsy (CP). There are no population-level or large-scale multi-national datasets using common measures characterizing pain experience and interference (ie, pain burden) and management practices for children with CP. The aim of the CPPain survey is to generate a comprehensive understanding of pain burden and current management of pain to change clinical practice in CP. The CPPain survey is a comprehensive cross-sectional study. Researchers plan to recruit approximately 1400 children with CP (primary participants) across several countries over 6-12 months using multimodal recruitment strategies. Data will be collected from parents or guardians of children with CP (0-17 years) and from children with CP (8-17 years) who are able to self-report. Siblings (12-17 years) will be invited to participate as controls. The CPPain survey consists of previously validated and study-specific questionnaires addressing demographic and diagnostic information, pain experience, pain management, pain interference, pain coping, activity and participation in everyday life, nutritional status, mental health, health-related quality of life, and the effect of the COVID-19 pandemic on pain and access to pain care. The survey will be distributed primarily online. Data will be analyzed using appropriate statistical methods for comparing groups. Stratification will be used to investigate subgroups, and analyses will be adjusted for appropriate sociodemographic variables. The Norwegian Regional Committee for Medical and Health Research Ethics and the Research Ethics Board at the University of Minnesota in USA have approved the study. Ethics approval in Canada, Sweden, and Finland is pending. In addition to dissemination through peer-reviewed journals and conferences, findings will be communicated through the CPPain Web site (www.sthf.no/cppain), Web sites directed toward users or clinicians, social media, special interest groups, stakeholder engagement activities, articles in user organization journals, and presentations in public media.

PMID: 35546915

11. Presence and predictors of pain after orthopedic surgery and associated orthopedic outcomes in children with cerebral palsy
Elizabeth R Boyer, Zachary B Novaczyk, Tom F Novacheck, Frank J Symons, Chantel C Burkitt

Paediatr Neonatal Pain. 2021 Dec 18;4(1):44-52. doi: 10.1002/pne2.12067. eCollection 2022 Mar.

While children with cerebral palsy (CP) may undergo 8-22 orthopedic surgeries in their lifetime, little is known about the associated pain. We aimed to assess the pain presence before and one year after lower extremity orthopedic surgery, predictors of pain presence at follow-up, and the association between pain and orthopedic outcomes related to surgery. This retrospective study included 86 children with CP (M age = 10.0 years, SD = 3.2; range = 4.1-17.3 years, Gross Motor Functional Classification System (GMFCS) level I-III) who underwent orthopedic surgery and had completed questionnaires at gait analyses before (M = 2.7 months; range = 0.0-5.7) and after surgery (M = 11.8 months; range = 9.0-14.9). Pain presence, location, and Pediatric Outcomes Data Collection Instrument (PODCI) scores were documented before and after surgery at gait analyses. Pain prevalence was 60% at baseline and 56% at follow-up. Significant predictors of pain presence at follow-up included (1) pain presence at baseline (range of odds ratios [OR] across any/all locations = 3.22 to 15.54), (2) older age (range of OR for any pain, back, knee, and foot pain = 1.24-1.26), (3) female sex (decreased OR for males for ankle pain = 0.12), (4) having hip surgery (decreased OR for foot pain = 0.20), and (5) lower GMFCS level (OR for foot pain = 0.41). Changes in PODCI Sports and Physical Function scores were associated with changes in hip and knee pain ($P < .03$); PODCI scores worsened for patients who had pain at both time points and improved for patients who had pain at baseline but not follow-up. Pain was present for over half of the participants before and after orthopedic surgery. Pain presence at follow-up was predicted by pain presence at baseline. Pain and functional outcomes were correlated at follow-up. Prospective studies examining perioperative pain experience and factors predicting pain outcomes are warranted.

PMID: 35546914

12. BrightHearts: A pilot study of biofeedback assisted relaxation training for the management of chronic pain in children with cerebral palsy
Katarina Ostojic, Nicole Sharp, Simon Paget, George Khut, Angela Morrow

Paediatr Neonatal Pain. 2021 Oct 15;4(1):34-43. doi: 10.1002/pne2.12062. eCollection 2022 Mar.

Background: Chronic pain is estimated to impact one-in-three children with cerebral palsy (CP). Psychological interventions including behavioral and cognitive strategies play a key role in chronic pain management, but there is a paucity of research exploring their use in children with CP. Aim: To investigate the acceptability and feasibility of biofeedback assisted relaxation training (BART) for chronic pain management in children with CP using a mixed-methods study design. Methods: Biofeedback assisted relaxation training was delivered via BrightHearts, an iOS application. Inclusion criteria were as follows: CP; self-reported chronic pain; age 9-18 years; and fluent English speaker. Children used BrightHearts for ten minutes daily, over four weeks. Qualitative post-intervention interviews were undertaken (child, parent) and quantitative pre-post measures (child) were gathered including pain intensity (numerical rating scale), and anxiety intensity (numerical rating scale). Content analysis was conducted for qualitative data. Descriptive statistics and exploratory analyses were performed for quantitative data. Results: Ten children participated (n = 3 male, mean age = 13.1 years SD = 2.5 years, GMFCS level I = 4, II = 2, III = 3, IV = 1). Predominant movement disorder was spasticity (n = 7) and dyskinesia, mainly dystonia (n = 3). Content analysis suggested an overarching theme "BrightHearts is a good thing to put in my toolbox" providing an overall representation of participants' experiences. For many, BrightHearts was a valuable supplement to children's pain management strategies: "The source of the pain is still there, but the actual effect of the pain isn't so relevant." Four sub-themes were identified: "Managing my pain;" "Managing my anxiety and stress," "Helping me do what I need to do;" and "Fitting it into my life." Some participants reported improvements in their anxiety management, and others described benefits in sleep and school following improved pain/anxiety management. A range of practical and personal factors within this heterogeneous group presented barriers to using BrightHearts including limited time, attention, and boredom. Seven-out-of-eight children would recommend BrightHearts to others with chronic pain and six-out-of-eight noticed a difference in their pain since using BrightHearts (n = 2 missing data). Non-significant reductions in pain or anxiety intensity scores were found following the intervention. Conclusion: This pilot suggests BrightHearts is an acceptable and feasible intervention for chronic pain management in children with CP and may be useful for some children as part of a multimodal approach.

PMID: 35546913

13. Effect of targeted movement interventions on pain and quality of life in children with dyskinetic cerebral palsy: a pilot single subject research design to test feasibility of parent-reported assessments
Nadine Smith, Simon Garbellini, Natasha Bear, Ashleigh Thornton, Peta Watts, Noula Gibson

Disabil Rehabil. 2022 May 11;1-9. doi: 10.1080/09638288.2022.2072007. Online ahead of print.

Purpose: To determine the feasibility of using parent-reported outcome measures of the Paediatric Pain Profile (PPP), Sleep Disturbance Scale for Children (SDSC) and Care and Comfort Hypertonicity Questionnaire (CCHQ) as repeated outcome measures of change at weekly intervals for children with dyskinetic cerebral palsy (CP). The secondary aim was to explore the efficacy of individualised movement intervention. Material and methods: In this pilot feasibility study a single subject research design was utilised. Three children with dyskinetic CP, completed 5 weeks of parent-reported baseline assessments, 8 weekly sessions of intervention and 5 weeks of follow up. Results: All children completed 18 weeks of the study, with no missing data. There was evidence of parent-reported improvements in their child's pain and care and comfort between the baseline and intervention phases. Conclusions: The PPP, SDSC and CCHQ were feasible to assess pain, sleep and comfort before and after an intervention in children with dyskinetic CP. There is preliminary evidence that individualised movement intervention as little as once a week may help improve pain, sleep and improve ease of care and comfort. IMPLICATIONS FOR REHABILITATION: The Paediatric Pain Profile is feasible to identify and monitor pain, as frequently as weekly, in children with dyskinetic cerebral palsy (CP). There is preliminary evidence that movement can decrease pain in children with dyskinetic CP. Assessments and treatment in this group may be interrupted due to their complex health issues which may be a limitation when collecting repeated measures.

PMID: 35544592

14. Effect of Virtual Reality on Balance Function in Children With Cerebral Palsy: A Systematic Review and Meta-analysis
Wei Liu, Yuanyan Hu, Junfeng Li, Jindong Chang

Front Public Health. 2022 Apr 25;10:865474. doi: 10.3389/fpubh.2022.865474. eCollection 2022.

Virtual Reality (VR) therapy is popular in treating children with Cerebral Palsy (CP) as a new technology for rehabilitation. Nevertheless, no substantial evidence supporting VR therapy promotion has been developed to date. This study aimed to investigate the effects of VR therapy on balance in children with CP. We conducted a systematic search in PubMed and Web of Science (updated to December 30, 2021). The systematic review and meta-analysis included all randomized controlled trials that included children with CP. A total of 18 RCT studies were eligible for inclusion in the systematic review, and meta-analysis was performed on 16 of them. Results showed that the VR intervention was beneficial for balance (SMD 0.47 [95% CI, SD 0.28, 0.66]). We concluded that VR therapy interventions for children with CP have positive effects. However, cautious implementation is needed in clinical applications.

PMID: 35548088

15. Neurodevelopmental Outcomes of Infants <29 Weeks' Gestation Born in Canada Between 2009 and 2016
M Florencia Ricci, Prakesh S Shah, Diane Moddemann, Ruben Alvaro, Eugene Ng, Shoo K Lee, Anne Synnes, Canadian Neonatal Network (CNN) and the Canadian Neonatal Follow-Up Network (CNFUN) Investigators

J Pediatr. 2022 May 10;S0022-3476(22)00408-5. doi: 10.1016/j.jpeds.2022.04.048. Online ahead of print.

Objective: To evaluate changes in mortality or significant neurodevelopmental impairment (sNDI) in children born <29 weeks' gestation in association with national quality improvement initiatives. Methods: This longitudinal cohort study included children born at 220 to 286 weeks' gestation who were admitted to Canadian NICUs between 2009 and 2016. Primary outcome was a composite rate of death or significant NDI (Bayley-III scores <70, severe cerebral palsy, blindness, or deafness needing amplification) at 18 to 24 months corrected age. To evaluate temporal changes, outcomes were compared between epoch 1: 2009-2012, and epoch 2: 2013-2016. Adjusted odds ratios (AOR) were calculated for differences between the two epochs accounting for patient characteristic differences. Results: Of the 4426 included children, 1895 (43%) were born in epoch 1 and 2531 (57%) in epoch 2. In epoch 2, more mothers received magnesium sulphate (56% vs 28%), antibiotics (69% vs 65%), and delayed cord clamping (37% vs 31%); and fewer infants had SNAP-2 scores >20 (31% vs 35%) and late onset sepsis (23% vs 27%). Death or significant NDI occurred in 30% of children in epoch 2 vs 32% of children in epoch 1 (AOR 0.86, 95%CI 0.75-0.99). In epoch 2 vs epoch 1, there were reductions in the need for hearing aids or cochlear implants (1.4% vs. 2.6% AOR 0.50, 95%CI 0.31-0.82) and in blindness (0.6% vs.1.4%; AOR 0.38, 95%CI 0.18-0.80). Conclusion: Among preterm infants born <29 weeks' gestation, composite rates of death or significant NDI and rates of visual and hearing impairment were significantly lower in 2013-2016 vs 2009-2012.

PMID: 35561804

16. Is cerebral palsy progressive? Why do we ask?
Peter Rosenbaum

Editorial Dev Med Child Neurol. 2022 Jun;64(6):672. doi: 10.1111/dmcn.15168.

No abstract available

PMID: 35532049

17. Risk factors of cerebral palsy in children: a systematic review and meta-analysis
Dandan Chen, Meiyuan Huang, Yangyan Yin, Dongmei Gui, Yuniao Gu, Taiping Zhuang, Caihua Chen, Kaiming Huo

Transl Pediatr. 2022 Apr;11(4):556-564. doi: 10.21037/tp-22-78.

Background: This study aimed to explore the main risk factors for cerebral palsy in children by meta-analysis of the literature on the risk factors of cerebral palsy. Methods: We performed a literature search of the PubMed, EMBASE, Medline, and CENTRAL databases using the following search terms: ("cerebral palsy" or "cerebral palsies" or "infantile cerebral palsy") and ("risk factors"). Case-control or cohort studies of children with cerebral palsy and healthy children were included for meta-analysis. The Newcastle-Ottawa Scale (NOS) of case-control studies was used to evaluate the quality of the included studies. The Chi-square test was used to test the heterogeneity of the literature. This study used subgroup analysis and sensitivity analysis to identify sources of heterogeneity. If subgroup analyses and sensitivity analyses could not identify the source of heterogeneity, no pooling between study results was performed, and only individual study results were described. In this study, Egger's test was used to test for publication bias. The random-effects model was used when heterogeneity existed, and the fixed -effect model was applied when heterogeneity did not exist. Results: A total of 1,836 related articles were retrieved. After screening, 13 articles were included in the analysis, involving a total of 2,489 children with cerebral palsy and 4,782 children without cerebral palsy. None of the included articles achieved a NOS score of 9, four articles scored 8, eight articles scored 7, and one article scored 6. Meta-analysis showed that maternal hypertension during pregnancy, premature rupture of membranes, premature delivery and emergency cesarean section were risk factors for cerebral palsy in children, and there was no heterogeneity among the literatures and no publication bias. Conclusions: This study identified gestational hypertension, preterm birth, premature rupture of membranes, and emergency cesarean section as risk factors for cerebral palsy in children through meta-analysis, providing a reference for risk monitoring and clinical intervention.

PMID: 35558974

18. Vitamin D deficiency in children with cerebral palsy: A narrative review of epidemiology, contributing factors, clinical consequences and interventions
Kamel Awadh Alenazi

Review Saudi J Biol Sci. 2022 Apr;29(4):2007-2013. doi: 10.1016/j.sjbs.2021.12.026. Epub 2021 Dec 16.

Sufficient vitamin D levels are necessary, not only for mineralization, normal growth and development of bones, but also for the prevention of fatal chronic diseases like diabetes mellitus, metabolic syndrome and cancer. This is of particular importance in children with neuro- and musculoskeletal disorders, especially cerebral palsy (CP). CP is a heterogeneous group of childhood developmental disability disorders described by uncharacteristic posture, balance, and movement. Patients with CP are at an increased risk of vitamin D deficiency and as a result reduced bone mineral density, bone fragility, osteopenia, and rickets. The present review aims to combine and summarize available evidence, regarding the epidemiology, underlying contributing factors, clinical consequences, and treatment interventions of vitamin D deficiency in children with CP.

PMID: 35531196

19. Understanding physiotherapy and physiotherapy services: exploring the perspectives of adults living with cerebral palsy
Gemma Cook, Elizabeth Cassidy, Cherry Kilbride

Disabil Rehabil. 2022 May 11;1-9. doi: 10.1080/09638288.2022.2062060. Online ahead of print.

Purpose: To understand physiotherapy and physiotherapy services from the perspectives of adults with cerebral palsy (CP). Methods: Twenty-two adults with CP (15 women, 7 men), from across the UK, aged between 23 and 51 years, Gross Motor Function Classification System I-V, were interviewed about their experiences of physiotherapy and physiotherapy services. Participants were recruited through advertisements placed with relevant national organisations. The interviews were transcribed and analysed according to principles of Reflective Lifeworld Research. A second analysis examined the findings in relation to Donabedian's structure-process-outcome framework for healthcare quality. Results: Specialist services for adults with CP were described as scarce, unknowable, complex and disconnected through the life course. Specific problems included; structural

dimensions such as access to and organisation of services, signposting to services and access to expert advice; process dimensions including a lack of attention to patients' perspectives, needs, priorities, experience and expertise; and outcome dimensions for example the negative impact of physiotherapy service configurations on health, well-being and quality of life. Conclusion: Study findings support grassroots calls to radically improve and increase physiotherapy services for adults with CP. Accessible and widely available specialist services, information and advice across the life course would do much to address unmet need. Implications for Rehabilitation: Adults with CP found it difficult to identify and access specialised physiotherapy services and to obtain information and advice to help them best manage their condition. Adults with CP need physiotherapy services throughout the different phases of their lives, to meet their present needs, and to anticipate and, where possible, to prevent future needs. Participants highly valued person-centred physiotherapy and we recommend this approach is adopted as the foundational philosophy guiding physiotherapy services and interventions for adults with CP. More specialist physiotherapy services are urgently needed to meet the needs of adults with CP in the UK.

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