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## Interventions and Management

**1. [Effectiveness of mirror therapy and action observation therapy in infantile cerebral palsy: a systematic review] [Article in Spanish]**
M Oliva-Sierra, M Ríos-León, V Abuín-Porras, P Martín-Casas

Review An Sist Sanit Navar. 2022 Aug 16;45(2):e1003. doi: 10.23938/ASSN.1003.

The aim of this review was to assess the effectiveness of mirror therapy (MT) and action observation therapy (AOT) on upper limb-related body structures, body functions, activity, and involvement in patients with infantile cerebral palsy (ICP). We carried out a systematic review of randomized controlled trials published over the past 10 years, in which MT or AOT was compared to other ICP-directed interventions. Nine studies met the inclusion criteria and we measured their methodological quality using the PEDro scale. MT or AOT seem to significantly improve upper limb-related body structures, body function, activity, and participation in comparison to other interventions for ICP. Both seem to improve overall quality of life, reduce their disability, and promote its functioning. Further studies with higher methodological quality need to be developed to confirm the long-term effectiveness of MT and AOT.

PMID: 35972309

**2. Efficacy of Selective Dorsal Rhizotomy and Intrathecal Baclofen Pump in the Management of Spasticity**
Pramath Kakodkar, Hidy Girgis, Perla Nabhan, Sharini Sam Chee, Albert Tu

Adv Tech Stand Neurosurg. 2022;45:379-403. doi: 10.1007/978-3-030-99166-1_13.

Background: Neurosurgical indications and interventions provided in the management of spasticity have evolved significantly over time. Selective dorsal rhizotomy (SDR) and intrathecal baclofen (ITB) pumps have been used to improve mobility, reduce lower extremity spasticity, and increase quality of life in patients with various diagnoses. Methods: Studies describing ITB and SDR outcomes in adult and pediatric patients were identified from Medline and Embase databases. Only publications between January 1990 to January 2021 were included. Combinations of search terms 'Selective Dorsal Rhizotomy', 'Selective Posterior Rhizotomy', 'functional posterior rhizotomy', 'intrathecal baclofen pump', and 'spasticity' were used. Only studies in English language and those that included parameters for lower extremity outcome (i.e., spasticity, ambulation) were included. Only studies describing follow-up 12 months or greater were included. Case reports, reviews without primary data, or inaccessible publications were excluded. Results: Two hundred and ninety publications between January 1990 to January 2021 were identified. Of these, 62 fit inclusion and exclusion criteria for a total of 1291 adult and 2263 patients. Etiologies in adult and pediatric populations varied substantially with multiple sclerosis, cerebral palsy, and trauma comprising the majority of causes for spasticity in adult patients. In pediatric patients, cerebral palsy was the predominant etiology of spasticity. While outcomes after SDR and ITB varied, both are effective for long-term tone reduction. SDR appeared to have a greater effect on

function compared to baseline when comparing relatively similar subgroups. The complication rates for either intervention were significant; ITB had a much greater incidence of wound and hardware adverse events, whereas SDR was associated with a not insignificant incidence of new bladder or sensory deficit. Conclusion: ITB and SDR have demonstrated efficacy and utility for tone reduction in a variety of conditions. The selection of a specific intervention may have a variety of determining features including the etiology of spasticity, age of patient, as well as balancing benefit and complication profiles of each technique. Appropriate patient selection is essential for providing optimal patient outcomes.

PMID: 35976458

**3. Spinal cord tethering after selective dorsal rhizotomy below the conus medullaris**
Katherine Belanger, William McKay, Joyce Oleszek, Sarah Graber, Corbett Wilkinson

Childs Nerv Syst. 2022 Aug 17. doi: 10.1007/s00381-022-05633-1. Online ahead of print.

Background: Two techniques for selective dorsal rhizotomy (SDR) involve stimulating and sectioning nerve rootlets either below the conus medullaris or above the entrances to their respective dural root sleeves. In general, both techniques lead to sustained improvements in lower extremity spasticity with low complication rates. To our knowledge, spinal cord tethering has not been previously reported as a complication of SDR using either technique. Methods: We review the presentation, treatment, and outcome of two patients who developed symptomatic spinal cord tethering after SDR below the conus. Results: A 4-year-old male and a 6-year-old female each with a history of spastic diparetic cerebral palsy underwent L1-L2 osteoplastic laminectomy and SDR below the conus. Both surgeries went well with no known complications. Both patients initially did well, with marked improvement in their tone and gait. There were no significant immediate postoperative bowel or bladder problems. The male patient presented 10 months after surgery with new-onset urinary incontinence. A urological evaluation was performed but no imaging was performed. He re-presented 8 months later with worsened urinary incontinence, new fecal incontinence, and worsened gait. An MRI showed signs of tethering, including a holocord syrinx. He underwent two untethering surgeries as well syrinx fenestration, and although his gait improved, it remained worse than it had been several months after surgery. The incontinence did not improve. The second patient also developed urinary incontinence a year after SDR. Due to our experience with the first patient, we obtained an MRI immediately and found evidence of tethering. She underwent untethering and her incontinence improved. Conclusion: We report two cases of spinal cord tethering after SDR below the conus, a previously unreported complication. It is important to realize that this complication can occur after SDR.

PMID: 35978197

**4. Educating rehabilitation professionals on clinical skills for postural care services: A scoping review**
Faye E McGuire, Jennifer Hutson, Hannah Oldenburg

Review J Rehabil Assist Technol Eng. 2022 Aug 10;9:20556683221114786. doi: 10.1177/20556683221114786. eCollection 2022 Jan-Dec.

Background: This scoping review aims to identify evidence-based practices for educating rehabilitation professionals who provide assistive technology interventions, specifically night-time postural care, to children with cerebral palsy. Methods: A review of both peer-reviewed and grey literature published between 2000 and 2021 was undertaken in June 2021. The articles were analyzed using a process outlined by Arksey and O'Malley in 2005: scanning abstracts, completing initial and critical reviews, collating and summarizing data into themes. Results: The search resulted in 15 articles, predominantly from the United Kingdom and the United States: 10 primary research, two reviews, two conceptual/theoretical, and one gray-literature source. Four themes emerged (1) Successful service delivery required competence, (2) Benefits of incorporating practice, collaboration, and feedback, (3) Effective online education through multifactorial approaches, (4) Considering different learning requirements among team members. Conclusions: There's beginning evidence that rehabilitation professionals' competence with night-time postural care might be achieved via active, interactive, multi-factorial online training.

PMID: 35966342

**5. Pelvic radiography as a non-invasive screening tool for hiatal hernia in children with cerebral palsy**
In Hyuk Yoo, Hye Ran Yang

Medicine (Baltimore). 2022 Aug 19;101(33):e29522. doi: 10.1097/MD.0000000000029522.

The diagnosis of hiatal hernia (HH), causing severe gastroesophageal reflux disease and complications in children with cerebral palsy (CP) is cumbersome because invasive investigations are required for diagnosis. Hip displacement, one of the most common complications in children with CP, can be diagnosed with a simple pelvic radiograph. This study aimed to evaluate the association between the severity of hip displacement and HH and the diagnostic accuracy of Reimers' hip migration percentage (MP) on pelvic radiography in assessing the presence of HH. A total of 52 children with CP (27 boys, 25 girls; mean age, 6.3 years; range, 0.6-17.4 years) who underwent esophagogastroduodenoscopy, upper gastrointestinal series and pelvic radiography between March 2013 and February 2020 were recruited. Demographic and clinical characteristics, as well as endoscopic and radiological findings, were evaluated and statistically analyzed. HH was defined as ≥ 2 cm proximal displacement of the gastroesophageal junction identified in esophagogastroduodenoscopy or upper gastrointestinal series, and MP was calculated by evaluating the pelvic radiograph. Of the 52 children enrolled in this study, HH was diagnosed in 18 children (34.6%). When the patients were classified and analyzed according to the MP result, HH was observed in 10%, 26.7%, and 70.6% in MP <33%, MP 33%-39%, and MP > 40% groups, respectively (P < .001). The optimal MP cutoff of 36.5% distinguished pediatric CP patients with HH from those without HH with a sensitivity of 78%, specificity of 68%, a positive predictive value of 56.0%, and a negative predictive value of 85.2%, respectively. The application of MP and the severity of hip displacement, which can be easily measured by simple radiography, may be useful and reliable in screening for detecting HH in children with CP. Retrospectively registered. This study was approved by the Institutional Review Board of Seoul National University Bundang Hospital (IRB No. B-2007-627-106).

PMID: 35984193

**6. Factors influencing the formation of the proximal femur in patients with cerebral palsy**
Mykhailo Yatsuliak, Mykhailo Nemesh, Viktor Filipchuk

Wiad Lek. 2022;75(6):1642-1647. doi: 10.36740/WLek202207105.

Objective: The aim: Establishment of the factors influencing the formation of femoral neck-shaft angles and femoral torsions indices among the patients with cerebral palsy. Patients and methods: Materials and methods: The total number of patients was 46 persons (84 joints). We have examined patients using our method (patent №137567), obtained the true parameters of the femoral neck-shaft angle and femoral torsion, and conducted a statistical analysis of factors that might influence their formation. Results: Results: A statistically significant influence of factors of age, Gross Motor Function Classification System (GMFCS) level, ambulatory status, adductor myotomy and lack of statistical significance concerning the influence of factors such as level of lesion and developmental dysplasia of the hip upon the indices of neck-shaft angle. Femoral torsion's parameters were in statistically significant fashion affected by GMFCS levels, ambulatory status, level of lesion, and did not display statistical significance of factors of age, adductor myotomy, developmental dysplasia of the hip. Conclusion: Conclusions: Our research shows that gait function, as well as GMFCS level, are the important factors in the formation of the proximal femur in patients with cerebral palsy.

PMID: 35962673

**7. Effectiveness of Apple Cider Vinegar and Mechanical Removal on Dental Plaque and Gingival Inflammation of Children With Cerebral Palsy**
Nour Asaad, Mohannad Laflouf

Cureus. 2022 Jul 15;14(7):e26874. doi: 10.7759/cureus.26874. eCollection 2022 Jul.

Background This study was designed to evaluate the effect of apple cider vinegar (ACV) 5% and mechanical plaque removal with a manual toothbrush on dental plaque and gingivitis. The objective was to study available, natural, and inexpensive ways to improve oral health status among the studied group. Materials and methods A randomized clinical trial was performed on 50 children with cerebral palsy aged from three to six years. Participants were divided into two groups (n=25, apple cider vinegar,

manual brushing without toothpaste). Plaque accumulation and gingival status were evaluated using Turesky of the Quigley-Hein plaque index (TQHPI) and modified gingival index (MGI) seven times: pre-intervention baseline (T0), post-intervention at one month (T1), two months (T2), three months (T3), four months (T4), five months (T5), six months (T6). Results Plaque accumulation and gingivitis decreased significantly for the ACV group between T0 and T6 ($p<0.05$) and demonstrated significantly lower plaque accumulation and gingivitis compared to the manual brushing group ($p<0.05$) at T5 and T6. The manual brushing group showed decreasing in TQHPI between T0 and T3, then TQHPI increased significantly ($p<0.05$) at T4, T5, and T6. Conclusions To sum up, this in vitro study has demonstrated the possibility of using apple cider vinegar to reduce plaque and gingivitis. In addition, without additives, apple cider vinegar has both mechanical and chemical effects on dental plaque, and it may be a natural, available, inexpensive, and harmless substance that can improve the quality of oral care for difficult groups of children and people with special needs. Unlike toothbrushes, especially electric toothbrushes, they are effective, but they may be expensive and not available to all children.

PMID: 35978745

**8. Relationship between daily swallowing frequency and pneumonia in patients with severe cerebral palsy**
Nobukazu Tanaka, Kanji Nohara, Chisato Uota, Nami Fujii, Aya Obana, Katsuji Tanaka, Takayoshi Sakai

BMC Pediatr. 2022 Aug 13;22(1):485. doi: 10.1186/s12887-022-03547-0.

Background: Aspiration pneumonia is a major complication that occurs in patients with severe cerebral palsy and is associated with their survival prognosis, necessitating appropriate assessment and response. We focused on swallowing frequency as an index of daily swallowing function due to the difficulty in evaluating the risk of pneumonia. The swallowing motion protects the airway by safely directing the food, saliva, and secretions accumulated in the pharynx into the esophagus to prevent aspiration and entry into the trachea. Thus, swallowing frequency may be correlated with the incidence of pneumonia. In this study, we aimed to investigate the relationship between swallowing frequency and history of pneumonia in patients with severe cerebral palsy. Methods: Fifty-seven patients with cerebral palsy were included in this study. Swallowing frequency was measured three times for each patient on separate days, and the reproducibility was examined by calculating the intraclass correlation coefficient. Further, the relationship between swallowing frequency and history of pneumonia was investigated using multivariate logistic regression analysis. Results: While swallowing frequency differed between participants, it was constant within individuals (intraclass correlation coefficient: 0.941). Furthermore, the swallowing frequencies per hour were $12.2 \pm 12.2$ and $27.0 \pm 20.4$ in the patient groups with and without a history of pneumonia, respectively ($P < 0.001$). Swallowing frequency (odds ratio: 10.489, 95% confidence interval: 2.706-40.663, $P = 0.001$) was significantly associated with the incidence of pneumonia in the previous year. Conclusions: Swallowing frequency could be used as an index for assessing the risk of dysphagia and pneumonia in patients with severe cerebral palsy.

PMID: 35964106

**9. Lung ultrasound in young children with neurological impairment: A proposed integrative clinical tool for deaeration-detection related to feeding**
Simona Fiori, Elena Moretti, Carolina Amador, Alice Martinelli, Rosa Teresa Scaramuzzo, Tiziana Controzzi, Roberta Battini, Luca Filippi, Andrea Guzzetta, Luna Gargani

Front Pediatr. 2022 Jul 27;10:932409. doi: 10.3389/fped.2022.932409. eCollection 2022.

Infants and children with neurological impairment, such as cerebral palsy (CP), often experience abnormal ingestion functions, including oropharyngeal dysphagia and gastroesophageal reflux disease, which led to aspiration-related respiratory complications, morbidity, hospitalization, or death. There is a lack of evidence-based, repeatable, infant-friendly instrumental procedures to assess aspiration-risk in infants with CP or other neurological disorders, with also a lack of clinical assessment measures to support the use of more invasive diagnostic techniques. To this purpose, in the current study we explore the feasibility of lung ultrasound (LUS), to assess lung deaeration possibly related to aspiration during meal, in a cohort of 35 subjects affected by CP or other encephalopathies, and 10 controls in the same age-range. We coupled LUS procedure with meal caregiver administration for each child. Our results support the feasibility of this innovative approach in the clinical setting. Exploratory findings revealed a number of lung abnormalities likely related to abnormal ingestion function in subjects. Subgroup analyses revealed possible differences in LUS abnormalities between CP and other encephalopathies, possibly related to different mechanism of disease or dysfunction. Also, some evidences arose about the possible relationship between such LUS abnormalities and feeding and swallowing abilities in CP or other encephalopathies. LUS showed preliminarily

feasibility and effectiveness in detecting meal-related LUS abnormalities in a dynamic manner in the clinical setting. This approach demonstrated usefulness as a potential tool for improving assessment and management in complex care of infants and young children with severe neurological disorders.

PMID: 35967558

**10. Clinical Validation of Feeding Handicap Index for Children (FHI-C)**
Srushti Shabnam, N Swapna

J Autism Dev Disord. 2022 Aug 17. doi: 10.1007/s10803-022-05699-5. Online ahead of print.

Children with developmental disabilities (DD) exhibit feeding and swallowing difficulties, which can have an impact on nutritional, developmental, and psychological aspects. The existing tools assess the nature of feeding problems and behaviors only. The present study aimed to assess the physical, functional, and emotional domains in children with DD with feeding issues using Feeding handicap index for children (FHI-C). For clinical validation, FHI-C was administered on the parents/ caregivers of 60 children with cerebral palsy, 61 with autism spectrum disorder, 59 with intellectual disability and 60 typically developing children in the age range of 2 to 10 years. The results revealed that the mean scores (Total FHI-C and FHI-C domain scores) were significantly higher for all three clinical groups than for the control group, which revealed good clinical validity. Also, FHI-C was found to have significantly high test-retest reliability. The study presents a valid and reliable tool for assessing the psychosocial handicapping effects of feeding problems in children with DD. FHI-C provides a holistic picture about the psychosocial impact of feeding problems in children with DD and will assist the clinicians in prioritizing the goals for feeding therapy. The scores obtained can be used as reference for pre and post therapy comparison purposes.

PMID: 35976508

**11. Device-based and subjective measurements of sleep in children with cerebral palsy: a comparison of sleep diary, actigraphy, and bed sensor data**
Ilse Margot van Rijssen, Raquel Yvette Hulst, Jan Willem Gorter, Anke Gerritsen, Johanna Maria Augusta Visser-Meily, Jeroen Dudink, Jeanine M Voorman, Sigrid Pillen, Olaf Verschuren

J Clin Sleep Med. 2022 Aug 17. doi: 10.5664/jcsm.10246. Online ahead of print.

Study objectives: To investigate how subjective assessments and device-based measurements of sleep relate to each other in children with cerebral palsy (CP). Methods: Sleep of children with CP, classified at Gross Motor Function Classification System (GMFCS) levels I-III, was measured during 7 consecutive nights using one subjective (i.e. sleep diary), and two device -based (i.e. actigraphy and bed sensor) instruments. The agreement between the instruments was assessed for all nights, and separately for school- and weekend nights, using intraclass correlation coefficients (ICC) and Bland-Altman plots. Results: A total of 227 nights from 38 children with CP (53% male; median age (range), 6 (2-12)), were included in the analyses. Sleep parameters showed poor agreement between the three instruments, except for total time in bed, which showed satisfactory agreement between i) actigraphy and sleep diary (ICC > 0.86), ii) actigraphy and bed sensor (ICC > 0.84) and iii) sleep diary and bed sensor (ICC > 0.83). Furthermore, agreement between sleep diary and bed sensor was also satisfactory for total sleep time (ICC > 0.70) and wakefulness after sleep onset (ICC = 0.55; only during weekend nights). Conclusions: Researchers and clinicians need to be aware of the discrepancies between instruments for sleep monitoring in children with CP. We recommend combining both subjective and device-based measures to provide information on the perception as well as an unbiased estimate of sleep. Further research needs to be conducted on the use of a bed sensor for sleep monitoring in children with CP.

PMID: 35975545

**12. Interventions with an Impact on Cognitive Functions in Cerebral Palsy: a Systematic Review**
Montse Blasco, María García-Galant, Alba Berenguer-González, Xavier Caldú, Miquel Arqué, Olga Laporta-Hoyos, Júlia Ballester-Plané, Júlia Miralbell, María Ángeles Jurado, Roser Pueyo

Review Neuropsychol Rev. 2022 Aug 16. doi: 10.1007/s11065-022-09550-7. Online ahead of print.

This systematic review aimed at investigating those interventions that impact on cognitive functioning in children and adults with cerebral palsy (CP). A systematic database search was conducted and twenty-eight studies suitable for inclusion were identified, of which only nine were randomized controlled trials (RCTs). Among all the studies included, ten were multi-modal (cognitive and physical tasks), eleven physical, five cognitive, and two alternative and augmentative communication interventions. The evidence suggests that multi-modal and physical interventions improve general cognitive functioning. Multi-modal and cognitive interventions have an impact on visual perception. Both interventions, together with physical interventions have an effect on a specific executive function domain (inhibitory control), and only cognitive interventions improved other executive function domains such as working memory. However, no RCT assessed the effects of all executive function domains. Few studies have looked at interventions to improve memory and language, and there is a scarcity of long-term research. Future RCTs must be of higher quality and better account for age and sex differences, as well as the clinical heterogeneity of CP. To date, there is evidence that multi-modal, cognitive or physical interventions have an impact on general cognitive functioning, visual perception and executive functions in children with CP, which may support their cognitive development. The protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO): CRD42020152616.

PMID: 35972712

**13. Reliable and Valid Robotic Assessments of Hand Active and Passive Position Sense in Children With Unilateral Cerebral Palsy**
Monika Zbytniewska-Mégret, Lisa Decraene, Lisa Mailleux, Lize Kleeren, Christoph M Kanzler, Roger Gassert, Els Ortibus, Hilde Feys, Olivier Lambercy, Katrijn Klingels

Front Hum Neurosci. 2022 Aug 1;16:895080. doi: 10.3389/fnhum.2022.895080. eCollection 2022.

Impaired hand proprioception can lead to difficulties in performing fine motor tasks, thereby affecting activities of daily living. The majority of children with unilateral cerebral palsy (uCP) experience proprioceptive deficits, but accurately quantifying these deficits is challenging due to the lack of sensitive measurement methods. Robot-assisted assessments provide a promising alternative, however, there is a need for solutions that specifically target children and their needs. We propose two novel robotics-based assessments to sensitively evaluate active and passive position sense of the index finger metacarpophalangeal joint in children. We then investigate test-retest reliability and discriminant validity of these assessments in uCP and typically developing children (TDC), and further use the robotic platform to gain first insights into fundamentals of hand proprioception. Both robotic assessments were performed in two sessions with 1-h break in between. In the passive position sense assessment, participant's finger is passively moved by the robot to a randomly selected position, and she/he needs to indicate the perceived finger position on a tablet screen located directly above the hand, so that the vision of the hand is blocked. Active position sense is assessed by asking participants to accurately move their finger to a target position shown on the tablet screen, without visual feedback of the finger position. Ten children with uCP and 10 age-matched TDC were recruited in this study. Test-retest reliability in both populations was good (intraclass correlation coefficients (ICC) >0.79). Proprioceptive error was larger for children with uCP than TDC (passive: 11.49° ± 5.57° vs. 7.46° ± 4.43°, $p = 0.046$; active: 10.17° ± 5.62° vs. 5.34° ± 2.03°, $p < 0.001$), indicating discriminant validity. The active position sense was more accurate than passive, and the scores were not correlated, underlining the need for targeted assessments to comprehensively evaluate proprioception. There was a significant effect of age on passive position sense in TDC but not uCP, possibly linked to disturbed development of proprioceptive acuity in uCP. Overall, the proposed robot-assisted assessments are reliable, valid and a promising alternative to commonly used clinical methods, which could help gain a better understanding of proprioceptive impairments in uCP, facilitating the design of novel therapies.

PMID: 35978982

**14. The Effects of Virtual Reality Tele-exergaming on Cardiometabolic Indicators of Health Among Youth With Cerebral Palsy: Protocol for a Pilot Randomized Controlled Trial**
Byron Lai, Drew Davis, Raven Young, Erin Kimani-Swanson, Cynthia Wozow, Huacong Wen, Yumi Kim, Jereme Wilroy, James Rimmer

JMIR Res Protoc. 2022 Aug 17;11(8):e40708. doi: 10.2196/40708.

Background: Youth with cerebral palsy do not have enjoyable, accessible, and scalable exercise options that can empower them to independently maintain their cardiometabolic health. Objective: The primary aim is to examine the preliminary efficacy of a 12-week home-based virtual reality tele-exergaming intervention on several indicators of cardiometabolic health in youth with cerebral palsy compared to the wait list control. A secondary aim is to describe feasibility metrics, namely, recruitment, retention, and adherence rates; perceived enjoyment; intervention safety; and management issues. The tertiary aim is to generate a theory that reveals critical behavioral mechanisms of adherence to tele-exergaming. Methods: In this parallel group design randomized controlled trial, 34 inactive youths with cerebral palsy are randomly allocated to one of two groups: a group that immediately receives 12 weeks of virtual reality exergaming with tele-physical education or a wait list control group that undergoes their habitual activity for 12 weeks. Participants are recruited from a Children's Hospital and community network. At baseline (week 0), week 6, and week 12, high sensitivity C-reactive protein and blood insulin, hemoglobin A1c, triglycerides, cholesterol, and pressure are measured by the youth and a caregiver at home using a blood spot test kit and blood pressure cuff. They will also self-measure their lung function and body weight using a peak flow meter and bathroom scale, respectively. Collections are supervised by research staff via videoconference. Changes in outcomes are compared between and within groups using exploratory statistical analyses and descriptive statistics. At postintervention or dropout, participants will undergo semistructured interviews to identify behavioral mechanisms that underly participation. Results: Recruitment procedures started in June 2022. All data are expected to be collected by October 2023. Full trial results are expected to be published by February 2024. Secondary analyses of data will be subsequently published. Conclusions: This trial tests an innovative serious exergaming virtual reality program that includes a completely remote enrollment, assessment, and intervention tele-protocol. The knowledge obtained will inform the development of a larger effectiveness trial for improving the health and well-being of youth with cerebral palsy. Trial registration: ClinicalTrials.gov NCT05336227; https://clinicaltrials.gov/ct2/show/NCT05336227. International registered report identifier (irrid): PRR1-10.2196/40708.

PMID: 35976192

**15. Effects of Interventions Involving Speech Output Technologies on Communication Outcomes for Individuals With Developmental Disabilities: A Scoping Review**
Tiffany N Chavers, Ralf W Schlosser, Cissy Cheng, Rajinder Koul

Am J Speech Lang Pathol. 2022 Aug 15;1-20. doi: 10.1044/2022_AJSLP-22-00039. Online ahead of print.

Purpose: This scoping review aimed to map the literature on the effects of interventions involving speech output technologies on communication outcomes for individuals with developmental disabilities other than autism spectrum disorder. Method: A scoping review methodology was used to limit bias in searching, selecting, coding, and synthesizing relevant intervention studies. This involved a multifaceted search for studies conducted between 1991 and March 2021 using various electronic databases, ancestry searches, and forward citation searches from selected articles. Studies had to meet stringent inclusion criteria. Each study was summarized in terms of authors, purpose, participants, design, speech output, outcomes, effectiveness, and quality appraisal. Results: Twenty-five single-case experimental design studies (88 participants) and one group design studies (62 participants) qualified for inclusion. Most of the participants had multiple diagnoses followed by a diagnosis of cerebral palsy and Down syndrome. Most studies focused on requesting behaviors and to a much lesser extent on syntactic structure and word identification. A dearth of high-quality studies was identified. Conclusions: Overall, there is a paucity of high-quality research investigating the effects of speech output technologies for children with developmental disabilities. Additionally, several directions for future research are posited. Supplemental material: https://doi.org/10.23641/asha.20468928.

PMID: 35969850

**16. Preliminary psychometric properties of a standard vocabulary test administered using a non-invasive brain-computer interface**
Seth Warschausky, Jane E Huggins , Ramses Eduardo Alcaide-Aguirre, Abdulrahman W Aref

Front Hum Neurosci. 2022 Jul 28;16:930433. doi: 10.3389/fnhum.2022.930433. eCollection 2022.

Objective: To examine measurement agreement between a vocabulary test that is administered in the standardized manner and a version that is administered with a brain-computer interface (BCI). Method: The sample was comprised of 21 participants, ages 9-27, mean age 16.7 (5.4) years, 61.9% male, including 10 with congenital spastic cerebral palsy (CP), and 11 comparison peers. Participants completed both standard and BCI-facilitated alternate versions of the Peabody Picture Vocabulary Test - 4 (PPVT™-4). The BCI-facilitated PPVT-4 uses items identical to the unmodified PPVT-4, but each quadrant forced-choice item is presented on a computer screen for use with the BCI. Results: Measurement agreement between instruments was excellent, including an intra-class correlation coefficient of 0.98, and Bland-Altman plots and tests indicating adequate limits of agreement and no systematic test version bias. The mean standard score difference between test versions was 2.0 points (SD 6.3). Conclusion: These results demonstrate that BCI-facilitated quadrant forced-choice vocabulary testing has the potential to measure aspects of language without requiring any overt physical or communicative response. Thus, it may be possible to identify the language capabilities and needs of many individuals who have not had access to standardized clinical and research instruments.

PMID: 35966998

**17. General movements assessment and Alberta Infant Motor Scale in neurodevelopmental outcome of preterm infants**
Canan Yildirim, Ayşegül Asalioğlu, Yeşim Coşkun, Gönül Acar, İpek Akman

Pediatr Neonatol. 2022 Jul 19;S1875-9572(22)00147-4. doi: 10.1016/j.pedneo.2022.06.002. Online ahead of print.

Aim: We aimed to compare the General Movement Assessment (GMA) and the Alberta Infant Motor Scale (AIMS) in preterm infants for the prediction of cerebral palsy (CP) and neurodevelopmental delay (NDD). Additionally, we aimed to evaluate the diagnostic compatibility of the General Movement Optimality Score (GMOS), the Motor Optimality Score (MOS), and AIMS for detecting CP and NDD. Method: Seventy-five preterm infants with gestational age (GA) 24-37 weeks were enrolled. Group 1 was composed of infants with 24-28 GA (n = 22); groups 2 and 3 consisted of infants with 29-32 GA weeks (n = 23) and 33-37 GA (n = 30) weeks, respectively. The infants were assessed during the writhing period, the fidgety period, and at 6-12 months of corrected age with GMOS, MOS, and AIMS, respectively. Results: In the writhing period, a cramped-synchronized pattern was observed in 17 (22%) infants, whereas a poor repertoire pattern was observed in 34 (45%) infants. In the fidgety period of the 63 infants, 29 (46%) presented with fidgety movements absent. The MOS and AIMS scores of the infants in group 1 were significantly lower than the other groups, which were statistically significant ($p = 0.004$, $p<0.001$). High and positive compatibility (Kappa coefficient: 0.709; $p = 0.001$) was found between AIMS and GMOS scores and between AIMS and MOS scores (Kappa coefficient: 0.804; $p < 0.001$). In all groups, a statistically significant association was found between total GMOS scores ($p = 0.003$) and the presence of fidgety movements ($p = 0.003$). GMOS, MOS, and AIMS were found to be associated with CP and NDD ($p < 0.001$). Conclusion: GMA is an important tool for the prediction of CP and NDD. The combined use of GMOS, MOS, and AIMS may guide the clinical practice for the valid and reliable diagnosis of CP and NDD.

PMID: 35965235

**18. Parasport: Effects on Musculoskeletal Function and Injury Patterns**
Hayley Sacks, Meagan Wu, Cordelia Carter, Mara Karamitopoulos

J Bone Joint Surg Am. 2022 Aug 16. doi: 10.2106/JBJS.21.01504. Online ahead of print.

Sports participation can improve gait, muscle strength, and functional abilities in patients with a wide variety of disabilities. Para athletes are also at substantial risk for injury during sports participation. Ambulant athletes with cerebral palsy are at risk for soft-tissue injuries about the knee as well as foot and ankle injuries. Wheelchair athletes are at risk for osteoporotic fractures and shoulder girdle injuries. Limb-deficient athletes are prone to low back pain and overuse injuries of the contralateral extremity. Para athletes are vulnerable to abuse during sports participation, and physicians should promptly report

any possible abuse or mistreatment. Orthopaedic surgeons should understand disability and sport-specific risk factors for injury in para athletes in order to initiate early management and injury prevention protocols.

PMID: 35975928