Interventions and Management

1.Effects of Hippotherapy and Horse-Riding Simulators on Gross Motor Function in Children with Cerebral Palsy: A Systematic Review

Antonio Ortega-Cruz, Víctor Sánchez-Silverio, Víctor Riquelme-Aguado, Jose Luis Alonso-Perez, Vanesa Abuín-Porras, Jorge Hugo Villafañe

Abstract
Background/Objectives: Cerebral palsy (CP) can have a negative impact on gross motor function. Conventional hippotherapy and horse-riding simulators (HRS) have shown promising results on gross motor function in populations with neurological disorders. This review aims to update the knowledge on the effectiveness of hippotherapy on gross motor function in children with CP. Methods: A search was conducted in Academic Search Ultimate, CINAHL, Medline complete, and PEDro covering publications between 2012 and 2022. Two authors identified studies that met the inclusion criteria; a third author resolved discrepancies. Studies were included if they analyzed the effects of hippotherapy on the gross motor function of children with CP. The quality of the methodology was assessed according to the PEDro scale. Results: Of the 150 studies initially identified, 9 were included in this review. The studies showed fair (N = 3) and good (N = 6) methodological quality on the PEDro scale. The majority used conventional hippotherapy (N = 7), while a minority used HRS (N = 2). The most commonly used protocol for conventional hippotherapy was 1-2 sessions of 30-45 min per week for 8 weeks (N = 4), whereas for HRS, these protocols were varied. Seven studies on conventional hippotherapy and one study on HRS showed improvements in gross motor function. However, the hippotherapy protocols were not very standardized and the samples were neither homogeneous nor representative. Conclusions: Conventional hippotherapy and HRS appear to have evidence to support their benefits on gross motor function in children with CP. However, more clinical trials with standardized protocols and more representative samples are needed to confirm these effects.
PMID: 39797365

2.Feasibility of Using Pulsed Electromagnetic Field Therapy to Improve the Dynamic Postural Balance of Children with Cerebral Palsy: A Randomized, Sham-Controlled Pilot Study

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Abstract
Cerebral palsy (CP) manifests with abnormal posture and impaired selective motor control, notably affecting trunk control and dynamic balance coordination, leading to inadequate postural control. Previous research has indicated the benefits of pulsed electromagnetic field (PEMF) therapy for various musculoskeletal and neurological conditions. Therefore, we conducted a randomized pilot study to assess the feasibility of our preliminary research design and examine the effect of the PEMF treatment among children with CP. Methods: Twelve children with spastic CP participated, with the study group undergoing PEMF treatment three times a week for four weeks. The treatment involved sine signal form, 20/200 Hz frequencies at an amplitude of 150 µT, initially administered for 8, 12, and 16 min per session. The control group received a sham treatment. Dynamic postural balance was evaluated using a force platform at baseline and post-intervention, and the data were analyzed. Data were processed using IBM SPSS 27 by repeated factorial analysis of variance. The significance level was $\alpha = 0.05$. Results: No side effects of PEMF therapy were detected; this is important, because this intervention has not yet been applied among CP patients. The treatment group demonstrated a positive trend in fine balance coordination tests ($p = 0.049$); however, the small sample size and variability in control group performance suggest caution in interpreting these findings. Other test domains did not show significant differences. Conclusions: Our pilot study reveals the safety, feasibility, and potential efficacy of pulsed electromagnetic field (PEMF) therapy for children with cerebral palsy. With no observed side effects, the significant improvement in fine balance coordination suggests a promising avenue.
PMID: 39797275

3.Gluteus medius muscle activation patterns during gait with Cerebral Palsy (CP): A hierarchical clustering analysis

Mehrdad Davoudi, Firooz Salami, Robert Reisig, Katharina S Gather, Sebastian I Wolf

Abstract
Duchenne gait, characterized by an ipsilateral trunk lean towards the affected stance limb, compensates for weak hip abductor muscles, notably the gluteus medius (GM). This study aims to investigate how electromyographic (EMG) cluster analysis of GM contributes to a better understanding of Duchenne gait in patients with cerebral palsy (CP). We analyzed retrospective gait data from 845 patients with CP and 65 typically developed individuals. EMG activity of GM in envelope format were collected and examined with gait kinematics and kinetics parameters in frontal plane and hip abductor strength, and hip abduction passive range of motion. Six key EMG envelope features during ten gait phases were extracted and normalized. A hybrid K-means-PSO clustering algorithm was employed, followed by hierarchical clustering. The identified clusters were characterized by having a low (cluster_1), medium (cluster_2), and high (cluster_3) activity of GM during loading response. The patients in cluster_1 also exhibited pathological gait characteristics, including increased trunk lateral lean and weak hip abductor, which are associated with Duchenne gait. The patients in this cluster were subclustered according to their response to the intervention: SUB_1 with a significant improvement in trunk obliquity, pelvic obliquity, and hip abduction after intervention, and SUB_2 without such improvement. Comparing pre-treatment EMG and clinical exam of the sub_clusters, SUB_1 had significantly higher activity of GM during 50-87% of the gait cycle with a greater passive range of hip abduction compared to SUB_2. This study established a relationship between EMG of GM and frontal plane gait abnormalities in patients with CP, highlighting potential improvement in Duchenne gait with prolonged GM activity during swing after the intervention.
PMID: 39787154

4.Disabilities and Disparities in Oral Health-Related Quality of Life: A Systematic Review and Meta-Analysis in Saudi Arabia

Faris Yahya I Asiri, Marc Tennant, Estie Kruger

Abstract
Background and Objectives: In Saudi Arabia, persons with disabilities (PWDs) face considerable oral health challenges, including a higher prevalence of dental caries and gingival inflammation, which adversely affects their oral health-related quality of life (OHRQoL). This population experiences distinct and substantial barriers in accessing adequate dental care. This systematic review and meta-analysis aims to quantify disparities in OHRQoL between PWDs and individuals without disabilities in Saudi Arabia, focusing on caries and gingivitis prevalence, and to identify specific areas for intervention. Materials and Methods: A structured search of PubMed, Scopus, Web of Science, and Google Scholar yielded 803 articles, of which seven met the inclusion criteria. These studies reported on OHRQoL and oral health outcomes in populations with autism, Down syndrome, cerebral palsy, and hearing impairments. Data on caries rates, gingival health, and self- or caregiver-reported quality of life were extracted and analysed. Results: PWDs in Saudi Arabia exhibit significantly higher caries prevalence (ranging from 60% to over 80%) and moderate-to-severe gingival inflammation (up to 60%) compared to individuals without disabilities. The caregivers of children with disabilities reported heightened stress levels, and PWDs experienced reduced functional and social well-being. These disparities were compounded by limited preventive care access and high unmet treatment needs, particularly among those with severe disabilities and limited caregiver support. Conclusions: PWDs in Saudi Arabia face marked oral health disparities, with notably higher rates of dental caries and gingivitis, severely impacting their quality of life. The findings underscore the need for targeted oral health policies and community-based interventions to enhance care accessibility, promote preventive measures, and address the unique needs of this vulnerable population.
PMID: 39768885

5.Motivational influence of virtual reality in physical therapy for children with cerebral palsy: a systematic review protocol

Huda Aliah Mohd Iqbal, Asfarina Zanudin, Nor Azlin Mohd Nordin

Introduction: Emulating the vast inclusion of advanced technology in everyday practice, the medical world is no exception to its implementation, in particular, virtual reality (VR). Initially, its introduction as a therapy was accompanied by high aspirations and expectations for its growth and potential. Motivation is said to be the most associated benefit; although it is imperative to note that there exists a paucity of research that specifically quantifies its tangible impact on cerebral palsy (CP). There has yet to be a systematic review of the instruments used to precisely measure motivation and examine its association with the benefits of VR for children with cerebral palsy.
Methods and analysis: This review will evaluate comparative studies that used VR therapy as part of interventions for children with CP. Qualitative studies, single-case studies, systematic reviews, literature reviews and guideline audits will be excluded. This review will be conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-P) guidelines. The methodological protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO). The following electronic databases will be used to access related studies published between January 2012 and December 2023: MEDLINE (via EBSCOhost), Web of Science, Scopus, PubMed and Cochrane. The Peer Review of Electronic Search Strategies checklist will be employed to develop database search strategies.
Ethics and dissemination: This review does not require ethical approval as it uses secondary data. The findings will be published in a scientific journal. We intend to contribute to the expansion of knowledge concerning the motivational implications of VR on children with CP.
Prospero registration number: International Prospective Register of Systematic Reviews (identification number CRD42023401079).
PMID: 39773787

6.Multimodal fuzzy logic-based gait evaluation system for assessing children with cerebral palsy

Saleh Massoud, Ebrahim Ismaiel, Rasha Massoud, Leila Khadour, Moustafa Al-Mawaldi

Abstract
Gait analysis is crucial for identifying functional deviations from the normal gait cycle and is essential for the individualized treatment of motor disorders such as cerebral palsy (CP). The primary contribution of this study is the introduction of a multimodal fuzzy logic system-based gait index (FLS-GIS), designed to provide numerical scores for gait patterns in both healthy children and those with CP, before and after surgery. This study examines and evaluates the surgical outcomes in children with CP who have undergone Achilles tendon lengthening. The FLS-GIS utilizes hierarchical feature fusion and fuzzy logic models to systematically evaluate and score gait patterns, focusing on spatial and temporal features across the hip, knee, and ankle joints. The two FLS types-1 (FLS-GIS-T1) and type-2 (FLS-GIS-T2) indices, respectively, were implemented to comprehensively study gait profiles. Starting with the gait parameters of all subjects, the changes in gait parameters in post-surgery children reflect significant improvements in gait dynamics, bringing walking patterns in CP children closer to those of their typically healthy peers. Both FLS-GIS-T1 and FLS-GIS-T2 demonstrated significant improvements in post-surgery evaluations compared to pre-surgery assessments, with p values < 0.05 and < 0.001, respectively, when compared to traditional indices. The proposed FLS-based index offers clinicians a robust and standardized gait evaluation tool, characterized by a fixed range of values, enabling consistent assessment across various gait conditions.
PMID: 39779763

7.Tele-rehabilitation for children with physical disabilities: qualitative exploration of challenges in Iran

Mahta Alsadat Aarabi, Kianoush Abdi, Farin Soleimani

Background: Children with physical disabilities (Having this type of disability can be due to any of the reasons such as cerebral palsy, genetic, developmental, neurodevelopment and any other reasons that cause physical disability in the child) need rehabilitation services. Tele-rehabilitation is a practical approach to provide rehabilitation services for children with rapid and continuous access. This approach has been used more recently and overcomes the limitations of conventional rehabilitation, which involves wasting time, traveling distance, and cost. The purpose of this study is to examine the challenges of telerehabilitation for children with physical disabilities such as cerebral palsy and developmental delay.
Method: This study was conducted with the qualitative approach of content analysis in order to investigate the challenges of tele-rehabilitation services in Tehran in 2023. Twenty-two participants were selected based on purposeful sampling with maximum variation. Data was gathered through semi-structured and in-depth interviews with children's parents and tele-rehabilitation service providers. The interviews lasted between 15 and 75 min, and MAXQDA 10 software was used for data analysis. The conventional content analysis method of Granheim and Lundman was used to analyze the data. In this research, four Guba and Lincoln criteria including creditability, dependency, conformability, and transferability were used to evaluate the trustworthiness of data. This article is part of a more extensive qualitative study that explored the barriers and facilitators of these services.
Finding: For the challenges of telerehabilitation services for these children, the researcher faced with 10 categories which were obtained after the investigation. The 10 categories are as follows: unorganized internet infrastructure, lack of a developed program, inefficient technology, disregard for ethical principles, lack of therapist information, visual and auditory limitations, cultural misconceptions, weakness of empathy and therapeutic alliance, Lack of familiarity with telerehabilitation, and the other online therapy problems.
Conclusion: Finally, by identifying these challenges, it is possible to provide services with higher qualities to people of this group by reducing barriers. Also, the policy makers of the mentioned area should take more effective steps in order to provide this type of services to the families of children with physical disabilities, so that it ultimately leads to basic measures to improve the condition of these children.
PMID: 39773713

8.Postneonatal Cerebral Palsy in Europe: Prevalence and Clinical Characteristics According to Contributory Events: An SCPE Study

Malika Delobel-Ayoub, Virginie Ehlinger, Dana Klapouszczak, Anja Troha Gergeli, Elodie Sellier, Katalin Hollody, Daniel Virella, Torstein Vik, Célia Perret, Nicolas Vidart d'Egurbide Bagazgoïtia, Karen Horridge, Catherine Arnaud

Background: Postneonatal cerebral palsy (PNCP) is rare and requires large databases to be studied over time.
Objectives: To study the time trend of prevalence of PNCP overall and by cause, and to describe the clinical characteristics of children with PNCP according to cause and compared with children with pre/peri/neonatal CP (PPNCP).
Methods: The Surveillance of Cerebral Palsy in Europe (SCPE) database was used. Primary events (the first known chronological event in the causal chain) were classified according to the SCPE classification (six main and 19 sub-categories). Prevalence trends for children born during 1976-2012 were modelled using multilevel generalised linear models. The clinical characteristics of PNCP and PPNCP cases born after 1998 were reported as proportions.
Results: The prevalence rates of PNCP were 1.76 (95% confidence interval (CI) 1.37, 2.23) and 0.82 per 10,000 live births (95% CI 0.73, 0.92) in children born during 1976-1980 and 2006-2012, respectively. The models showed a 2% annual decline in overall prevalence (prevalence rate multiplied by 0.98 each year) and a 10% decline for infectious causes for every 5-year change. The prevalence rate in children born during 2006-2012 was 0.26 per 10,000 (95% CI 0.21, 0.32) for infectious causes, which remained the most frequent. No trend emerged for other causes. Unilateral spastic CP, associated impairments and severe gross motor dysfunction were more frequent in PNCP than in PPNCP, and PNCP showed predominantly grey matter injury (55.6%). Seventeen percent were born preterm. PNCP differed by cause, with cerebrovascular accidents presenting the least severe and hypoxic causes the most severe forms.
Conclusion: Our study confirms the decrease in the prevalence of PNCP in children born up to 2012, particularly for CP, due to infectious causes, which remain the most frequent. Children with PNCP had more severe presentation overall than those with PPNCP, with severity depending on the cause.
PMID: 39775879

9.Prediction of cerebral palsy and cognitive delay among high-risk children in a developing nation: A successful early detection programme

No authors listed

No abstract available
PMID: 39797587

10.Gross Motor Development by Age and Functional Level in Children with Cerebral Palsy from 6 Months to 17 Years-A Norwegian Population-Based Registry Study

Reidun Birgitta Jahnsen, Harald Weedon-Fekjar, Gerd Myklebust, Gunfrid Vinje Storvold

Abstract
Background: Cerebral palsy is a complex lifespan disability caused by a lesion to the immature brain. Evaluation of interventions for children with cerebral palsy requires valid and reliable outcome measures. Motor development curves and reference percentiles for The Gross Motor Function Measure (GMFM-66) are valuable tools for following, predicting, comparing, and evaluating changes in gross motor skills. The aims of this study were to create motor development curves with reference percentiles based on Norwegian data and compare them with published counterparts for Canadian children aged 2-21 years. Method: Prospective population-based cohort data from the Norwegian Quality and Surveillance Registry for Cerebral Palsy (NorCP) for 1206 children with 3612 GMFM-66 tests between 0.5 and 17.3 years of age. Median development by Gross Motor Function Classification System (GMFCS) levels was estimated using a generalized additive regression model with smoothed parameters for location, scale, and shape (based on the R GAMLSS library). To adjust for repeated individual measurements, we report the median curve of 100 random samples with only one observation per observed child. Results: The Norwegian motor development curves for GMFCS levels I-IV increase up to 7 years of age before flattening off, while GMFCS level V curves are relatively flat. Overall, both motor development curves and GMFM-66 percentiles are very similar to Canadian counterparts. Conclusions: The existing Canadian reference curves are valid also for Norway, working well for both clinical and research applications. However, Norwegian percentiles can be used from an earlier age.
PMID: 39797261

11.From publication to action for early detection, surveillance and intervention in cerebral palsy in Spain-Who, how and now

Álvaro Hidalgo-Robles, Javier Merino-Andrés, María Del Mar Batista-Guerra, Cristina Herráiz-Perea

No abstract available
PMID: 39794198

12.The mPower (Mother's Power) Initiative: Improving Health Behavior Through Peer Support and Health Literacy for Mothers of Children with Cerebral Palsy in Rural Bangladesh

Genevieve Perrins, Israt Jahan, Md Nuruzzaman Khan, Mahmudul Hassan Al Imam, Rosalie Power, Catherine King, Mohammad Muhit, Nadia Badawi, Gulam Khandaker

Background/objectives: Cerebral palsy (CP) affects a substantial number of children, particularly in low- and middle-income countries such as Bangladesh. Maternal health literacy is critical to the health and well-being of children with CP, particularly in low-resource settings. In this study, we sought to assess how the mPower (mother's power) community-based intervention impacted mothers' CP-specific knowledge, as well as their utilization of rehabilitation services in rural Bangladesh.
Methods: This quasi-experimental study was conducted with a group of mothers of children with CP, formed through the ongoing initiatives of the Bangladesh CP Register in rural Bangladesh. A pre-post-intervention comparison method was used to assess the outcomes of the intervention.
Results: Mothers who participated in over two-thirds of the mPower sessions demonstrated a significant increase in CP-related knowledge (75.5% vs. 63.6%, p = 0.04). Additionally, mothers who attended two-thirds of the mPower sessions utilized rehabilitation services more often compared to those who attended fewer sessions (55.3% vs. 22.6%, p < 0.001).
Conclusions: The mPower intervention successfully improved health literacy and likely increased rehabilitation service utilization among mothers of children with CP in rural Bangladesh.
PMID: 39767867

13.Assessment of Iron Metabolism and Inflammation in Children with Cerebral Palsy

Ozhan Orhan, Gul Sahika Gokdemir

Abstract
Background/Objectives: Cerebral palsy (CP) is a motor disorder resulting from brain damage that is common in childhood. Iron is vital for the body's basic functions. Iron metabolism disorders and inflammation contribute to the neurological complications seen in CP. The purpose of this research was to ascertain the association and correlation between markers of inflammation and iron metabolism in children with CP. Methods: A total of 181 children diagnosed with CP and 111 typically developing children were retrospectively included in the study. Demographic data, blood parameters, C-reactive protein, iron, total iron binding capacity, and inflammation markers were evaluated. Results: C-reactive protein (CRP), neutrophil-to-lymphocyte ratio (NLR) and systemic immuno-inflammatory index (SII) levels of CP children were found to be statistically significantly higher than those of control group children (p < 0.05). Iron (Fe) and ferritin levels were lower in the CP group, while total iron binding capacity (TIBC) was higher. Spearman correlation analysis showed significant correlations between iron, ferritin and TIBC and SII. Conclusions: Iron deficiency and chronic inflammation are associated with the pathophysiology of CP in patients with CP, and therefore it is important to monitor markers of iron metabolism and inflammation in these patients.
PMID: 39797144

14. Indications for tracheostomy placement in pediatric patients with cerebral palsy

Elizabeth Fisher, Taher Valika

Background: Cerebral palsy (CP) is the most common neuromuscular disorder in children, and children with CP are at increased risk of respiratory distress potentially requiring tracheostomy placement. Previous studies have characterized indications for tracheostomy in neurologically compromised children, however no studies focus specifically on children with CP. The purpose of this study was to identify the indications for tracheostomy placement, sites of airway obstruction, and rate of decannulation in children with CP.
Methods: We conducted a single-center retrospective chart review of all patients who presented with cerebral palsy and required tracheostomy at our center between 2005 and 2023. Patients were categorized according to primary indication for tracheostomy placement. The most common sites of airway obstruction in the cohort were recorded. The date of decannulation was recorded for those patients who had undergone decannulation.
Results: 933 patients with tracheostomies were identified, of whom 169 (18 %) had CP and 122 met inclusion criteria. The median age at tracheostomy placement was 1.69 (IQR 0.539-6.609) years. The most common indications for tracheostomy placement were: prolonged intubation or BiPAP dependence (81 %), airway obstruction/hypotonia (13 %), and aspiration/recurrent respiratory infection (6 %). At the time of tracheostomy placement: 38 % of patients had a single site of upper airway obstruction, while 27 % had multi-level obstruction. The most common sites of upper airway obstruction were the supraglottis (23.0 %), tongue base (12 %), and the tonsils/pharyngeal wall (8 %). 24 % of patients had tracheobronchomalacia, and 16 % had subglottic stenosis. Among all patients, 4 of 122 (3 %) were ultimately decannulated.
Conclusions: Patients in our cohort most often received tracheostomy after failure of less invasive ventilation therapies. Tracheostomy placement occurred at a young age. Patients presented with a variety of sites of airway obstruction. Decannulation rate in this cohort was low. Further work is needed to confirm indications for tracheostomy placement and decannulation rate in this population.
PMID: 39793295

15. Effect of individual variations in genes related to dopamine brain transmission on performance with and without rewards during motor sequence and probabilistic learning tasks in children and young adults with and without cerebral palsy

Barrett Dryden, Jesse Matsubara, Eric Wassermann, Hans Forssberg, Diane L Damiano

Abstract
Children with cerebral palsy (CP) often participate in training to improve mobility, hand function and other motor abilities. However, responses to these interventions vary considerably across individuals even those with similar brain injuries, ages and functional levels. Dopamine is a neurotrasmitter known to affect motor skill acquistion in animals and humans and may be influenced by individual variations in genes related to brain transmission of dopamine. To evaluate potential genetic influences on learning in young people with and without CP, we calculated individual dopamine-related gene scores and compared these to the ability to learn two different tasks, an implicit sequence learning task and a probablistic classification task. Each task was also administered in an unrewarded condition and a rewarded one known to increase circulating levels of dopamine. The main finding was an interaction between gene score and condition for the sequence task such that those with low gene scores were poorer learners without rewards but responded positively to rewards whereas the converse was true for those with high gene scores. This is the first prospective study in CP suggesting that genetic variability may influence neurorehabilitation outcomes and could potentially be modulated using rewards or medications for those with poorer learning at baseline, thus promoting more personalized approaches to enhancing motor training in CP and other neurological conditions.
PMID: 39787065

16. Parental and Medical Classification of Neurodevelopment in Children Born Preterm

Lindsay L Richter, Annie Janvier, Rebecca Pearce, Claude Julie Bourque, Paige T Church, Thuy Mai Luu, Anne Synnes

Background and objectives: The likelihood and severity of neurodevelopmental impairment (NDI) affects critical health care decisions. NDI definitions were developed without parental perspectives. We investigated the agreement between parental vs medical classification of NDI among children born preterm.
Methods: In this multicenter study, parents of children born preterm (<29 weeks) evaluated at 18 to 21 months corrected age (CA) were asked whether they considered their child as developing normally, having mild/moderate impairment, or having severe impairment. Medical categorization was based on hearing, vision, cerebral palsy status, and Bayley Scales of Infant and Toddler Development Third Edition (Bayley-III) scores. Agreement was analyzed using Cohen's weighted κ. Discrepancies in categorization by NDI components and parental demographics were examined using the Pearson $\chi 2$ test, Fisher exact test, or Wilcoxon signed-rank test.
Results: Children (n = 1098, gestational age 26.1 ± 1.5 weeks, birthweight 919 ± 247 g) were evaluated at 19.6 ± 2.6 months CA at 13 clinics. Agreement between parental and medical NDI classification was poor (κ = 0.30; 95% CI: 0.26-0.35). Parents described their child's development as normal or less impaired. Only 12% of parents of children classified as having a severe NDI according to the medical definition agreed. There were significant disagreements between classification for children based on Bayley-III cognitive, language, and motor scores but not for cerebral palsy. Discrepancies varied by parental education and ethnicity but not by single caregiver status.
Conclusions: Parent perception of NDI differs from medical categorization, creating a risk of miscommunication. This indicates an overestimation of the impact of disability by clinicians, which may affect life-and-death decisions. Parental perspectives should be considered when reporting and discussing neurodevelopmental outcomes.
PMID: 39786567

17. Impact of Social Disadvantage on Medical and Functional Severity in Children With Cerebral Palsy

Theresa Sukal-Moulton, Michael E Msall, Kristen Wroblewski, Sarah Safdar, Deborah J Gaebler-Spira

Background: Those with neurological disorders like cerebral palsy (CP) may experience an altered impact of social determinates of health on child functioning and well-being. We investigated the relationship between relative social advantage and medical and functional outcomes in a large cohort of children, adolescents and young adults with CP (n = 1269, aged 2-84 years).
Methods: We extracted data from the Cerebral Palsy Research Registry and dichotomized a range of independent factors (income, ethnicity and race) into advantaged and disadvantaged/vulnerable and a range of medical and functional outcomes (gross motor, manual ability, behaviour, breathing, nutritional intake, hearing, seizures, language and vision) and computed odds ratios using logistic regression.
Results: We found significantly more gross and fine motor functional limitations for those with disadvantage in income (p = 0.002 and 0.006), marginalized race (p < 0.001 and 0.062) or ethnicity (p = 0.013 and 0.014). Ethnicity was further implicated in gestational age, whereas minority race played a role in more severe impairments in breathing, nutritional intake, language functioning and low birth weight status.
Conclusion: We found evidence of more health and functional challenges for children with CP and social disadvantage in our cohort. Additional access to equitable resources may improve these imbalances and should be prioritized.
PMID: 39778918

18. Psychometric properties of Child Sensory Profile-2 (CSP-2) among children with spastic cerebral palsy

Sapna Dhiman, Ramesh K Goyal, Puneeta Ajmera, Sheffali Gulati

Abstract
Cerebral palsy (CP) is not just caused by neuromuscular abnormalities; it is also a result of an impaired sensory system. Since there is not a standardized measure to evaluate sensory processing of children with spastic CP, therefore an in-depth assessment of sensory processing deficits in children with spastic CP would require an understanding of the validity and reliability of the Child Sensory Profile-2 (CSP-2) in children with spastic CP. The sample of this study included 230 children with spastic CP aged 3 to 14 years who referred to different paediatric rehabilitation centres of Delhi-NCR from April 2021 and September 2023 by using the snowball sampling procedure. To collect the data, the CSP-2 caregiver questionnaire was used. For validity, face and content validity were determined. For reliability, internal consistency of all the responses was examined using Cronbach's alpha reliability coefficient. For validity, experts involved in the study reported that the organization and design of the questionnaire would be appropriate for the children with spastic CP. All the items of the CSP-2 questionnaire were simple and easy to understand. Internal consistency was also calculated for total items (N = 86) and found to be 0.898 which indicates that all items of the questionnaire are internally consistent and reliable.
Conclusion: According to the findings of our study, the CSP-2 is a valid and reliable measure for evaluating sensory processing in children with spastic CP. Additionally, it may be an appropriate tool for accurately assessing this population's sensory processing deficits.
What is known: • Sensory processing deficits commonly concur with motor deficit in children with CP. Overall prevelance of sensory processing deficit was 83% in children with CP.
What is new: • Child Sensory Profile-2 is a reliable and valid tool for measuring sensory processing abilities in children with CP.

PMID: 39776282

Prevention and Cure

19.Human umbilical cord mesenchymal stem cell-derived exosomes combined with mouse nerve growth factor can more effectively ameliorate the motor disorder and brain pathological injury in mice with cerebral palsy

Xingxing Chen, Yipa Sai, Weijing Cui, Xiaoxia Hu, Jing Liu, Xiaofeng Cao, Shili Wu

Background: Cerebral palsy (CP) is a neurodevelopmental disorder and motor disorder syndrome. It has been confirmed that mesenchymal stem cells (MSCs) and mouse nerve growth factor (mNGF) can repair brain tissue damage and nerve injury; however, exosomes derived from healthy cells may have a comparable therapeutic potential as the cells themselves.
Objectives: The purpose of this study was to explore the improvement effect of human umbilical cord mesenchymal stem cell (hUC-MSCs)-derived exosomes on a CP model and determine whether there is a synergistic effect when combined with mNGF.
Material and methods: Exosomes were isolated from hUC-MSCs and examined using transmission electron microscopy (TEM), particle size and western blot (WB). A total of 38 BALB/c mice (male, postnatal day 6 (PND6)) were randomly divided into 5 groups: sham group, CP group, CP-exo group, CP-mNGF group, and CP-exo-mNGF group. Hypoxic induction after unilateral common carotid artery ligation combined with lipopolysaccharide (LPS) infection was used to construct the CP model. Pathological damage to neuron tissue and synaptic structures in the hippocampus was confirmed using light microscopy after hematoxylin-eosin (H&E) staining and TEM, respectively. Survival of neurons was evaluated using Nissl staining. Western blot was applied to monitor PSD-95 and synaptophysin (SYN) protein levels.
Results: This study indicated that exosomes released by hUC-MSCs ameliorated brain damage and synaptic structure destruction in CP mice induced by hypoxic ischemia and LPS infection. When combined with mNGF, there was more effective improvement. In the CP group, neuronal function was severely impaired; however, hUC-MSCs-derived exosomes and mNGF improved it. PSD-95 and SYN proteins were presynaptic and postsynaptic proteins, respectively. Interestingly, the PSD-95 and SYN protein levels were significantly lower in the CP mice, but with the addition of hUC-MSCs-exosomes or mNGF, they increased significantly, especially in the CP-exo-mNGF group.
Conclusions: The nerve function injury in CP can be improved the most when hUC-MSCs-derived exosomes are combined with mNGF through intraperitoneal (ip.) administration.
PMID: 39776315