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Professor Nadia Badawi AM

Macquarie Group Foundation Chair of Cerebral Palsy

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Interventions and Management

1. [Discussion on the clinical treatment of infantile cerebral palsy with the differentiated intervention of meridian points on the spine and back].

[Article in Chinese]

Zhang C, Wang X, Jia G, Yang T.

Zhongguo Zhen Jiu. 2017 Sep 12;37(9):1001-4. doi: 10.13703/j.0255-2930.2017.09.026.

In view of the literature study and clinical practice, the rules of the distribution, the general function and the indication of the meridians points on the spine and back were explored. The TCM mechanism on the rehabilitation of infantile cerebral palsy was studied. The rules of acupoint combination on the spine and back were summarized with meridians, main points and supplementary points involved in the TCM rehabilitation of infantile cerebral palsy. In view of the theoretic study, the advantages on the early infantile motor function, such as body turning, sitting, standing and walking, were analyzed with the long-term intervention of meridian points on the spine and back. It is showed in the rehabilitation of infantile cerebral palsy that the intervention of meridian points on the spine and back improves the motor function on the back and relieves the incoordination in the development between each system and enhances the rehabilitation mechanism of the integration of Chinese and western medicine for the functional development of core stability, which provides much more effective and more precise approach to the diagnosis and treatment of infantile cerebral palsy in clinical practice.

PMID: [29354924](#)

2. Anesthetic management of two parturients with cerebral palsy and prior selective dorsal rhizotomy.

Aiudi CM, Sharpe EE, Arendt KW, Pasternak JJ, Sviggum HP.

Int J Obstet Anesth. 2017 Dec 15. pii: S0959-289X(17)30346-1. doi: 10.1016/j.ijoa.2017.12.003. [Epub ahead of print]

Selective dorsal rhizotomy is a surgical spine procedure used to reduce spasticity in patients with upper motor neuron dysfunction caused by conditions such as cerebral palsy. The optimal anesthetic approach for obstetric patients who have undergone a selective dorsal rhizotomy is unknown. The use and efficacy of neuraxial anesthesia in these patients has not been described. We describe the use of neuraxial anesthesia in two patients with prior selective dorsal rhizotomy. Unless contraindicated for other reasons, a neuraxial anesthetic approach appears to be an effective option in patients with a history of a selective dorsal rhizotomy.

PMID: [29352624](#)

3. Surgical treatment of neglected hip fracture in children with cerebral palsy: case report and review of the literature.

Toro G, Moretti A, Toro G, Tirelli A, Calabrò G, Toro A, Iolascon G.

Clin Cases Miner Bone Metab. 2017 Sep-Dec;14(3):317-323. doi: 10.11138/ccmbm/2017.14.3.317. Epub 2017 Dec 27.

Case: A clinical case of a 15-year-old cerebral palsy child with a Sandhu type 2 neglected femoral neck fracture is presented. The patient was treated using cannulated screws and cancellous bone graft augmented with mesenchymal stem cells. At 6 months after the surgery complete fracture healing was observed. Conclusion: To early diagnose this fractures, it is mandatory to perform a comprehensive clinical and radiological evaluation including also a second level imaging. The use of cannulated screws with cancellous bone graft and MSCs is a viable treatment option in these patients.

PMID: [29354160](#)

4. Simulating the effect of muscle weakness and contracture on neuromuscular control of normal gait in children.

Fox AS, Carty CP, Modenese L, Barber LA, Lichtwark GA.

Gait Posture. 2018 Jan 12;61:169-175. doi: 10.1016/j.gaitpost.2018.01.010. [Epub ahead of print]

Altered neural control of movement and musculoskeletal deficiencies are common in children with spastic cerebral palsy (SCP), with muscle weakness and contracture commonly experienced. Both neural and musculoskeletal deficiencies are likely to contribute to abnormal gait, such as equinus gait (toe-walking), in children with SCP. However, it is not known whether the musculoskeletal deficiencies prevent normal gait or if neural control could be altered to achieve normal gait. This study examined the effect of simulated muscle weakness and contracture of the major plantarflexor/dorsiflexor muscles on the neuromuscular requirements for achieving normal walking gait in children. Initial muscle-driven simulations of walking with normal musculoskeletal properties by typically developing children were undertaken. Additional simulations with altered musculoskeletal properties were then undertaken; with muscle weakness and contracture simulated by reducing the maximum isometric force and tendon slack length, respectively, of selected muscles. Muscle activations and forces required across all simulations were then compared via waveform analysis. Maintenance of normal gait appeared robust to muscle weakness in isolation, with increased activation of weakened muscles the major compensatory strategy. With muscle contracture, reduced activation of the plantarflexors was required across the mid-portion of stance suggesting a greater contribution from passive forces. Increased activation and force during swing was also required from the tibialis anterior to counteract the increased passive forces from the simulated dorsiflexor muscle contracture. Improvements in plantarflexor and dorsiflexor motor function and muscle strength, concomitant with reductions in plantarflexor muscle stiffness may target the deficits associated with SCP that limit normal gait.

PMID: [29353741](#)

5. Long-term development of overcorrection after femoral derotation osteotomy in children with cerebral palsy.

Niklasch M, Klotz MC, Wolf SI, Dreher T.

Gait Posture. 2018 Jan 17;61:183-187. doi: 10.1016/j.gaitpost.2018.01.012. [Epub ahead of print]

BACKGROUND: Recent studies showed rates of recurrence of internal rotation gait (IRG) after femoral derotation osteotomy (FDO) up to 40%. Some surgeons even advice overcorrection during FDO to avoid a later recurrence. RESEARCH QUESTION: Evaluation of the long-term development of limbs with initial overcorrection after FDO. METHODS: 29 limbs of 20 children (9.9 ± 3.2 years at surgery) with IRG, cerebral palsy (CP) and more than 5° external hip rotation postoperatively were included retrospectively. A gait analysis and clinical examination were performed preoperatively (less than one year, E0), postoperatively (9-23 months, E1) and at the long-term follow-up (at least five years postoperatively, E2). Differences between those children that remained overcorrected at E2 and those with a hip rotation within normal range at E2 were evaluated. RESULTS: At E2 41% of these limbs remained overcorrected, 52% showed a hip rotation within normal range and 7% showed recurrence of IRG. A comparison of those limbs that remained overcorrected and those ending within normal range revealed neither a difference in age at surgery nor in static and dynamic torsional parameters at E0 and E1 except for pelvic rotation. A significantly larger pelvic internal rotation at E1 for those with remaining overcorrection could be identified. SIGNIFICANCE: A general overcorrection during FDO in children with CP to avoid recurrence of IRG cannot be recommended, as 41% remain overcorrected. Preoperative predictors for long-term development couldn't be identified. If pelvic mal-rotation is corrected, hip rotation may change into normal range over the time in combination with the development of a flexed knee gait.

PMID: [29353743](#)

6. Backward walking highlights gait asymmetries in children with Cerebral Palsy.

Cappellini G, Sylos-Labini F, MacLellan MJ, Sacco A, Morelli D, Lacquaniti F, Ivanenko Y.

J Neurophysiol. 2017 Dec 20. doi: 10.1152/jn.00679.2017. [Epub ahead of print]

To investigate how early injuries to developing motor regions of the brain affect different forms of gait, we compared the spatiotemporal locomotor patterns during forward (FW) and backward (BW) walking in children with cerebral palsy (CP). Bilateral gait kinematics and EMG activity of 11 pairs of leg muscles were recorded in 14 children with CP (9 diplegic, 5 hemiplegic, 3.0-11.1 yrs) and 14 typically developing (TD) children (3.3-11.8 yrs). During BW, children with CP showed a significant increase of gait asymmetry in foot trajectory characteristics and limb intersegmental coordination. Furthermore, gait asymmetries, which were not evident during FW in diplegic children, became evident during BW. Factorization of the EMG signals revealed a comparable structure of the motor output during FW and BW in all groups of children, but we found differences in the basic temporal activation patterns. Overall, the results are consistent with the idea that both forms of gait share pattern generation control circuits providing similar (though reversed) kinematic patterns. However, BW requires different muscle activation timings associated with muscle modules, highlighting subtle gait asymmetries in diplegic children, and thus provides a more comprehensive assessment of gait pathology in children with CP. The findings suggest that spatiotemporal asymmetry assessments during BW might reflect an impaired state and/or descending control of the spinal locomotor circuitry and can be used for diagnostic purposes and as complementary markers of gait recovery.

PMID: [29357466](#)

7. Evaluating the effectiveness of home exercise programmes using an online exercise prescription tool in children with cerebral palsy: protocol for a randomised controlled trial.

Johnson RW, Williams SA, Gucciardi DF, Bear N, Gibson N.

BMJ Open. 2018 Jan 23;8(1):e018316. doi: 10.1136/bmjopen-2017-018316.

INTRODUCTION: Children with cerebral palsy (CP) and other neurodevelopmental disabilities often receive a home programme of exercises to assist in reaching their therapy goals. Adherence to exercise programmes is necessary to attain the level of practice required to achieve goals; however, adherence can be difficult to accomplish. In this paper, we describe the protocol for a randomised controlled trial to evaluate the effectiveness of delivering a home exercise programme to school-age children with disabilities using Physitrack, an online exercise prescription tool with a website or app interface. **METHODS AND ANALYSIS:** Participants aged 6-17 years, with CP or other neurodevelopmental disabilities, receiving community physiotherapy services in Western Australia, will be recruited. Participants will be stratified by age and functional mobility and randomised to either the intervention group, who will complete an 8-week home exercise programme using Physitrack, or the control group, who will complete an 8-week exercise programme without Physitrack. Researcher blinding to group allocation, and participant blinding to outcome, will be maintained. The primary outcome measures are adherence to the home exercise programme with weekly collection of home exercise logs; achievement of individualised goals by phone interview before and after intervention; and correctness of exercise performance by collection and analysis of videos of participants performing home exercises. Secondary outcome measures include enjoyment of physical activity, confidence to complete exercise programme, preferred method of delivery of programme and usability of Physitrack. A sample size of 58 participants will be necessary to see an effect on home programme adherence. Data will be analysed using the intention-to-treat principle. **ETHICS AND DISSEMINATION:** Ethical approval was obtained from Curtin University Human Research Ethics Committee in July 2016 (10391). Outcomes will be disseminated through publication in peer-reviewed journals and presentations at scientific conferences.

PMID: [29362255](#)

8. Motor skills intervention research of children with disabilities.

Bishop JC, Pangelinan M.

Res Dev Disabil. 2018 Jan 20;74:14-30. doi: 10.1016/j.ridd.2017.11.002. [Epub ahead of print]

BACKGROUND: Physical inactivity and obesity among children with physical and cognitive disabilities is an emerging public health issue. Children's motor skill development is a determinant of lifelong physical activity and obesity. **AIMS:** The purpose of this article is to critically evaluate motor skill intervention literature among children with physical and cognitive disabilities. **METHODS AND PROCEDURES:** Electronic searches were completed to identify research articles published from 1984 to 2014. Major findings were categorized among subtopics including characteristics of intervention studies, research designs, diagnostic method, motor skill interventions and motor skill outcome. **OUTCOMES AND RESULTS:** 21 studies were found

and included participants with developmental delay (42.8%), autism (19.0%), cross-disability (19.0%), intellectual disability (4.8%), cerebral palsy (4.8%), developmental coordination disorder (4.8%), and learning disabilities (4.8%). Only one study was a randomized controlled trial. **CONCLUSIONS:** The current literature on motor skill intervention research is broad in scope and has limited generalizability within and across disability groups. Future research is needed to develop cross-disability intervention methods adaptable to disability and function-specific needs, including the utilization of rapidly developing technology. Researchers are encouraged to utilize sound methodology with robust theoretical foundations. Family and community engagement is encouraged in intervention delivery.

PMID: [29366922](#)

9. Tuina for children with cerebral palsy: A protocol for a systematic review.

Guo T, Zhu B, Zhang X, Xu N, Wang H, Tai X.

Medicine (Baltimore). 2018 Jan;97(4):e9697. doi: 10.1097/MD.0000000000009697.

BACKGROUND: Cerebral palsy (CP) describes a group of permanent disorders of movement and posture causing activity limitations, leading the most common movement disorder to children. On recovery of various aspects of CP, massotherapy has a good effect in a great many of Chinese clinical trials. Therefore, we plan to conduct a protocol of systematic review aimed at systematically reviewing all the clinical evidence on the effectiveness of massotherapy for treating CP in children. **METHODS:** The following electronic databases will be searched from inception to October 1, 2017: Cochrane Library, Web of Science, EBASE, Springer, World Health Organization International Clinical Trials Registry Platform, China National Knowledge Infrastructure, Wan-fang database, Chinese Biomedical Literature Database, Chinese Scientific Journal Database, and other sources. All published English and Chinese articles randomized controlled trials (RCTs) will be included. All types of CP of children in the trials will be included in this study and these individuals will be involved as coresearchers to evaluate the efficacy of massotherapy. RevMan V.5.3.5 software will be implemented for the assessment of bias risk, data synthesis, subgroup analysis, and meta-analyses if inclusion conditions are met. Continuous outcomes will be presented as mean difference (MD) or standard mean difference (SMD), while dichotomous data will be expressed as a relative risk. **RESULTS:** A high-quality synthesis of current evidence of massotherapy for children with CP will be provided from several aspects, including motor function improvement, intellectual development, improvement of self-care ability, and daily living. **CONCLUSION:** This protocol will present the evidence of whether Tuina therapy is an effective intervention for children with CP.

PMID: [29369196](#)

10. Rapid calibration of an intracortical brain-computer interface for people with tetraplegia.

Brandman DM, Hosman T, Saab J, Burkhart MC, Shanahan BE, Ciancibello JG, Sarma AA, Milstein DJ, Vargas-Irwin CE, Franco B, Kelemen J, Blabe C, Murphy BA, Young DR, Willett FR, Pandarinath C, Stavisky SD, Kirsch RF, Walter BL, Bolu Ajiboye A, Cash SS, Eskandar EN, Miller JP, Sweet JA, Shenoy KV, Henderson JM, Jarosiewicz B, Harrison MT, Simeral JD, Hochberg LR.

J Neural Eng. 2018 Jan 24;15(2):026007. doi: 10.1088/1741-2552/aa9ee7. [Epub ahead of print]

OBJECTIVE: Brain-computer interfaces (BCIs) can enable individuals with tetraplegia to communicate and control external devices. Though much progress has been made in improving the speed and robustness of neural control provided by intracortical BCIs, little research has been devoted to minimizing the amount of time spent on decoder calibration. **APPROACH:** We investigated the amount of time users needed to calibrate decoders and achieve performance saturation using two markedly different decoding algorithms: the steady-state Kalman filter, and a novel technique using Gaussian process regression (GP-DKF). **MAIN RESULTS:** Three people with tetraplegia gained rapid closed-loop neural cursor control and peak, plateaued decoder performance within 3 min of initializing calibration. We also show that a BCI-naïve user (T5) was able to rapidly attain closed-loop neural cursor control with the GP-DKF using self-selected movement imagery on his first-ever day of closed-loop BCI use, acquiring a target 37 s after initiating calibration. **SIGNIFICANCE:** These results demonstrate the potential for an intracortical BCI to be used immediately after deployment by people with paralysis, without the need for user learning or extensive system calibration.

PMID: [29363625](#)

11. Dental Decay and Oral Findings in Children and Adolescents Affected by Different Types of Cerebral Palsy: A Comparative Study.

Rodríguez JPL, Ayala-Herrera JL, Muñoz-Gomez N, Martínez-Martínez RE, Santos-Díaz MA, Olvera-Delgado JH, Loyola-Leyva A.

J Clin Pediatr Dent. 2018;42(1):62-66. doi: 10.17796/1053-4628-42.1.11.

OBJECTIVE: To compare dental caries and oral findings in patients affected by different types of Cerebral Palsy (CP). **STUDY DESIGN:** This cross-sectional study involved 120 children and adolescents with a diagnosis of CP. WHO diagnostic criteria were used to determine DMFT (caries diagnosis), the pocket depth and attachment level (periodontitis diagnosis). Additionally, the study evaluated dental erosion, traumatic dental injuries, treatment needs index (TNI), oral habits, malocclusions, gingival overgrowth, and dental fluorosis. **RESULTS:** The most frequent CP type was spastic (62.5%), followed by mixed (18.3%), ataxic (10%), and athetoid (9.1). Patients affected by mixed CP showed a higher prevalence in decayed, DMFT index and TNI compared with the other types of CP ($p < 0.05$). The frequency of malocclusion in the clinical evaluation was 87.5% and in plaster models was 49.2%. **CONCLUSIONS:** Dental caries was an important issue in mixed and athetoid CP groups. Oral habits and malocclusions were the most significant oral health problems in individuals with CP.

PMID: [29360427](#)

12. Shared meanings of success, happiness, and health among adults with cerebral palsy and physiotherapists: implications for practice and research.

Gannotti ME, Blanchard Y, Blumberg L, LaRocco D.

Disabil Rehabil. 2018 Jan 25:1-10. doi: 10.1080/09638288.2018.1425488. [Epub ahead of print]

PURPOSE: To describe shared meanings of success, happiness, and health of adults with cerebral palsy and physiotherapists. **MATERIALS AND METHODS:** Ethnography employed open ended/semi-structured interviews and structured questionnaires (Satisfaction with Life Scale, Beck Depression Inventory-II®, Oxford Happiness Questionnaire, Life Habits Questionnaire, Medical Outcomes Study-Social Support Survey, and PROMIS® Pain Interference Scale). Content analysis of qualitative data and principal components analysis of questionnaire responses identified shared meanings. **RESULTS:** Fourteen adults with cerebral palsy and 15 physiotherapists (median age 46) had similar levels of education. For both groups, social achievements, personal goals, employment, and supporting a family defined success. Adults with cerebral palsy more frequently identified tenacity and persistence as important for success. Both groups described happiness as spending time with loved ones, recreational activities, and having purpose in life. Adults with cerebral palsy identified the importance of self-acceptance for happiness. For both, health included self-care of mind/spirit, cardiovascular and musculoskeletal wellness, and physical fitness (the ability to perform physical tasks). Analysis of questionnaire responses identified shared meanings (eigenvalue 41, 95% explained variance). **CONCLUSIONS:** Adults with cerebral palsy and physiotherapists share similar experiences, behaviors, and feelings about success, happiness, and health. This knowledge may improve communication, enhance evidence-based practice, and foster services to support wellbeing. Implications for rehabilitation Cerebral palsy is a life-long condition, but we know little about social and physical outcomes for adults with cerebral palsy. Lack of understanding about meanings of success, happiness, and health may be a barrier for consumers accessing and for providers delivering evidence-based services. Physiotherapists and adults with cerebral palsy share similar meanings (feelings, experiences, beliefs, behaviors) of success, happiness, and health- or wellbeing. Knowledge of this common ground may result in improved communication between providers and consumers, and foster more relevant and meaningful services to support the wellbeing of adults with cerebral palsy.

PMID: [29370730](#)

13. Early Predictors and Correlates of Communication Function in Children With Cerebral Palsy.

Hidecker MJC, Slaughter J, Abeysekara P, Ho NT, Dodge N, Hurvitz EA, Workinger MS, Kent RD, Rosenbaum P, Lenski M, Vanderbeek SB, DeRoos S, Paneth N.

J Child Neurol. 2018 Jan 1:883073817754006. doi: 10.1177/0883073817754006. [Epub ahead of print]

Birth characteristics and developmental milestones were evaluated as early predictors/correlates of communication in children with cerebral palsy. The hypothesis was that maternal report of child's age for vocal play and first words would predict current functional communication. A case series of 215 children, 2 to 17 years (mean age = 8.2 years, SD = 3.9) with cerebral palsy was recruited from medical practices in 3 Michigan cities. Early developmental data were collected by maternal interview. The child's Communication Function Classification System (CFCS) level was obtained from parent. Predictors of less functional communication included gestational age >32 weeks, number of comorbidities, age of first words after age 24 months, and use 5

of communication methods other than speech. Several birth characteristics and developmental language milestones were predictive of later communication performance for children with cerebral palsy. These characteristics and milestones should trigger referrals for communication evaluations, including speech, language, hearing, and/or augmentative and alternative communication.

PMID: [29366365](#)

Prevention and Cure

14. Relevant obstetric factors associated with fetal heart rate monitoring for cerebral palsy in pregnant women with hypertensive disorder of pregnancy.

Hasegawa J, Ikeda T, Toyokawa S, Jojima E, Satoh S, Ichizuka K, Tamiya N, Nakai A, Fujimori K, Maeda T, Masuzaki H, Takeda S, Suzuki H, Ueda S, Ikenoue T; Prevention Recurrence Committee, Japan Obstetric Compensation System for Cerebral Palsy.

J Obstet Gynaecol Res. 2018 Jan 23. doi: 10.1111/jog.13555. [Epub ahead of print]

AIM: The study identifies the relevant obstetric factors associated with fetal heart rate (FHR) monitoring for cerebral palsy (CP) in pregnant women with hypertensive disorders of pregnancy (HDP). METHODS: The subjects were neonates with CP (birth weight \geq 2000 g, gestational age \geq 33 weeks) who were approved for compensation for CP by the Operating Organization of the Japan Obstetric Compensation System between 2009 and 2012. After selection of women with antepartum HDP, obstetric characteristics associated with FHR monitoring were analyzed. RESULTS: The subjects included 33 neonates with CP whose mothers suffered from HDP during pregnancy and 450 neonates whose mothers did not develop HDP. The rates of placental abruption (48.5% vs. 20%; $P < 0.001$) and light-for-gestational age (12.1% vs. 2.2%; $P = 0.011$) were significantly higher in women with HDP than in those without HDP. Regarding FHR pattern analysis, fetal bradycardia was observed on admission to hospital in 94% of women with placental abruption. In women without placental abruption, FHR was likely to indicate a favorable pattern on admission, but became worse with the progression of labor. CONCLUSION: This is first study to clinically demonstrate FHR patterns in CP cases in association with HDP. Although antepartum CP is undetectable, pregnant women with HDP should be placed under strict observation and management to minimize fetal hypoxic conditions during labor.

PMID: [29363232](#)

15. Pretreatment with magnesium sulfate attenuates white matter damage by preventing cell death of developing oligodendrocytes.

Seyama T, Kamei Y, Iriyama T, Imada S, Ichinose M, Toshimitsu M, Fujii T, Asou H.

J Obstet Gynaecol Res. 2018 Jan 23. doi: 10.1111/jog.13568. [Epub ahead of print]

AIM: Antenatal maternal administration of magnesium sulfate ($MgSO_4$) reduces cerebral palsy in preterm infants. However, it remains controversial as to whether it also reduces occurrence of white matter damage, or periventricular leukomalacia. We assessed the effect of $MgSO_4$ against white matter damage induced by hypoxic-ischemic insult using a neonatal rat model and culture of premyelinating oligodendrocytes (pre-OL). METHODS: Rat pups at postnatal day (P) 6 were administered either $MgSO_4$ or vehicle intraperitoneally before hypoxic-ischemic insult (unilateral ligation of the carotid artery followed by 6% oxygen for 1 h). The population of oligodendrocyte (OL) markers and CD-68-positive microglia at P11, and TdT-mediated biotin-16-dUTP nick-end labeling (TUNEL)-positive cells at P8 were evaluated in pericallosal white matter. Primary cultures of mouse pre-OL were subjected to oxygen glucose deprivation condition, and the lactate dehydrogenase release from culture cells was evaluated to assess cell viability. RESULTS: Pretreatment with $MgSO_4$ attenuated the loss of OL markers, such as myelin basic protein and Olig2, in ipsilateral pericallosal white matter and decreased the number of CD-68-positive microglia and TUNEL-positive cells in vivo. Pretreatment with $MgSO_4$ also inhibited lactate dehydrogenase release from pre-OL induced by oxygen glucose deprivation in vitro. CONCLUSION: Pretreatment with $MgSO_4$ attenuates white matter damage by preventing cell death of pre-OL.

PMID: [29363221](#)

16. Magnesium sulphate induces preconditioning in preterm rodent models of cerebral hypoxia-ischemia.

Koning G, Lyngfelt E, Svedin P, Leverin AL, Jinnai M, Gressens P, Thornton C, Wang X, Mallard C, Hagberg H.

Int J Dev Neurosci. 2018 Jan 17. pii: S0736-5748(17)30324-6. doi: 10.1016/j.ijdevneu.2018.01.002. [Epub ahead of print]

BACKGROUND: Brain injury in preterm infants represents a substantial clinical problem associated with development of motor impairment, cognitive deficits and psychiatric problems. According to clinical studies, magnesium sulphate (MgSO₄) given to women in preterm labor reduces the risk of cerebral palsy in the offspring but the mechanisms behind its neuroprotective effects are still unclear. Our aim was to explore whether MgSO₄ induces tolerance (preconditioning) in the preterm rodent brain. For this purpose we established a model of perinatal hypoxia-ischemia (HI) in postnatal day 4 rats and also applied a recently developed postnatal day 5 mouse model of perinatal brain injury. **METHODS:** Postnatal day 4 Wistar rats were exposed to unilateral carotid artery ligation followed by 60, 70 or 80 min of hypoxia (8% O₂). On postnatal day 11, brains were collected and macroscopically visible damage as well as white and grey matter injury was examined using immunohistochemical staining. Once the model had been established a possible preconditioning protection induced by a bolus MgSO₄ injection prior to 80 min HI was examined 7 days after the insult. Next, a MgSO₄ bolus was injected in C57Bl6 mice on PND 4 followed by exposure to unilateral carotid artery ligation and hypoxia, (10% O₂) for 70 min on PND 5. Brains were collected 7 days after the insult and examined with immunohistochemistry for grey and white matter injury. **RESULTS:** In rats, a 60 min period of hypoxia resulted in very few animals with brain injury and although 70 min of hypoxia resulted in a higher percentage of injured animals, the brains were marginally damaged. An 80 min exposure of hypoxia caused cortical tissue damage combined with hippocampal atrophy and neuronal loss in the C3 hippocampal layer. In the rat model, MgSO₄ (1.1 mg/g administered i.p. 24 h prior to the induction of HI, resulting in a transient serum Mg²⁺ concentration elevation to 4.1 ± 0.2 mmol/l at 3 h post i.p. injection) reduced brain injury by 74% in grey matter and 64% in white matter. In the mouse model, MgSO₄ (0.92 mg/g) i.p. injection given 24 h prior to the HI insult resulted in a Mg²⁺ serum concentration increase reaching 2.7 ± 0.3 mmol/l at 3 h post injection, which conferred a 40% reduction of in grey matter injury. **CONCLUSIONS:** We have established a postnatal day 4 rat model of HI for the study of preterm brain injury. MgSO₄ provides a marked preconditioning protection both in postnatal day 4 rats and in postnatal day 5 mice.

PMID: [29355709](https://pubmed.ncbi.nlm.nih.gov/29355709/)

17. Association between socioeconomic status and cerebral palsy.

Tseng SH, Lee JY, Chou YL, Sheu ML, Lee YW.

PLoS One. 2018 Jan 24;13(1):e0191724. doi: 10.1371/journal.pone.0191724. eCollection 2018.

BACKGROUND: The present study investigated the annual prevalence of cerebral palsy (CP) among children aged <7 years in Taiwan and the association between socioeconomic status and CP prevalence. **METHODS:** Data from the Taiwan National Health Insurance Research Database for the 2002-2008 period were used in this population-based study. Severe and total CP were defined according to catastrophic illness certificate and medical claim records, respectively. The annual CP prevalence was calculated as the number of children with CP among all children aged <7 years. **RESULTS:** From 2002 to 2008, the annual prevalence of total and severe CP ranged from 1.9 to 2.8 and from 1.1 to 1.4 per 1000 children, respectively. Boys were 30% more likely to have CP than girls [adjusted relative risk (RR) and 95% confidence interval (CI) ranged from 1.3 (1.2-1.4) to 1.4 (1.2-1.5)]. Low family income was associated with a higher CP prevalence [adjusted RR (95% CI) ranged from 5.1 (4.2-6.2) to 6.4 (5.4-7.6)]. The prevalence of CP in rural area was higher than that in urban or suburban areas. The mortality rate of severe CP ranged from 12.2-22.7 per 1000 children within the 7 years study period. **CONCLUSIONS:** The prevalence of CP in Taiwan is similar to that in Western countries. A higher prevalence of CP is associated with male sex, low income, and rural residential location. Our findings provide insights into CP epidemiology among the Chinese population.

PMID: [29364952](https://pubmed.ncbi.nlm.nih.gov/29364952/)

18. Low Apgar scores at both one and five minutes are associated with long-term neurological morbidity.

Leinonen E, Gissler M, Haataja L, Rahkonen P, Andersson S, Metsäranta M, Rahkonen L.

Acta Paediatr. 2018 Jan 23. doi: 10.1111/apa.14234. [Epub ahead of print]

AIM: This study evaluated the associations between low Apgar scores at one and five minutes and long-term neurological impairments. **METHODS:** This study used population-based data on 399,815 singletons born in Finland in 2004-2010 and multivariable logistic regression to examine any associations between low (0-3) and intermediate (4-6) Apgar scores and

cerebral palsy, epilepsy, intellectual disability and sensorineural defects by the age of four years. RESULTS: The odd ratios (OR) and 95% confidence intervals (95% CI) showed that low Apgar scores were associated with cerebral palsy at one and five minutes (ORs 2.08, 95% CI 1.32-3.26 and 5.19, 95% CI 3.06-8.80), epilepsy (ORs 1.62, 95% CI 1.13-2.33 and 4.79, 95% CI 3.03-7.56), and intellectual disability (ORs 2.46, 95% CI 1.45-4.16 and 6.21, 95% CI 3.33-11.58). Only a low five-minute Apgar score was associated with sensorineural defects (OR 3.13, 95% CI 1.95-5.02). Neurological impairment risks were increased by low Apgar scores at both one and five minutes (OR 11.1, 95% CI 8.6-14.5), but 90.3% of children with persistent low Apgar scores had no impairment. CONCLUSIONS: Low one-minute and five-minute Apgar scores were associated with long-term neurological morbidity, especially when both scores were low.

PMID: [29359524](#)