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CP Research News

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1: Dev Med Child Neurol. 2008 Nov 20. [Epub ahead of print]

Transition to adulthood: validation of the Rotterdam Transition Profile for young adults with cerebral palsy and normal intelligence.

Donkervoort M, Wiegerink DJ, VAN Meeteren J, Stam HJ, Roebroek ME; Transition Research Group South West Netherlands.

Department of Rehabilitation Medicine, Erasmus MC, University Medical Centre, Rotterdam, the Netherlands.

The aim of this study was to investigate the validity of the Rotterdam Transition Profile (RTP) to describe the transition process from childhood to adulthood in young adults with cerebral palsy (CP). Participants were recruited from rehabilitation centres and hospital departments of rehabilitation. In total, 81 young adults (47 males, 34 females) with CP and normal intelligence participated (mean age 20y 5mo [SD 1y 4mo] range 18-22y; 95% spastic CP, 48% hemiplegia, 38% diplegia, 14% quadriplegia; 78% Gross Motor Function Classification System Level I, 83% Manual Ability Classification System Level I). The RTP and the Assessment of Life Habits questionnaire are used to measure transition and functioning in daily activities and participation. Almost all participants were in the transition process or had reached an independent adult lifestyle (ranging from 60-100%, housing 42%). Compared with able-bodied peers, young adults with CP lagged behind in their development in housing (25 vs 36%; $p < 0.05$), employment (33 vs 49%; $p < 0.05$), and intimate relationships (37 vs 76%; $p < 0.01$). Associations were found between the phase of transition and age, parents' level of education, gross motor functioning, manual ability, level of education, and level of functioning in daily activities and participation. The RTP is a valid tool to gain more insight into the transition process, at the individual as well as at group level.

PMID: 19021680 [PubMed - as supplied by publisher]



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2: Dev Med Child Neurol. 2008 Nov 20. [Epub ahead of print]

Neuroimaging for cerebral palsy.

Korzeniewski SJ.

Bureau of Epidemiology, Michigan Department of Community Health, USA.

PMID: 19021678 [PubMed - as supplied by publisher]

3: Dev Med Child Neurol. 2008 Nov 19. [Epub ahead of print]

Use of the GMFCS in infants with CP: the need for reclassification at age 2 years or older.

Gorter JW, Ketelaar M, Rosenbaum P, Hadders PJ, Palisano R.

CanChild Centre for Childhood Disability Research, McMaster University, Hamilton, Ontario, Canada.

The stability of the Gross Motor Function Classification System (GMFCS) over time is described in 77 infants (41 boys, 36 girls) with cerebral palsy (CP; mean age 19.4mo [SD 1.6 mo]; 27 unilateral spastic, 42 bilateral spastic, eight dyskinetic type) and in the same children at follow-up at age 2 to 4 years. The overall level of agreement over time (linear weighted kappa) was 0.70 (95% confidence interval [CI] 0.61-0.79). The overall percentage of children whose GMFCS level changed one or two levels was 42%, of which the majority were reclassified to a less functional level (McNemar's Chi(2) test $p=0.11$). The chance that children initially classified in the combination of GMFCS Levels I, II, and III would subsequently be classified in the same level in early childhood was 96% (positive predictive value [PPV] 0.96, 95% CI 0.85-0.99), whereas the PPV for the combination of Levels I and II was 0.88, 95% CI 0.70-0.96. These findings indicate that GMFCS classification in infants is less precise than classification over time in older children. In conclusion, children can be classified by the GMFCS early on, but there is a need for reclassification at age 2 or older as more clinical information becomes available.

PMID: 19018834 [PubMed - as supplied by publisher]

4: Dev Med Child Neurol. 2008 Nov 18. [Epub ahead of print]

Motor function in five-year-old children with cerebral palsy in the South Australian population.

Rice J, Russo R, Halbert J, van Essen P, Haan E.

Paediatric Rehabilitation Department, Children, Youth and Women's Health Service, North Adelaide, Women's and Children's Hospital, Australia.

The aim of this study was to describe the motor function of a population of children at age 5 years enrolled on the South Australian Cerebral Palsy Register. Among children born between 1993 and 1998, there were 333 with confirmed cerebral palsy (prevalence rate 2.2 per 1000 live births), in whom 247 assessments (56.7% males, 43.3% females) were completed. The distribution by Gross Motor Function Classification System (GMFCS) level was: Level I, 50.6%; Level II, 18.2%; Level III, 9.3%; Level IV, 9.7%; Level V, 12.1%. The most common topographical classification was spastic diplegia (38.5%), followed by spastic hemiplegia (34.8%) and spastic quadriplegia (14.6%). Abnormal movements occurred at rest or with intention in 19.4% of children. A high proportion of the population with relatively mild gross motor impairments have difficulty with everyday bimanual tasks, reinforcing the need to assess upper limb function independently of gross motor function. The use of ankle-foot orthoses was common, particularly across GMFCS levels II to IV. Further refinement is indicated for this population's motor dataset, to include more recently described classification measures as well as future novel measures to better describe the presence of both spasticity and dystonia.

PMID: 19018845 [PubMed - as supplied by publisher]

5: Int J Obstet Anesth. 2008 Nov 18. [Epub ahead of print]

Epidural analgesia in labor for a woman with an intrathecal baclofen pump.

Ali Sakr Esa W, Toma I, Tetzlaff JE, Barsoum S.

Anesthesiology Institute, Cleveland Clinic, Cleveland, OH, USA.

A 28-year-old woman in active labor at 38 weeks of gestation requested epidural analgesia. She had previously received an intrathecal baclofen infusion pump to relieve the spasticity of cerebral palsy. She had right hemiparesis and cerebral palsy but was otherwise healthy. The patient had been seen one month before her expected delivery date by a staff anesthesiologist. A lumbar X-ray demonstrated the intrathecal catheter entering the L3-4 interspace and extending to the mid-thoracic region. For labor analgesia the epidural space was identified at L4-5 with the patient sitting, using a standard 17-gauge Tuohy needle. An epidural catheter was threaded to 5 cm and provided effective analgesia until delivery four hours later. There were no postnatal complications.

PMID: 19022655 [PubMed - as supplied by publisher]

6: Gait Posture. 2008 Nov 17. [Epub ahead of print]

Measuring distance walked and step count in children with cerebral palsy: An evaluation of two portable activity monitors.

Kuo YL, Culhane KM, Thomason P, Tirosh O, Baker R.

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Assessing clinical outcomes in the context of activity and participation is essential to reflect functional changes in the home and community for children with cerebral palsy (CP). However, no activity monitor has been investigated for measurement of the distance walked and step count in children with CP who have atypical gait. Twenty typically developing children and twenty children with CP, aged 4-16 years, were recruited to evaluate two portable activity monitors, AMP 331 (AMP) and Dynaport Minimod (Minimod), under three walking conditions (continuous walking, structured activity lap walking and stair climbing). Measurements of the activity monitors were compared to known walking distances and video recordings for step count. The devices performed differently under different walking conditions. The Minimod gave more accurate measurement of continuous walking over level ground. On the other hand, the AMP performed better in detecting the walks in a structured activity lap and during stair ascent and descent. Researchers and clinicians need to consider different characteristics of the monitoring devices and walking conditions, and choose an appropriate device that is most reflective of what they want to measure.

PMID: 19019680 [PubMed - as supplied by publisher]

7: Gait Posture. 2008 Nov 13. [Epub ahead of print]

Test-retest reliability of a 1-min walk test in children with bilateral spastic cerebral palsy (BSCP).

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Ireland, United Kingdom.

The test-retest reliability of a 1-min walk test at a child's maximum walking speed was assessed in children with bilateral spastic cerebral palsy (BSCP). Twelve male and five female children (age range 3-18 years, mean age 12 years 8 months) participated in the study. Children were classified as GMFCS level I (n=5), level II (n=8) and level III (n=4). Results showed that for walk tests performed on different days, distances varied by no more than 13.1m (for 95% of participants) and that a practice walk was vital for reducing systematic bias. The intraclass correlation coefficient was 0.94. A 1-min walk test is a reliable method of assessing function in children with CP but care must be taken when interpreting changes in individual patient data.

PMID: 19013798 [PubMed - as supplied by publisher]

8: Neurosci Lett. 2008 Nov 11. [Epub ahead of print]

Basic motor capacity in relation to object manipulation and general manual ability in young children with spastic cerebral palsy.

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Objective: Limited resources in terms of elementary functions may be a limiting factor for functional activities. The objective of the study was to examine basic hand motor capacities in young children with bilateral spastic cerebral palsy (BSCP) and to compare with deficits in functional activities. Method: Eighty-eight children with BSCP, 3-6 years of age, manipulated a grip object (200g) equipped with a uni-axial force sensor. Basic motor capacity was assessed based upon (1) maximal grip strength and (2) production of fast repetitive grip force changes (FFC) while holding the object on the table. Subjects' performance on this task was compared to the grip force amplitude and force rate assessed while the subject was lifting the same object. Results were compared between different degrees of manual ability according to the Manual Ability Classification System (MACS). Results: In children with BSCP, even in high-functioning children with MACS 1, fast grip force changes and grip strength were 2 SDs and more below the mean of controls. Differences increased from MACS 2 to 4 but not between MACS 1 and 2. During lifting children with BSCP used considerable proportions of their maximum grip strength (40-90%) and of their grip force rates during 70% vs. 86%. In some children with low manual abilities (MACS 3/4), grip force rates during lifting were higher than during FFC. Conclusion: In children with BSCP, basic motor capacity may influence manual ability, particularly in children with MACS 3 and 4. In some of these children, the underlying processes during lifting may also differ qualitatively.

PMID: 19014998 [PubMed - as supplied by publisher]

9: Neuroscience. 2008 Oct 30. [Epub ahead of print]

Developmental motor deficits induced by combined fetal exposure to lipopolysaccharide and early neonatal hypoxia/ischemia: A novel animal model for cerebral palsy in very premature infants.

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A critical issue in animal models of perinatal brain injury is to adapt the pertinent pathophysiological scenarios to their corresponding developmental window in order to induce neuropathological and behavioral characteristics reminiscent to perinatal cerebral palsy (CP). A major problem in most of these animal models designed up to now is that they do not present motor deficits characteristic of CP. Using a

unique rat paradigm of prenatal inflammation combined to an early postnatal hypoxia-ischemia pertinent to the context of very early premature human newborns, we were interested in finding out if such experimental conditions might reproduce both histological damages and behavioral deficits previously described in the human context. We showed that exposure to lipopolysaccharide (LPS) or hypoxia-ischemia (H/I) induced behavioral alterations in animals subjected to forced motor activity. When both LPS and H/I aggressions were combined, the motor deficits reached their highest intensity and affected both spontaneous and forced motor activities. LPS+H/I-exposed animals also showed extensive bilateral cortical and subcortical lesions of the motor networks affecting the frontal cortices and underlying white matters fascicles, lenticular nuclei and the substantia nigra. These neuropathological lesions and their associated motor behavioral deficits are reminiscent of those observed in very preterm human neonates affected by subsequent CP and validate the value of the present animal model to test new therapeutic strategies which might open horizons for perinatal neuroprotection.

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10: Dev Med Child Neurol. 2008 Oct 29. [Epub ahead of print]

Levetiracetam therapy for treatment of choreoathetosis in dyskinetic cerebral palsy.

Vles GF, Hendriksen JG, Visschers A, Speth L, Nicolai J, Vles JS.

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Dyskinetic cerebral palsy (CP) is a movement disorder that is difficult to treat and which causes major disability. We report on two female patients (aged 5 and 8y) who experienced severe perinatal asphyxia and developed dyskinetic CP, clinically characterized by choreoathetosis. Neuropsychological testing of these children showed a low average developmental quotient and no attentional deficit. Monotherapy with levetiracetam was initiated to improve balance control and fine motor skills. Treatment was evaluated by use of video and the Visual Analog Scale. In both children an impressive improvement of balance control and fine motor skills was observed. No side effect occurred. Furthermore, both patients showed more interest and pleasure during activities according to their parents. In a recent multidisciplinary evaluation of the initiated therapy, the parents, the therapist, and the rehabilitation doctor all confirmed that the effect initially observed was still present at 14 and 26 months later. To our knowledge, this report on two patients with dyskinetic CP is the first suggesting that levetiracetam may offer an alternative to the standard therapy of involuntary, uncontrolled movements in this group of patients.

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11: Dev Med Child Neurol. 2008 Oct 17. [Epub ahead of print]

Hyperactive stretch reflexes, co-contraction, and muscle weakness in children with cerebral palsy.

Poon DM, Hui-Chan CW.

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The aim of this study was to examine the repeatability of and relationships among spasticity, co-contraction of agonist-antagonist, and muscle strength in children with cerebral palsy (CP). Eight children with spastic diplegic CP (five males, three females; Gross Motor Function Classification System [GMFCS] Levels I-III; mean age 10y 2mo [SD 2y 9mo], range 6-13y) and nine children in a comparison group (six males, three females; mean age 8y 10mo [SD 2y 4mo], range 6y to 12y 6mo) were assessed twice to examine repeatability of Composite Spasticity Scale, soleus stretch reflexes, electromyography (EMG) co-contraction ratio, and torque recorded during maximal isometric voluntary contraction of ankle dorsiflexors and plantarflexors. Sixty-one children with spastic CP, (54 diplegic, seven hemiplegic; 32 males, 29 females; GMFCS levels I-III; mean age 10y 8mo [SD 2y 9mo], range 6-15y) were then as-

essed to delineate possible correlations among these measures. Intraclass correlation coefficients (0.78-0.97) showed high data repeatability in both groups. Children with spastic CP demonstrated significantly larger soleus stretch reflex/M-response areas smaller torques, but larger EMG co-contraction ratios during both voluntary dorsiflexion and plantarflexion (all $p < 0.05$). Children with spastic CP who had larger soleus stretch reflex/M-response areas demonstrated larger plantarflexion co-contraction ratio ($r = 0.28$), and produced smaller plantarflexion and dorsiflexion torques ($r = -0.48$ and -0.27 respectively). However, no correlation was noted between soleus stretch reflex and clinical spasticity. Our findings demonstrated that hyperactive soleus stretch reflex affected torque production of ankle muscles. Moreover, the severity of spasticity may not be fully described by either stretch reflex or tone measure alone.

PMID: 19018843 [PubMed - as supplied by publisher]

12: Dev Med Child Neurol. 2008 Oct 17. [Epub ahead of print]

Magnetic resonance imaging findings in a population-based cohort of children with cerebral palsy.

Robinson MN, Peake LJ, Ditchfield MR, Reid SM, Lanigan A, Reddihough DS.

Department of Developmental Medicine, Murdoch Childrens Research Institute, University of Melbourne, Melbourne, Australia.

To investigate the frequency and spectrum of magnetic resonance imaging (MRI) abnormalities in a population of children with cerebral palsy (CP) who were born in the years 2000 and 2001 in Victoria, Australia. In 2000 and 2001, 221 children (126 males, 95 females; mean age 6y [SD 7mo], range 5-7y) with CP, excluding those with CP due to postneonatal causes (6% of all cases), were identified through the Victorian Cerebral Palsy Register. All medical records were systematically reviewed and all available brain imaging was comprehensively evaluated by a single senior MRI radiologist. MRI imaging was available for 154 (70%) individuals and abnormalities were identified in 129 (84%). The study group comprised 88% with a spastic motor type CP; the distribution was hemiplegia in 33.5%, diplegia in 28.5%, and quadriplegia in 37.6% of children. Overall, pathological findings were most likely to be identified in children with spastic hemiplegia (92%) and spastic quadriplegia (84%). Abnormalities were less likely to be identified in non-spastic motor types (72%) and spastic diplegia (52%). The most common abnormalities identified on MRI were periventricular white matter injury (31%), focal ischaemic/haemorrhagic lesions (16%), diffuse encephalopathy (14%), and brain malformations (12%). Dual findings were seen in 3% of patients. This is the first study to document comprehensively the neuroimaging findings of all children identified with CP born over a consecutive 24-month period in a large geographical area.

PMID: 19018841 [PubMed - as supplied by publisher]

13: Dev Med Child Neurol. 2008 Oct 17. [Epub ahead of print]

Psychometric properties of the Pediatric Motor Activity Log used for children with cerebral palsy.

Wallen M, Bundy A, Pont K, Ziviani J.

The Children's Hospital at Westmead and Discipline of Occupational Therapy, University of Sydney, Australia.

The Pediatric Motor Activity Log (PMAL) is a parent-report measure of the use, by children with hemiplegic cerebral palsy (CP), of their affected upper limb in everyday activities. The aim of this study was to examine the psychometric properties of both scales of the PMAL ('How Often' and 'How Well' scales) using Rasch measurement modelling. Sixty-one parents of children with hemiplegic CP completed the PMAL and 31 completed it again 3 weeks later. The mean age of children was 4 years 6 months (SD 1y 9mo); 35 males, 26 females. Children were at Gross Motor Function Classification System (GMFCS)

Levels I (83%) and II (17%), and Manual Ability Classification System levels I (35%), II (52%), and III (14%). The original scales were found to have disordered rating scale structure. Further Rasch modelling with collapsed rating scale structures resulted in both scales conforming to the expectations of the Rasch model, yielding strong evidence for construct validity and reliability. One item from the How Often scale failed to conform to Rasch expectations and was deleted in subsequent analyses. Test-retest reliability of both scales was high (the intraclass correlation coefficient for the How Often scale was 0.94, and for the How Well scale 0.93). The revised scales possess good psychometric properties, specifically a logical item hierarchy, evidence of unidimensionality, adequate rating scale structure, and good test-retest reliability. We conclude that the revised PMAL has the capacity to yield valid and reliable scores except for children at the extremes of upper limb ability.

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14: Asian J Surg. 2008 Oct;31(4):204-6.

Laparoscopy-assisted Percutaneous Endoscopic Gastrostomy.

Takahashi T, Okazaki T, Kato Y, Watayo H, Lane GJ, Kobayashi H, Segawa O, Kameoka S, Yamataka A.

Department of Paediatric Surgery, Juntendo University School of Medicine Tokyo, Japan.

OBJECTIVE: Percutaneous endoscopic gastrostomy (PEG) placement is associated with considerable complications. We added laparoscopic monitoring to improve outcome. **METHODS:** Thirty-four patients who had laparoscopy-assisted PEG (LAP-PEG) were reviewed. A 5 mm supraumbilical trocar and two 5 mm working ports were required for LAP-PEG. A needle was placed percutaneously into the stomach under laparoscopic and gastroscopic control. A wire was placed through the needle, encircled with a snare, and the PEG completed. The anterior wall of the stomach was then anchored to the abdominal wall. **RESULTS:** Thirty-one subjects had cerebral palsy. Age at LAP-PEG ranged from 5 months to 25 years (mean, 8.1 years). Weight ranged from 4.7 kg to 25.9 kg (mean, 12.2 kg). In 23 patients, LAP-PEG was performed with laparoscopic Nissen fundoplication. In 11 patients, it was performed for reasons such as gastric volvulus and nutritional supplementation. Mean operating time was 67 minutes, and all procedures were performed safely without intra- or postoperative complications. **CONCLUSION:** LAP-PEG is our method of choice for gastrostomy because it allows the first and last parts of a conventional PEG procedure to be well controlled and safe instead of being blind.

PMID: 19010764 [PubMed - in process]

15: Rev Obstet Gynecol. 2008 Summer;1(3):148.

Cerebral palsy and genetic predisposition.

Kent A.

Department of Obstetrics & Gynaecology, University of Cape Town Rondebosch, South Africa.

PMID: 19015770 [PubMed - in process]

PMCID: PMC2582653

16: Nervenarzt. 2008 Jun;79 Suppl 1:19-21.

Treatment of juvenile spasticity with botulinum toxin type A.

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Publication Types:
Review

PMID: 18927960 [PubMed - indexed for MEDLINE]

17: *Pediatr Phys Ther.* 2008 Winter;20(4):369-372.

Intrarater Range of Motion Reliability in Cerebral Palsy: A Comparison of Assessment Methods.

Glanzman AM, Swenson AE, Kim H.

Departments of Physical Therapy (A.M.G., A.E.S.) and Department of Child Development, Physical Medicine and Rehabilitation, and Metabolism (H.K.), Children's Seashore House of The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; Department of Physical Therapy (A.E.S.), Drexel University, Philadelphia, Pennsylvania; and University of Pennsylvania School of Medicine (H.K.), Philadelphia, Pennsylvania.

PURPOSE:: To compare intrarater reliability of goniometry performed with and without an assistant and compare the reliability of the Staheli and Thomas tests of hip extension. Visual estimation was also evaluated as a method of range of motion assessment. **METHODS::** Twenty-five children with cerebral palsy (50 legs) were evaluated in a blind fashion. **RESULTS::** Interclass correlations (ICCs) ranged from 0.9701 to 0.9804 and from 0.9685 to 0.9822 for 1 and 2-person goniometry, respectively. Pearson product moment correlations of 0.8944 to 0.9553 for visual estimation were established. Staheli and Thomas test ICCs were 0.9793 and 0.9804, respectively. **CONCLUSIONS::** Goniometry with 1 and 2 assessors both produced ICCs in the excellent range as did the Staheli and Thomas test measurements of hip extension. The use of an assistant did not provide additional benefit. Visual estimation showed excellent correlation with goniometry.

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18: *Pediatr Phys Ther.* 2008 Winter;20(4):356-362.

Using Cognitive Interviewing for Test Items to Assess Physical Function in Children with Cerebral Palsy.

Dumas HM, Watson K, Fragala-Pinkham MA, Haley SM, Bilodeau N, Montpetit K, Gorton GE 3rd, Mulcahey MJ, Tucker CA.

Research Center for Children with Special Health Care Needs (H.M.D, M.A.F-P., S.M.H.), Franciscan Hospital for Children, Boston, Massachusetts; Shriners Hospitals for Children (K.W., M.J.M.), Philadelphia, Pennsylvania; Health and Disability Research Institute (S.M.H.), School of Public Health, Boston University, Boston, Massachusetts; Shriners Hospitals for Children (N.B., K.M.), Montreal, Canada; Shriners Hospitals for Children (G.E.G.), Springfield, Massachusetts; and Department of Physical Therapy, Temple University (C.A.T.), Philadelphia, Pennsylvania.

PURPOSE:: The purpose of this study was to assess the content, format, and comprehension of test items and responses developed for use in a computer adaptive test (CAT) of physical function for children with cerebral palsy (CP). **METHODS::** After training in cognitive interviewing techniques, investigators defined item intent and developed questions for each item. Parents of children with CP (n = 27) participated in interviews probing item meaning, item wording, and response choice adequacy and appropriateness. **RESULTS::** Qualitative analysis identified 3 themes: item clarity; relevance, context, and attribution; and problems with wording or tone. Parents reported the importance of delineating task components, assistance amount, and environmental context. **CONCLUSION::** Cognitive interviewing provided

valuable information about the validity of new items and insight to improve relevance and context. We believe that the development of CATs in pediatric rehabilitation may ultimately reduce the impact of the issues identified.

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19: *Pediatr Phys Ther.* 2008 Winter;20(4):334-9.

Do therapists' goals and interventions for children with cerebral palsy reflect principles in contemporary literature?

Darrah J, Wiart L, Magill-Evans J.

Department of Physical Therapy (J.D., L.W.) and Department of Occupational Therapy (J.M.-E.), Faculty of Rehabilitation Medicine, University of Alberta, Edmonton, Alberta, Canada.

PURPOSE:: To explore therapists' goal setting and intervention with children with cerebral palsy, and to examine their acceptance of children's use of compensatory movement strategies. **METHODS::** Interviews were conducted with 23 occupational therapists and 31 physical therapists. Goals and assumptions of relationships between intervention approaches and expected outcomes were coded using the International Classification of Functioning, Disability, and Health (ICF). Therapists' acceptance of compensatory movement strategies was rated. **RESULTS::** Thirty-three therapists identified goals representing the ICF activity component. Therapists working with younger children identified goals representing the ICF body function/structure component. Twenty-four therapists assumed that an intervention targeted at 1 ICF component would affect an outcome in a different component. Eleven therapists would not accept compensatory movement strategies. **CONCLUSIONS::** Most therapists' goals are congruent with principles encouraging functional goals. The ICF matrix developed for this study may be useful for clinical evaluation and documentation of assumed relationships among interventions and outcomes.

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20: *Pediatr Phys Ther.* 2008 Winter;20(4):318-333.

Systematic Review of Progressive Strength Training in Children and Adolescents with Cerebral Palsy Who Are Ambulatory.

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PURPOSE:: To capture and analyze the evidence concerning the effects of progressive strength training on function and gait in children and adolescents with cerebral palsy (CP) who are ambulatory. **METHOD::** A language-inclusive search was conducted for controlled or noncontrolled studies of strength training for subjects with CP who were ambulatory and aged 4 to 20 years, using objective outcome measures. Quality was assessed with the Maastricht-Amsterdam List. Data were extracted and analyzed. **RESULTS::** The 13 included articles favored treatment without significant adverse effects. Function and gait improved more following isotonic rather than isokinetic training, and in younger rather than older subjects. **CONCLUSIONS::** Function and gait improvements were greater in preadolescents.

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21: *Pediatr Phys Ther.* 2008 Winter;20(4):303-17.

Effectiveness of adaptive seating on sitting posture and postural control in children with cerebral palsy.

Chung J, Evans J, Lee C, Lee J, Rabbani Y, Roxborough L, Harris SR.

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PURPOSE:: We reviewed research on the effect of adaptive seating on sitting posture/postural control in children with cerebral palsy. Second, we examined whether changes in postural control related to changes in other aspects of functioning. **METHODS::** Electronic database/hand searches were undertaken to locate studies published in English. Reviewers screened studies for inclusion criteria, extracted data, indexed outcomes to the International Classification of Functioning, Disability and Health, assigned levels of evidence, and assessed study quality. **RESULTS::** Thirteen of 14 articles used group designs and the other a single-subject design. Conflicting findings were reported for saddle seats and optimal seat/back angle for improving sitting posture/postural control. Significant improvements were reported with seat inserts, external supports, and modular seating systems. Evidence supporting effects of postural control on functional abilities was limited. **CONCLUSIONS::** Future studies on the effects of adaptive seating should describe participants with standardized classification systems and employ stronger research designs.

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