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NEWS
Cerebral Palsy Research

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Interventions and Management

1. J Phys Ther Sci. 2016 Jan;28(1):7-13. doi: 10.1589/jpts.28.7. Epub 2016 Jan 30.

Effect of combining passive muscle stretching and whole body vibration on spasticity and physical performance of children and adolescents with cerebral palsy.

Tupimai T, Peungsuwan P, Prasertnoo J, Yamauchi J.

[Purpose] This study evaluated the immediate and short-term effects of a combination of prolonged passive muscle stretching (PMS) and whole body vibration (WBV) on the spasticity, strength and balance of children and adolescents with cerebral palsy. [Subjects and Methods] A randomized two-period crossover trial was designed. Twelve subjects with cerebral palsy aged 10.6 ± 2.4 years received both PMS alone as a control group (CG) and a combination of PMS and WBV as an experimental group (EG). After random allocation to the trial schedules of either EG-CG or CG-EG, CG received prolonged PMS while standing on a tilt-table for 40 minutes/day, and EG received prolonged PMS for 30 minutes, followed by 10 minutes WBV. Both CG and EG received the treatment 5 days/week for 6 weeks. [Results] Immediately after one treatment, EG resulted in better improvement in scores on the Modified Ashworth Scale than CG. After the 6-week intervention, EG also showed significantly decreased scores on the Modified Ashworth Scale compared to CG. Both CG and EG showed significantly reduced the performance times in the five times sit to stand test, and EG also showed significantly increased scores on the pediatric balance scale. [Conclusion] This study showed that 6 weeks of combined prolonged PMS and WBV had beneficial effects on the spasticity, muscle strength and balance of children and adolescents with CP.

PMID: 26957720

2. Res Dev Disabil. 2016 Mar 5;53-54:267-278. doi: 10.1016/j.ridd.2016.02.014. [Epub ahead of print]

Evaluation of group versus individual physiotherapy following lower limb intra-muscular Botulinum Toxin-Type A injections for ambulant children with cerebral palsy: A single-blind randomized comparison trial.

Thomas RE, Johnston LM, Sakzewski L, Kentish MJ, Boyd RN.

This study aimed to evaluate efficacy of group (GRP) versus individual (IND) physiotherapy rehabilitation following lower limb intramuscular injections of Botulinum Toxin-Type A (BoNT-A) for ambulant children with cerebral palsy (CP). Following lower limb BoNT-A injections, 34 children were randomly allocated to GRP (n=17; mean age 7y8m SD 2.0; 13 males; Gross Motor Function Classification System (GMFCS) I=5, II=8, III=4) or IND physiotherapy (n=17; mean age 8y7m SD 2.0; 11 males; GMFCS I=9, II=5, III=3). Primary outcomes were the Canadian Occupational Performance Measure (COPM) and Edinburgh Visual Gait Score (EVGS) assessed at baseline, 10 and 26 weeks post intervention. There were no baseline differences between groups. GRP intervention had greater, but not clinically meaningful, improvement in COPM satisfaction (estimated mean difference EMD 1.7, 95% CI 0.4-3.1; p<0.01) at 26 weeks. Both groups demonstrated clinically significant improvements in COPM performance and satisfaction, but minimal change in quality of gait (EVGS). Six hours of

direct physiotherapy (either GRP or IND) with an additional indirect dose (median 16 episodes) of individualized home programme activities following lower limb BoNT-A injections, however, was inadequate to drive clinically meaningful changes in lower limb motor outcomes.

PMID: 26955912

3. Tohoku J Exp Med. 2016;238(3):213-8. doi: 10.1620/tjem.238.213.

Treadmill Training with Virtual Reality Improves Gait, Balance, and Muscle Strength in Children with Cerebral Palsy.

Cho C, Hwang W, Hwang S, Chung Y.

Independent walking is an important goal of clinical and community-based rehabilitation for children with cerebral palsy (CP). Virtual reality-based rehabilitation therapy is effective in motivating children with CP. This study investigated the effects of treadmill training with virtual reality on gait, balance, muscular strength, and gross motor function in children with CP. Eighteen children with spastic CP were randomly divided into the virtual reality treadmill training (VRTT) group (9 subjects, mean age, 10.2 years) and treadmill training (TT) group (9 subjects, mean age, 9.4 years). The groups performed their respective programs as well as conventional physical therapy 3 times/week for 8 weeks. Muscle strength was assessed using a digitalized manual muscle tester. Gross motor function was assessed using the Gross Motor Functional Measure (GMFM). Balance was assessed using the Pediatric Balance Scale (PBS). Gait speed was assessed using the 10-meter walk test (10MWT), and gait endurance was assessed using the 2-minute walk test (2MWT). After training, gait and balance was improved in the VRTT compared to the TT group ($P < 0.05$). Muscular strength was significantly greater in the VRTT group than the TT group, except for right hamstring strength. The improvements in GMFM (standing) and PBS scores were greater in the VRTT group than the TT group ($P < 0.05$). Furthermore, the VRTT group showed the higher values of 10MWT and 2MWT compared to the TT group ($P < 0.05$). In conclusion, VRTT programs are effective for improving gait, balance, muscular strength, and gross motor function in children with CP.

PMID: 26947315

4. Dev Med Child Neurol. 2016 Mar 6. doi: 10.1111/dmcn.13107. [Epub ahead of print]

Nutrition and physical activity in people with cerebral palsy: opposite sides of the same coin.

Verschuren O, Peterson MD.

In the last decade we have seen an increasing number of interventions focussed on bolstering participation rates of physical activity and muscle strengthening exercise in people with cerebral palsy (CP). Given the high prevalence of sedentary lifestyles and the concomitant risk of chronic conditions in adults with CP,1these interventions are vital for health preservation across the lifespan. However, it is important to emphasize that the acute stimulus of repeated exercise bouts is only one of a multitude of factors contributing to the chronic adaptive response and long-term effectiveness of training. A myriad of factors play important roles, including adherence to training guidelines, motivation, and injury prevention. Perhaps the best examples of this are the often-disregarded health and fitness benefits associated with proper nutrition. Indeed, it is the position of the American Dietetic Association and the American College of Sports Medicine that balanced nutrition is essential for all individuals who are physically active, and can enhance the long-term effectiveness of exercise training.

PMID: 26946523

5. J Pediatr Rehabil Med. 2016 Feb 27;9(1):65-72. doi: 10.3233/PRM-160362.

Factors associated with caregiver experience in families with a child with cerebral palsy.

Lowes L, Clark TS, Noritz G.

PURPOSE: Managing the stresses of parenting a child with cerebral palsy (CP) can be challenging. This study sought to identify factors that are associated with higher levels of caregiver stress. METHODS: A retrospective review of data from the Learn From Every Patient™ project conducted in an interdisciplinary CP clinic were used to compare caregiver responses on 2 subsets (financial and time/emotional) of the Assessment of Caregiver Experience in Neuromuscular Disorders (ACEND) and

physical and medical characteristics of the child. RESULTS: The range of scores in both the financial and emotional subset was large. The presence of behavior problems, seizures, and severity of CP showed the strongest associations with emotional stress and accounted for 14% of the variance in scaled scores (r= 0.392, adj R2= 14.3, p< 0.01). The child's age was not significantly related to parental stress. The most highly reported areas of stress were worry about the child's pain, and the financial impact of lost wages. CONCLUSION: Caregiver experience varied widely and is associated with a range of factors among families caring for a child with CP. Further research is needed to test whether interventions to minimize the areas of greatest stress could make a meaningful difference in family functioning.

PMID: 26966802

6. Res Dev Disabil. 2016 Mar 5;53-54:279-286. doi: 10.1016/j.ridd.2016.02.013. [Epub ahead of print]

Does early communication mediate the relationship between motor ability and social function in children with cerebral palsy?

Lipscombe B, Boyd RN, Colemen A, Fahey M, Rawicki B, Whittingham K.

BACKGROUND: Children diagnosed with neurodevelopmental conditions such as cerebral palsy (CP) are at risk of experiencing restrictions in social activities negatively impacting their subsequent social functioning. Research has identified motor and communication ability as being unique determinants of social function capabilities in children with CP, to date, no research has investigated whether communication is a mediator of the relationship between motor ability and social functioning. AIMS: To investigate whether early communication ability at 24 months corrected age (ca.) mediates the relationship between early motor ability at 24 months ca. and later social development at 60 months ca. in a cohort of children diagnosed with cerebral palsy (CP). METHOD: A cohort of 71 children (43 male) diagnosed with CP (GMFCS I=24, 33.8%, II=9, 12.7%, III=12, 16.9%, IV=10, 14.1%, V=16, 22.5%) were assessed at 24 and 60 months ca. Assessments included the Gross Motor Function Measure (GMFM), the Communication and Symbolic Behaviour Scales-Developmental Profile (CSBS-DP) Infant-Toddler Checklist and the Paediatric Evaluation of Disability Inventory (PEDI). A mediation model was examined using bootstrapping. RESULTS: Early communication skills mediated the relationship between early motor abilities and later social functioning, b=0.24 (95% CI=0.08-0.43 and the mediation model was significant, F (2, 68)=32.77, p<0.001, R2=0.49. CONCLUSIONS AND IMPLICATION: Early communication ability partially mediates the relationship between early motor ability and later social function in children with CP. This demonstrates the important role of early communication in ongoing social development. Early identification of communication delay and enriched language exposure is crucial in this population.

PMID: 26955913

7. Syst Rev. 2016 Mar 9;5(1):42. doi: 10.1186/s13643-016-0219-3.

An evaluation of psychometric properties of caregiver burden outcome measures used in caregivers of children with cerebral palsy: a systematic review protocol.

Dambi JM, Jelsma J, Mlambo T, Chiwaridzo M, Dangarembizi-Munambah N, Corten L.

BACKGROUND: Cerebral palsy (CP) is the most common, life-long paediatric disability. Taking care of a child with CP often results in caregiver burden/strain in the long run. As caregivers play an essential role in the rehabilitation of these children, it is therefore important to routinely screen for health outcomes in informal caregivers. Consequently, a plethora of caregiver burden outcome measures have been developed; however, there is a dearth of evidence of the most psychometrically sound tools. Therefore, the broad objective of this systematic review is to evaluate the psychometrical properties and clinical utility of tools used to measure caregiver burden in caregivers of children with CP. METHODS/DESIGN: This is a systematic review for the evaluation of the psychometric properties of caregiver burden outcome tools. Two independent and blinded reviewers will search articles on PubMed, Scopus, Web of Science, CINAHL, PsychINFO and Africa-Wide Google Scholar. Information will be analysed using predefined criteria. Thereafter, three independent reviewers will then screen the retrieved articles. The methodological quality of studies on the development and validation of the identified tools will be evaluated using the four point COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) checklist. Finally, the psychometric properties of the tools which were developed and validated from methodological sound studies will then be analysed using predefined criteria. DISCUSSION: The proposed systematic review will give an extensive review of the psychometrical properties of tools used to measure caregiver burden in caregivers of children with CP. We hope to identify tools that can be used to accurately screen for caregiver burden both in clinical setting and for research purposes. SYSTEMATIC REVIEW REGISTRATION: PROSPERO CRD42015028026 .

PMID: 26960677

8. Zhongguo Zhen Jiu. 2016 Jan;36(1):12-6.

[Effects of moxibustion on immune function in children with cerebral palsy]. (Article in Chinese)

Tang Ying, Ma C, Shang Q, Liu D.

OBJECTIVE: To compare the effects between moxibustion at Guanyuan (CV 4), Shenshu (BL 23), Zusanli (ST 36) and western medication on immune function in children with cerebral palsy. METHODS: A total of 230 children with cerebral palsy were randomly divided into an observation group and a control group, 115 cases in each one. Patients in the observation group were treated with warm moxibustion at Guanyuan (CV 4), Shenshu (BL 23) and Zusanli (ST 36). Patients in the control group were treated with oral administration of pidotimod 10 mL every time. The treatment was given once a day, and 30 days were considered as one session for total 90 days. The changes of T-lymphoctyte subgroups, serum immunoglobulin and development quotient were compared 30 days, 60 days and 90 days into treatment respectively; also the occurrence rate.of disease was observed during 6-month and 12-month follow-up visit. RESULTS: The T-lymphoctyte subgroups (CD3+, CD4+, CD4+/CD8+), serum immunoglobulin (IgG, IgA) and development quotient were significantly improved 30 days, 60 days and 90 days into treatment ($P < 0.01$, $P < 0.05$). Regarding the changes of CD3+, CD4+, CD4+/CD4+, IgG, IgA and development quotient, the control group was superior to the observation group 30 days into treatment (all $P < 0.05$), and the control group was similar to the observation group 60 days into treatment (all $P > 0.05$), and the observation group was superior to the control group 90 days into treatment (all $P < 0.05$). There was no significant difference of CD8+ and IgM before and after treatment in two groups (all $P > 0.05$). The rate of adverse events was 7.0% (8/115) in the observation group, which was lower than 23.5% (27/115) in the control group ($P < 0.01$); during 6-month and 12-month follow-up visit, the occurrence rate of disease in the observation group was lower than that in the control group ($P < 0.05$). CONCLUSION: Moxibustion at Guanyuan (CV 4), Shenshu (BL 23) and Zusanli (ST 36) can improve immune function of children with cerebral palsy, which is superior to pidotimod.

PMID: 26946726

Prevention and Cure

9. J Autism Dev Disord. 2016 Mar 5. [Epub ahead of print]

Retrospective Descriptive Study of Cerebral Palsy in Nepal.

Thapa R.

There is very little data pertaining to cerebral palsy (CP) from Nepal. In this retrospective study it was observed that dyskinetic CP was seen in 29 % and the sex ratio of males to females was two in the study population of children with CP. Both of these are much higher than data from developed countries. Hence, further randomized cross-sectional community based study is recommended to enquire into this pattern. Data regarding early identification was encouraging as majority of the cases (56 %) were diagnosed before 4 years of age. There is a stark necessity of early screening and rehabilitation program with provision for follow-up for the affected children, which must also be accessible to the disadvantaged and marginalized groups in Nepal.

PMID: 26944590

10. J Matern Fetal Neonatal Med. 2016 Mar 9:1-25. [Epub ahead of print]

Risk of neurodevelopmental impairment for outborn extremely preterm infants in an Australian regional network.

Mahoney K, Bajuk B, Oei J, Lui K, Abdel-Latif ME; NICUS Network.

OBJECTIVE: To compare neurodevelopmental outcomes at 2-3 years in extremely premature outborn and inborn infants. DESIGN: Population-based retrospective cohort study. SETTING: Geographically defined area of New South Wales (NSW) and the Australian Capital Territory (ACT) served by a network of 10 neonatal intensive care units (NICUs). PATIENTS: All premature infants <29 weeks gestation born between 1998-2004 in the setting. INTERVENTION: At 2-3 years, corrected age, 1473 children were assessed with either the Griffiths Mental Developmental Scales (GMDS) or the Bayley Scales of Infant Development (BSID-II). MAIN OUTCOME MEASURE: Moderate/severe functional disability (FD) defined as: developmental delay (GMDS general quotient (GQ) or BSID-II mental developmental index (MDI))>2 standard deviations (SD) below the mean; cerebral palsy (CP) requiring aids; sensorineural or conductive deafness (requiring amplification); or bilateral blindness (visual acuity <6/60 in better eye). RESULTS: At 2-3 years, moderate/severe functional disability does not appear to be significantly different between outborn and inborn infants (adjusted OR 0.782; 95% CI 0.424-1.443). However, there were a significant number of outborn infants lost to follow up (23.3% vs 42.9%). CONCLUSION: In this cohort, at 2-3 years follow up neurodevelopmental outcome does not appear to be significantly different between outborn and inborn infants. These results should be interpreted with caution given the limitation of this study.

PMID: 26957041

11. Neonatology. 2016 Mar 12;110(1):27-32. [Epub ahead of print]

Serial 1- and 2-Dimensional Cerebral MRI Measurements in Full-Term Infants after Perinatal Asphyxia.

Spring In 't Veld LG, de Vries L, Alderliesten T, Benders MJ, Groenendaal F.

OBJECTIVE: Cranial magnetic resonance imaging (MRI) is associated with neurodevelopmental outcome in full-term infants with neonatal encephalopathy (NE) following presumed perinatal asphyxia. The aim of this study is to relate 2-dimensional measurements of the basal ganglia and thalami (BGT) and cerebellum in the first week after birth and after 3 months with neurodevelopmental outcome at 18 months. METHODS: Retrospectively, 29 full-term infants with NE following presumed perinatal asphyxia who had a cranial MRI in the first week after birth were studied serially. One- and 2-dimensional measurements were obtained and related to different patterns of brain injury, and neurodevelopmental outcome at 18 months. A Griffiths developmental quotient <85 or cerebral palsy was considered adverse. RESULTS: On the first MRI, the adverse outcome group showed increased basal ganglia width (42.1 ± 0.1 vs. 40.3 ± 0.3 mm, $p < 0.001$), thalamic width (40.3 ± 0.1 vs. 39.3 ± 1.0 mm, $p < 0.001$), and basal ganglia surface (1,230 ± 21 vs. 1,199 ± 36 mm2, $p = 0.007$) compared to the favorable outcome

group. In the BGT lesions group, basal ganglia width and thalamic width were increased compared to the watershed infarction group (42.1 ± 0.1 vs. 40.9 ± 0.8 mm, $p < 0.001$, and 40.3 ± 0.1 vs. 39.9 ± 0.5 mm, $p = 0.01$, respectively). On the second MRI, cerebellar width was larger in the favorable outcome group ($p = 0.025$). There was a greater increase in dimensions between both MRI time points for basal ganglia width ($p = 0.014$), basal ganglia surface ($p = 0.028$) and thalamic width ($p = 0.012$) in the favorable outcome group. CONCLUSIONS: One- and 2-dimensional measurements for basal ganglia surface, BGT width and cerebellar width are associated with neurodevelopmental outcome at 18 months.

PMID: 26968012