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Interventions and Management

1. A systematic review of vestibular stimulation in cerebral palsy.

Topley D, McConnell K, Kerr C.

Disabil Rehabil. 2020 Mar 26;1-7. doi: 10.1080/09638288.2020.1742802. [Epub ahead of print]

Purpose: Identify the types and dosage of vestibular stimulation interventions in persons with cerebral palsy (CP), and establish the efficacy of these interventions on balance and function. **Materials and Methods:** This systematic review followed Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols to search for studies evaluating vestibular stimulation interventions in persons with CP. Information sources included MEDLINE, Embase, CINAHL, Cochrane Central Register of Controlled Trials, clinicaltrials.gov and the World Health Organisation registry. Methodological quality was assessed by two independent reviewers using the Methodological Index of Non-Randomised Studies (MINORS) and Cochrane Risk of Bias Tool. **Results:** Five articles were included. Three randomised studies were judged to have high risk of bias in at least one domain of the Cochrane Risk of Bias Tool. Two non-randomised studies were rated as low methodological quality using the MINORS tool. All studies used exercise-based vestibular stimulation, but there was little homogeneity regarding dosage. Findings related to efficacy of vestibular stimulation were inconsistent. **Conclusions:** Clinical practice recommendations cannot be made due to lack of high quality studies and heterogeneity of treatment protocols. Future research should address theory-driven selection of intervention, establish dosage, use psychometrically robust tools and include all ages of persons with CP. **IMPLICATIONS FOR REHABILITATION** Optimal intervention parameters for vestibular stimulation cannot be determined from existing literature. Further studies to describe vestibular stimulation intervention components and duration are warranted. In practice, use of valid and reliable balance and gross motor function outcome measures are essential if using vestibular stimulation techniques with people with CP, as the efficacy of these interventions has not been clearly demonstrated. Investigation of electrical Vestibular Nerve Stimulation in people with CP is warranted.

PMID: [32212976](https://pubmed.ncbi.nlm.nih.gov/32212976/)

2. Non-ambulatory children with cerebral palsy: effects of four months of static and dynamic standing exercise on passive range of motion and spasticity in the hip.

Tornberg ÅB, Lauruschkus K.

PeerJ. 2020 Mar 17;8:e8561. doi: 10.7717/peerj.8561. eCollection 2020.

PURPOSE: The aim of this study was to compare the effects of four months of two types of structured training regimes, static standing (StS) versus dynamic standing (DyS), on passive range of motion (PROM) and spasticity in the hip among non-ambulatory children with cerebral palsy. **METHOD:** Twenty non-ambulatory children with cerebral palsy participated in an exercise intervention study with a crossover design. During StS, the Non-ambulatory children with cerebral palsy were encouraged to exercise according to standard care recommendations, including daily supported StS for 30-90 min. During

DyS, daily exercise for at least 30 min at a speed between 30 and 50 rpm in an Innowalk (Made for movement, Norway) was recommended. We assessed adaptive effects from the exercise programs through PROM in the hip assessed with a handheld goniometer, and spasticity in the hip assessed with the Modified Ashworth Scale before and after 30 min of StS or DyS. A trained physiotherapist performed the assessments. The exercise test and exercise training were performed in the children's habitual environment. Non-parametric statistics were used and each leg was used as its own control. RESULT: PROM increased in all directions after 30 min ($p < 0.001$), and after four months of exercise training ($p < 0.001$) of DyS. Thirty minutes of DyS lowered the spasticity in the muscles around the hip ($p < 0.001$) more than 30 min of StS ($p < 0.001$). CONCLUSION: Thirty minutes of DyS increased PROM and decreased spasticity among non-ambulatory children with CP. Four months of DyS increased PROM but did not decrease spasticity. These results can help inform individualised standing recommendations.

PMID: [32211225](#)

3. Interventions within the Scope of Occupational Therapy Practice to Improve Motor Performance for Children Ages 0-5 Years: A Systematic Review.

Tanner K, Schmidt E, Martin K, Bassi M.

Am J Occup Ther. 2020 Mar/Apr;74(2):7402180060p1-7402180060p40. doi: 10.5014/ajot.2020.039644.

IMPORTANCE: Occupational therapy practitioners need updated information about which interventions may improve motor skills for young children. OBJECTIVE: To identify the effectiveness of occupational therapy interventions to promote motor development and prevent delay for children ages 0-5 yr. DATA SOURCES: Six databases (CINAHL, MEDLINE, PsycINFO, ERIC, Cochrane, and OTseeker) were searched for articles published from January 2010 to March 2017. STUDY SELECTION AND DATA COLLECTION: The search yielded 4,488 articles that were reviewed for inclusion. Fifty-six studies were entered into both evidence and risk-of-bias tables. Included studies used Level I-III designs, were within occupational therapy's scope of practice, included participants with a mean age younger than 6 yr, and addressed motor skills. FINDINGS: Three intervention themes emerged: early intervention for children younger than age 3 yr, interventions for preschool children ages 3-5 yr, and interventions for children with or at risk for cerebral palsy. CONCLUSIONS AND RELEVANCE: Occupational therapy practitioners should consider use of interventions with moderate or strong evidence as described in this review. Limitations include high risk of bias and limited evidence for several interventions. WHAT THIS ARTICLE ADDS: This article provides occupational therapy practitioners with updated information on evidence-based practices for children age 5 and younger who have motor delays.

PMID: [32204777](#)

4. Intraoperative testing of passive and active state mechanics of spastic semitendinosus in conditions involving intermuscular mechanical interactions and gait relevant joint positions.

Kaya CS, Bilgili F, Akalan NE, Yucesoy CA.

J Biomech. 2020 Mar 17:109755. doi: 10.1016/j.jbiomech.2020.109755. [Epub ahead of print]

In cerebral palsy (CP) patients suffering pathological knee joint motion, spastic muscle's passive state forces have not been quantified intraoperatively. Besides, assessment of spastic muscle's active state forces in conditions involving intermuscular mechanical interactions and gait relevant joint positions is lacking. Therefore, the source of flexor forces limiting joint motion remains unclear. The aim was to test the following hypotheses: (i) in both passive and active states, spastic semitendinosus (ST) per se shows its highest forces within gait relevant knee angle (KA) range and (ii) due to intermuscular mechanical interactions, the active state forces elevate. Isometric forces (seven children with CP, GMFCS-II) were measured during surgery over a range of KA from flexion to full extension, at hip angle (HA) = 45° and 20°, in four conditions: (I) passive state, (II) individual stimulation of the ST, simultaneous stimulation of the ST (III) with its synergists, and (IV) also with an antagonist. Gait analyses: intraoperative data for KA = 17-61° (HA = 45°) and KA = 0-33° (HA = 20°) represent the loading response and terminal swing, and mid/terminal stance phases of gait, respectively. Intraoperative tests: Passive forces maximally approximated half of peak force in condition II (HA = 45°). Added muscle activations did increase muscle forces significantly (HA = 45°: on average by 42.0% and 72.5%; HA = 20°: maximally by 131.8% and 123.7%, respectively in conditions III and IV, $p < 0.01$). In conclusion, intermuscular mechanical interactions yield elevated active state forces, which are well above passive state forces. This indicates that intermuscular mechanical interactions may be a source of high flexor forces in CP.

PMID: [32204891](#)

5. The Relationship Between Body Composition and Muscle Tone in Children with Cerebral Palsy: A Case-Control Study.

Więch P, Ćwirlej-Sozańska A, Wiśniowska-Szurlej A, Kilian J, Lenart-Domka E, Bejer A, Domka-Jopek E, Sozański B, Korczowski B.

Nutrients. 2020 Mar 24;12(3). pii: E864. doi: 10.3390/nu12030864.

The monitoring of children with cerebral palsy (CP) should include a precise assessment of the nutritional status to identify children and adolescents at risk of nutrition disorders. Available studies assessing the nutritional status of children with CP mainly focus on the relationship between body composition and the coexistence of motor dysfunctions, frequently overlooking the role of muscle tone. Therefore, the aim of this study was to assess the relationship between body composition and muscle tone in children with CP. In a case-control study (n = 118; mean age 11 y; SD = 3.8), the children with CP presented various stages of functional capacities, corresponding to all the levels in gross motor function classification system (GMFSC), and muscle tone described by all the grades in Ashworth scale. The control group consisted of healthy children and adolescents, strictly matched for gender and age in a 1:1 case-control manner. The children with CP were found with significantly lower mean values of fat-free mass (FFM kg = 29.2 vs. 34.5, $p < 0.001$), muscle mass (MM kg = 18.6 vs. 22.6, $p < 0.001$), body cell mass (BCM kg = 15.1 vs. 18.3, $p < 0.001$), and total body water (TBW L = 23.0 vs. 26.7, $p < 0.001$). The same differences in body composition were identified with respect to gender ($p < 0.01$ respectively). Moreover, children with higher muscle tone (higher score in Ashworth scale) were found with significantly lower values of fat mass (FM), FFM, MM, BCM, and TBW ($p < 0.05$). The findings showed lower parameters of body composition in the children with CP compared to the healthy children, and a decrease in the parameters coinciding with higher muscle tone in the study group. This observation suggests that it is necessary to measure muscle tone while assessing nutritional status of children with CP.

PMID: [32213841](#)

6. Spatial Attention Disregard in Children with Hemiplegic Cerebral Palsy.

Wang TN, Liang KJ, Howe TH, Chen HL, Huang CW, Wu CT.

Am J Occup Ther. 2020 Mar/Apr;74(2):7402205090p1-7402205090p9. doi: 10.5014/ajot.2020.038851.

IMPORTANCE: Children with hemiplegic cerebral palsy (CP) demonstrate spatial attention disregard, but the rehabilitation approach to CP is traditionally motor oriented. **OBJECTIVE:** To explore spatial attention disregard in children with hemiplegic CP and its relationship to their motor performance in daily activities. **DESIGN:** Cross-sectional study. **SETTING:** Community. **PARTICIPANTS:** Twenty-five children with hemiplegic CP and 25 age-matched typically developing children. **OUTCOMES AND MEASURES:** For spatial attention performance, the Random Visual Stimuli Detection Task; for developmental disregard, the Observatory Test of Capacity, Performance, and Developmental Disregard; and for motor performance, the Melbourne Assessment 2. **RESULTS:** Children with hemiplegic CP evidenced spatial attention disregard on their more affected sides, and this phenomenon was correlated with developmental disregard. **CONCLUSIONS AND RELEVANCE:** Children with hemiplegic CP demonstrate developmental disregard in both the motor and the visual-spatial attention domains. Including evaluation of and intervention for visual-spatial attention for children with hemiplegic CP in the traditionally motor-oriented rehabilitation approach is recommended. **WHAT THIS ARTICLE ADDS:** This research provides evidence that children with hemiplegic CP demonstrate disregard in the domain of visual-spatial attention. The findings suggest that evaluation of and intervention for visual-spatial attention should be included in CP rehabilitation in addition to the traditionally motor-oriented approach.

PMID: [32204787](#)

7. Cerebral palsy in children: a clinical overview.

Patel DR, Neelakantan M, Pandher K, Merrick J.

Transl Pediatr. 2020 Feb;9(Suppl 1):S125-S135. doi: 10.21037/tp.2020.01.01.

Cerebral palsy (CP) is a disorder characterized by abnormal tone, posture and movement and clinically classified based on the predominant motor syndrome-spastic hemiplegia, spastic diplegia, spastic quadriplegia, and extrapyramidal or dyskinetic. The incidence of CP is 2-3 per 1,000 live births. Prematurity and low birthweight are important risk factors for CP; however, multiple other factors have been associated with an increased risk for CP, including maternal infections, and multiple gestation. In most cases of CP the initial injury to the brain occurs during early fetal brain development; intracerebral hemorrhage and periventricular leukomalacia are the main pathologic findings found in preterm infants who develop CP. The diagnosis of CP is primarily based on clinical findings. Early diagnosis is possible based on a combination of clinical history, use of standardized neuromotor assessment and findings on magnetic resonance imaging (MRI); however, in most clinical settings CP is more reliably recognized by 2 years of age. MRI scan is indicated to delineate the extent of brain lesions and to identify congenital brain malformations. Genetic tests and tests for inborn errors of metabolism are indicated based on clinical findings to identify specific disorders. Because CP is associated with multiple associated and secondary medical conditions, its management requires a multidisciplinary team approach. Most children with CP grow up to be productive adults.

PMID: [32206590](#)

8. Understanding basic concepts of developmental diagnosis in children.

Brown KA, Parikh S, Patel DR.

Transl Pediatr. 2020 Feb;9(Suppl 1):S9-S22. doi: 10.21037/tp.2019.11.04.

Developmental diagnosis is based on an understanding of basic concepts of typical and atypical developmental progression. Child development is influenced by multiple factors, including the development of the nervous system and other organ systems, and the child's physical and social environment. Different factors interplay with each other in influencing the overall development of the child. Development and behavior of the child are intricately associated. Typical child development follows certain basic principles. Some of the more commonly reported developmental concerns include global developmental delay, intellectual disability, cerebral palsy, delayed speech and language, attention deficits, autism, and specific learning disabilities. The clinical presentation of atypical development varies, depending up on the age of the child; with motor delay in early infancy, and learning difficulties in school age child. Regular surveillance and periodic screening help identify specific areas of developmental and behavioral concerns and suggest a need for further appropriate psychological, medical and laboratory evaluation. The principles of management of a child with developmental concerns include early intervention and response to treatment approach, remediation, accommodation, and specific behavioral and pharmacological interventions when indicated.

PMID: [32206580](#)

9. The design and evaluation of electromyography and inertial biofeedback in hand motor therapy gaming.

MacIntosh A, Vignais N, Vigneron V, Fay L, Musielak A, Desailly E, Biddiss E.

Assist Technol. 2020 Mar 24. doi: 10.1080/10400435.2020.1744770. [Epub ahead of print]

This article details the design of a co-created, evidence-based biofeedback therapy game addressing the research question: is the biofeedback implementation efficient, effective, and engaging for promoting quality movement during a therapy game focused on hand gestures? First, we engaged nine young people with Cerebral Palsy (CP) as design partners to co-create the biofeedback implementation. A commercially available, tap-controlled game was converted into a gesture-controlled game with added biofeedback. The game is controlled by forearm electromyography and inertial sensors. Changes required to integrate biofeedback are described in detail and highlight the importance of closely linking movement quality to short- and long-term game rewards. After development, 19 participants (8-17 years old) with CP played the game at home for four-weeks. Participants played 17±9 minutes/day, 4±1 days/week. The biofeedback implementation proved efficient (i.e. participants reduced compensatory arm movements by 10.2±4.0%), effective (i.e. participants made higher quality gestures over time) and engaging (i.e. participants consistently chose to review biofeedback). Participants found the game usable and enjoyable. Biofeedback design in therapy games should consider principles of motor learning, best practices in video game design, and user perspectives. Design recommendations for integrating biofeedback into therapy games are compiled in an infographic to support interdisciplinary knowledge sharing.

PMID: [32207635](#)

10. Virtual keyboard with the prediction of words for children with cerebral palsy.

Jordan M, Nogueira GN Neto, Brito A Jr, Nohama P.

Comput Methods Programs Biomed. 2020 Mar 3;192:105402. doi: 10.1016/j.cmpb.2020.105402. [Epub ahead of print]

One in every 200 people worldwide cannot express orally because of cognitive, motor, neurological, or emotional problems. Assistive technologies can help people with impairments to use computers to perform their daily life activities independently and to communicate with others. This paper presents a Hidden Markov Model-based word prediction method that allows keyboard emulation software to predict words so that children with disabilities can type texts more quickly. The proposed system involved the development of a keyboard emulator, the construction and processing of a corpus, as well as a word prediction algorithm. Children with different cognitive profiles had to produce a text and type it twice: first with free typing, second using the virtual keyboard's word prediction. Results indicated the word prediction of the keyboard emulator software reduced typing efforts. However, the software initially increased the typing time when the corpus was not well adapted to users. The total amount of clicks with word prediction decreased by around 26.2%. Regarding execution time using prediction, 61% typed the text in less time. The tests performed with literate volunteers indicated a reduction in the number of clicks by up to 51.3%. This result surpasses the 15% achieved in the previous study by Free Virtual Keyboard with word prediction based on pure statistics. Moreover, all volunteers required fewer clicks to perform the task. People with impairments, especially children, could use the system and demonstrate their knowledge and abilities. The entire system is available on the Internet and users have unrestricted and free access to it.

PMID: [32208301](#)

11. Brain Stiffness Relates to Dynamic Balance Reactions in Children With Cerebral Palsy.

McIlvain G, Tracy JB, Chaze CA, Petersen DA, Villermaux GM, Wright HG, Miller F, Crenshaw JR, Johnson CL.

J Child Neurol. 2020 Mar 23;883073820909274. doi: 10.1177/0883073820909274. [Epub ahead of print]

Cerebral palsy is a neurodevelopmental movement disorder that affects coordination and balance. Therapeutic treatments for balance deficiencies in this population primarily focus on the musculoskeletal system, whereas the neural basis of balance impairment is often overlooked. Magnetic resonance elastography (MRE) is an emerging technique that has the ability to sensitively assess microstructural brain health through in vivo measurements of neural tissue stiffness. Using magnetic resonance elastography, we have previously measured significantly softer grey matter in children with cerebral palsy as compared with typically developing children. To further allow magnetic resonance elastography to be a clinically useful tool in rehabilitation, we aim to understand how brain stiffness in children with cerebral palsy is related to dynamic balance reaction performance as measured through anterior and posterior single-stepping thresholds, defined as the standing perturbation magnitudes that elicit anterior or posterior recovery steps. We found that global brain stiffness is significantly correlated with posterior stepping thresholds ($P = .024$) such that higher brain stiffness was related to better balance recovery. We further identified specific regions of the brain where stiffness was correlated with stepping thresholds, including the precentral and postcentral gyri, the precuneus and cuneus, and the superior temporal gyrus. Identifying brain regions affected in cerebral palsy and related to balance impairment can help inform rehabilitation strategies targeting neuroplasticity to improve motor function.

PMID: [32202191](#)

12. Quality of life and health services utilization for Spanish children with cerebral palsy.

Pérez-Ardanaz B, Morales-Asencio JM, León-Campos A, Kaknani-Uttumchandani S, López-Leiva I, García-Piñero JM, Martí-García C, García-Mayor S.

J Pediatr Nurs. 2020 Mar 19. pii: S0882-5963(19)30560-3. doi: 10.1016/j.pedn.2020.03.001. [Epub ahead of print]

PURPOSE: To examine the health-related quality of life of children with cerebral palsy and its relationship with their use of

health resources, taking into account sociodemographic factors concerning the family context. **DESIGN AND METHODS:** Cross-sectional study of children with cerebral palsy in Granada (Spain). Quality of life was evaluated with PedsQL questionnaire. **RESULTS:** A total of 75 children were analysed (mean age 7.41 years; SD 4.37; 50.7% male). They made an average of 22.80 visits (SD 12.43) per year; greater use was made of resources by children who had been diagnosed with cerebral palsy for <45 months (36.00 vs. 26.93 visits per year, $p < 0.0001$). Older children suffered more fatigue and pain. Children aged 2-4 years who presented with fatigue had more hospitalizations ($r = -0.35$; $p = 0.20$), whereas those >4 years who had a higher quality of life for daily activities had made more visits to hospital A&E ($r = 0.35$, $p = 0.043$). Among the children studied, there was no significant association between HRQOL and the parents' education or occupation. **CONCLUSION:** These findings highlight variables that may influence children's quality of life and their use of health resources, identifying certain profiles of children who might need individualized interventions. **PRACTICE IMPLICATIONS:** These findings could inform services provided by paediatric nurses to children with cerebral palsy, to individualize interventions and improve patient centred care.

PMID: [32201113](#)

13. Development of the MobQoL patient reported outcome measure for mobility-related quality of life.

Bray N, Spencer LH, Tuersley L, Edwards RT.

Disabil Rehabil. 2020 Mar 24:1-10. doi: 10.1080/09638288.2020.1741701. [Epub ahead of print]

Purpose: To examine how mobility and mobility impairment affect quality of life; to develop a descriptive system (i.e., questions and answers) for a novel mobility-related quality of life outcome measure. **Materials and methods:** Data were collected through semi-structured interviews. Participants were recruited predominantly from NHS posture and mobility services. Qualitative framework analysis was used to analyse data. In the first stage of analysis the key dimensions of mobility-related quality of life were defined, and in the second stage a novel descriptive system was developed from the identified dimensions. **Results:** Forty-six interviews were conducted with 37 participants (aged 20-94 years). Participants had a wide range of conditions and disabilities which impaired their mobility, including cerebral palsy, multiple sclerosis, and arthritis. Eleven dimensions of mobility-related quality of life were identified: accessibility, safety, relationships, social inclusion, participation, personal care, pain and discomfort, independence, energy, self-esteem, and mental-wellbeing. A new outcome measure, known as MobQoL, was developed. **Conclusions:** Mobility and mobility impairment can have significant impacts on quality of life. MobQoL is the first outcome measure designed specifically to measure the impact of mobility on quality of life, and therefore has utility in research and practice to measure patient outcomes related to rehabilitation. **Implications for Rehabilitation:** Mobility impairment affects many different aspects of health and quality of life. The impact of mobility impairment on quality of life is related to processes of physical, emotional, and behavioural adaptation. MobQoL is the first patient-reported outcome measure designed specifically to measure the quality of life impacts of mobility impairment and assistive mobility technology use. MobQoL has potential to be used by rehabilitation professionals to measure and monitor mobility-related quality of life as part of routine clinical practice.

PMID: [32208059](#)

14. Neurodevelopment at age 2 and umbilical artery Doppler in cases of preterm birth after prenatal hypertensive disorder or suspected fetal growth restriction: the EPIPAGE 2 prospective population-based cohort study.

Delorme P, Kayem G, Lorthé E, Sentilhes L, Zeitlin J, Subtil D, Rozé JC, Vayssière C, Durox M, Ancel PY, Pierrat V, Goffinet F; EPIPAGE2 Obstetrical Study Group.

Ultrasound Obstet Gynecol. 2020 Mar 25. doi: 10.1002/uog.22025. [Epub ahead of print]

OBJECTIVE: To investigate the association of absent or reversed end diastolic flow (ARED) in umbilical artery Doppler ultrasound with poor neurological outcome at age 2 after very preterm birth associated with suspected fetal growth restriction (FGR) or maternal hypertensive disorders. **METHODS:** The study population included all very preterm singletons born because of suspected FGR or maternal hypertensive disorders included in EPIPAGE-2, a prospective, nationwide, population-based cohort of preterm births in France in 2011. We analyzed the association of ARED in the umbilical artery with severe or moderate neuromotor or sensory disabilities, and with an Age and Stages Questionnaire (ASQ) score below the threshold at age 2. ASQ is used to identify children at risk of developmental delay needing reinforced follow-up and further evaluation. We performed univariate and two-level multivariable logistic regression analyses. **RESULTS:** The analysis included 484 children followed up at 2 years of age for whom prenatal umbilical Doppler ultrasound was available. Among them, 8 (1.5%) had severe

or moderate neuromotor or sensory disabilities, and 156 (43.9%) had an ASQ score below the threshold. Compared to normal or reduced end diastolic flow in the umbilical artery (n=305), ARED (n=179) was associated with either severe or moderate neuromotor or sensory disabilities (adjusted OR 11.3, 95% CI 1.4-93.4) but not with an ASQ score below the threshold (adjusted aOR 1.2, 95% CI 0.8-1.9). CONCLUSION: Among children born before 32 weeks of gestation because of suspected fetal growth restriction or hypertensive disorder who survived until age 2, prenatal ARED in the umbilical artery was associated with more frequent moderate or severe neuromotor or sensory disabilities. This article is protected by copyright. All rights reserved.

PMID: [32212388](#)

15. Intrathecal Baclofen Overdose With Paradoxical Autonomic Features Mimicking Withdrawal.

Parker-Pitts CK, Weymouth CW, Frawley MT.

J Emerg Med. 2020 Mar 20. pii: S0736-4679(19)31133-3. doi: 10.1016/j.jemermed.2019.12.031. [Epub ahead of print]

BACKGROUND: Intrathecal Baclofen (ITB) has become an increasingly common treatment for severe muscle spasticity associated with conditions such as cerebral palsy and spinal cord injury. Classically, withdrawal symptoms mimic symptoms of serotonin syndrome with hypertension, increased spasticity, clonus, hyperthermia, tachycardia, and possibly acute psychosis. Hypotension, muscle flaccidity, and respiratory depression are generally considered symptoms of toxicity or overdose. **CASE REPORT:** We present the case of a male with recent ITB pump revision who presented with autonomic features suggestive of Baclofen withdrawal, while the remainder of his physical examination suggested appropriate medication dosing. Interrogation of the patient's ITB pump revealed normal function, and the patient had no clinical change with intravenous benzodiazepines, but his condition ultimately improved when his Baclofen dosing was decreased, indicating toxicity instead of withdrawal. **WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?:** As Baclofen pump use increases, the importance of recognizing these potentially life-threatening complications also increases. This case presents the emergency physician with an atypical presentation and emphasizes the importance of a thorough neurologic examination to diagnose patients accurately.

PMID: [32204996](#)

16. Loss of ap4s1 in zebrafish leads to neurodevelopmental defects resembling spastic paraplegia 52.

D'Amore A, Tessa A, Naef V, Bassi MT, Citterio A, Romaniello R, Fichi G, Galatolo D, Mero S, Battini R, Bertocci G, Baldacci J, Sicca F, Gemignani F, Ricca I, Rubegni A, Hirst J, Marchese M, Sahin M, Ebrahimi-Fakhari D, Santorelli FM.

Ann Clin Transl Neurol. 2020 Mar 25. doi: 10.1002/acn3.51018. [Epub ahead of print]

Autosomal recessive spastic paraplegia 52 is caused by biallelic mutations in AP4S1 which encodes a subunit of the adaptor protein complex 4 (AP-4). Using next-generation sequencing, we identified three novel unrelated SPG52 patients from a cohort of patients with cerebral palsy. The discovered variants in AP4S1 lead to reduced AP-4 complex formation in patient-derived fibroblasts. To further understand the role of AP4S1 in neuronal development and homeostasis, we engineered the first zebrafish model of AP-4 deficiency using morpholino-mediated knockdown of ap4s1. In this model, we discovered several phenotypes mimicking SPG52, including altered CNS development, locomotor deficits, and abnormal neuronal excitability.

PMID: [32216065](#)