Effectiveness of Hydrotherapy/Postural Management in therapy for Cerebral Palsy GMFCS Level 5 child recovering from Hip Surgery

28th October 2011

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Introduction

This evidence summary is the selected highlights of the results found during this information consultancy. Rather than simply provide you with all available results found, NHS Bolton Library using its professional expertise, has selected only the most relevant results that match your needs. The emphasis is on quality rather than quantity of the knowledge provided. For more information on this, please contact NHS Bolton Library. This document whilst suitable to print is intended to be an electronic document. It is also published on the NHS Bolton Library Blog.

This search is different, because from very on in the search it became apparent there were no results that best fit all aspects of the search enquiry. With this in mind, 4 separate searches were undertaken – which while casting the net wider will hopefully provide partial answers upon which the evidence base can be built. Those 4 searches have been undertaken for each relevant search resource, and are:

- Cerebral Palsy AND GMFCS AND Hydrotherapy/Postural Management
- Cerebral Palsy AND Hip Surgery AND GMFCS
- Cerebral Palsy AND Hip Surgery AND General Rehabilitation/Therapy
- Hip Surgery AND Hydrotherapy/Postural Management

Because of the similar nature of the searches, there has inevitably been some crossover, but where possible, I have tried to keep that to a minimum meaning some results may seem limited. In reality, they were just repetitive so have been removed.

I hope this evidence summary is of at least some relevance.

Cochrane Library Highlights

“The Cochrane Library is a collection of six databases that contain different types of high-quality, independent evidence to inform healthcare decision-making, and a seventh database that provides information about groups in The Cochrane Collaboration”.

Cerebral Palsy AND GMFCS AND Hydrotherapy/Postural Management
A search has been undertaken for you and can be viewed by clicking here. It is recommended that you view this search.

Cerebral Palsy AND Hip Surgery AND GMFCS
A search has been undertaken for you and can be viewed by clicking here. It is recommended that you view this search.

Cerebral Palsy AND Hip Surgery AND General Rehabilitation/Therapy
A search has been undertaken for you and can be viewed by clicking here. It is recommended that you view this search.

Hip Surgery AND Hydrotherapy/Postural Management
A search has been undertaken for you and can be viewed by clicking here. It is recommended that you view this search.
Literature Search Highlights
A ‘traditional’ literature search has been undertaken using NHS Evidence’s ‘Healthcare Databases Advanced Search’ (HDAS) function. This search is the professionally selected most relevant results – that have been narrowed from the original search results. Their abstracts are below, preceded by a search breakdown, and where applicable the search ‘PICO’. The original search has been saved and is available upon request. To view any of the abstracts in full text, you will require an NHS Athens account where noted or contact the library.

Cerebral Palsy AND GMFCS AND Hydrotherapy/Postural Management

Search Summary

Databases
- AMED
- Medline
- Cinahl
- EMBASE

Key Terms
- ‘Postural Management; Hydrotherapy; ‘Aquatic Physiotherapy’
- ‘GMFCS’; “Gross Motor Function Classification System”, Disability Evaluation
- Cerebral Palsy

Limits
- English Language Only
- Aged 0-18

Search Results

Title: A qualitative analysis of the benefits of strength training for young people with cerebral palsy

Citation: Developmental Medicine and Child Neurology, October 2003, vol./is. 45/10(658-663), 0012-1622 (01 Oct 2003)

Author(s): McBurney H., Taylor N.F., Dodd K.J., Graham H.K.

Language: English

Abstract: This qualitative study investigated the positive and negative outcomes of a home-based strength-training programme for young people with cerebral palsy (CP). Eleven young people with spastic diplegic CP (seven females, four males; mean age 12 years 9 months, SD 2 years 10 months; range 8 to 18 years) and their parents were interviewed. Gross Motor Function Classification System scores ranged from I (walks without limitations) to in (walks with assistive device), with a mode of m. The strength-training programme, which was conducted in the participants' homes three times per week for 6 weeks (total of 18 prescribed sessions), comprised three exercises targeting the major support muscles of the lower limbs. Exercises were bilateral half squats, heel raises, and step-ups. The training load was increased by adding free weights to a backpack so that 8 to 10 repetitions of each exercise could be performed. Using thematic coding, three categories of outcome emerged: body function and structure, activity, and participation, which were influenced by environmental and personal contextual factors. The programme generated overwhelmingly positive outcomes with only minor negative responses about some equipment and the need for parental involvement. Benefits included perceptions that strength, flexibility, posture, walking, and the ability to negotiate steps had improved. In addition, participants reported psychological benefits such as a feeling of increased well-being and improved participation in school and leisure activities. The contextual factors highlighted the fact that sufficient clinician resources must be allocated to solve individual exercise and equipment problems. As well as providing further evidence that strength training can be beneficial, this study provides useful indicators to guide future quantitative studies of outcomes that are meaningful for people with CP.
Publication Type: Journal: Article

Source: EMBASE

Full Text: Available in fulltext at ProQuest (Legacy Platform)

Title: Postural muscle dyscoordination in children with cerebral palsy

Citation: Neural Plasticity, 2005, vol./is. 12/2-3(197-203), 0792-8483 (2005)

Author(s): van der Heide J.C., Hadders-Algra M.

Language: English

Abstract: The present paper gives an overview of the knowledge currently available on muscular dyscoordination underlying postural problems in children with cerebral palsy (CP). Such information is a prerequisite for developing successful therapeutic interventions in children with CP. Until now, three children with CP functioning at GMFCS (Gross Motor Function Classification System) level V have been documented. The children totally or partially lacked direction specificity in their postural adjustments and could not sit independently for more than 3 seconds. Some children functioning at GMFCS level IV have intact direction-specific adjustments, whereas others have problems in generating consistently direction-specific adjustments. Children at GMFCS levels I to III have an intact basic level of control but have difficulties in fine-tuning the degree of postural muscle contraction to the task-specific conditions, a dysfunction more prominently present in children with bilateral spastic CP than in children with spastic hemiplegia. The problems in the adaptation of the degree of muscle contraction might be the reason that children with CP, more often than typically developing children, show an excess of antagonistic co-activation during difficult balancing tasks and a preference for cranial-caudal recruitment during reaching. This might imply that both stereotypes might be regarded as functional strategies to compensate for the dysfunctional capacity to modulate subtly postural activity. 2005 Freund & Pettman, U.K.

Publication Type: Journal: Review

Source: EMBASE

Full Text: Available in fulltext at National Library of Medicine

Title: Effect of balance training on muscle activity used in recovery of stability in children with cerebral palsy: A pilot study

Citation: Developmental Medicine and Child Neurology, July 2005, vol./is. 47/7(455-461), 0012-1622 (Jul 2005)

Author(s): Woollacott M., Shumway-Cook A., Hutchinson S., Ciol M., Price R., Kartin D.

Language: English

Abstract: This study explored possible neural mechanisms that contribute to improvements in balance control produced by reactive balance training in children with cerebral palsy (CP). Six children with CP (four males, two females; mean age 9y 4mo), two with spastic hemiplegia (Gross Motor Function Classification System [GMFCS] level I) and four with spastic diplegia (GMFCS level II,) were given 5 days of intensive training in reactive balance control (100 perturbations per day on a moveable force platform). Surface electromyography was used to characterize changes in neuromuscular responses pretraining, immediately posttraining, and 1 month posttraining. Training in reactive balance control resulted in improvements in directional specificity of responses (a basic level of response organization) and other spatial/temporal characteristics including: (1) faster activation of muscle contraction after

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training, allowing children to recover stability faster; (2) emergence of a distal-proximal muscle sequence; and (3) improved ability to modulate the amplitude of muscle activity (increased amplitude of agonist and decreased amplitude of antagonist, reducing coactivation). Each child with spastic hemiplegia or diplegia showed a different combination of factors that contributed to improved performance; the level of change in neural factors depended on the severity of involvement of the child: hemiplegia vs diplegia, and level of involvement within each diagnostic category.

**Publication Type:** Journal: Article

**Source:** EMBASE

**Full Text:**
Available in *fulltext* at ProQuest (Legacy Platform)

**Title:** Testing of the spinal alignment and range of motion measure: a discriminative measure of posture and flexibility for children with cerebral palsy

**Citation:** Developmental Medicine and Child Neurology, November 2005, vol./is. 47/11(739-43), 0012-1622 (2005 Nov)

**Author(s):** Bartlett D, Purdie B

**Language:** English

**Abstract:** In this study we describe the development and preliminary psychometric testing of the Spinal Alignment and Range of Motion Measure (SAROMM). Through consultation with pediatric physiotherapists, the items were refined. Subsequently 25 children and adolescents with cerebral palsy (CP; 17 males, 8 females) with a mean age of 9 years 8 months (SD 4y 4mo), stratified by the Gross Motor Function Classification System (GMFCS, n=5 in each group), were recruited. Twenty-two children had spastic CP, and one each was also diagnosed with hypotonic, athetoid, and mixed CP. Three children had hemiplegia, 12 had diplegia, and 10 had quadriplegia. These participants were examined by two physiotherapists on one occasion and by the primary physiotherapist again two weeks later. The intraclass correlation coefficients reflecting interrater and test-retest reliabilities for the spine and range of motion subscales and the total scores were all above 0.80. Validity was supported by a significant contribution of GMFCS level and age to the SAROMM score (r²=0.44). The SAROMM has sufficient reliability and validity for use with children with CP in clinical and research settings by rehabilitation therapists.

**Publication Type:** Journal Article

**Source:** AMED

**Full Text:**
Available in *fulltext* at ProQuest (Legacy Platform)

**Title:** The Effect of Hippotherapy on Postural Control in Sitting for Children with Cerebral Palsy

**Citation:** Physical and Occupational Therapy in Pediatrics, 2007, vol./is. 27/4(23-42), 0194-2638 (2007)

**Author(s):** Hamill D, Washington K, White OR

**Language:** English

**Abstract:** The purpose of this single subject research study was to examine the effects of a once weekly, 10-week hippotherapy program for three children, ages 27-54 months, with cerebral palsy. Participants were rated as Level V on the Gross Motor Function Classification System. The Sitting Dimension of the Gross Motor Function Measure was
used to establish a baseline of sitting abilities, and was administered every 2 weeks during intervention. The Sitting Assessment Scale and the Gross Motor Function Measure were administered before, after, and 4 weeks postintervention. Parental perceptions of the hippotherapy intervention were assessed using questionnaires. None of the children made gains on any of the standardized outcome measures. Parental perceptions were very positive, with reported improvements in range of motion and head control.

**Publication Type:** Journal Article

**Source:** AMED

**Full Text:**
Available in *fulltext* at [EBSCO Host](https://www.ebscohost.com)

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**Title:** Hand-held dynamometry for muscle strength measurement in children with cerebral palsy

**Citation:** Developmental Medicine and Child Neurology, February 2007, vol./is. 49/2(106-111), 0012-1622;1469-8749 (Feb 2007)

**Author(s):** Crompton J., Galea M.P., Phillips B.

**Language:** English

**Abstract:** The aim of this study was to investigate the reliability of hand-held dynamometry for measuring isometric lower-limb muscle strength in children with cerebral palsy (CP). Twenty-three children (14 males, nine females) with CP (spastic diplegia; Gross Motor Function Classification System Levels I-III) aged 5 years 7 months to 14 years 5 months (mean 9y 6mo [SD 2y 8mo]) attended two test sessions 1 week apart. A 'make' test, using a gradual build-up of force to a maximum isometric contraction, was employed and peak values were normalized to body weight for analyses. Within-session reliability was high with an intraclass correlation coefficient (ICC) of 1,1>0.79 for all muscle groups, and there was acceptable between-session reliability ICC>0.70 and measurement errors for hip flexors and extensors (measured in supine), knee flexors and extensors, and ankle dorsiflexors (with stabilization). Within- and between-session reliability was poor (ICC<0.70) for hip extensors (in prone), knee extensors (20degree flexion), ankle dorsiflexors (without stabilization), and ankle plantarflexors. Measurement error differed in each test and across limbs, with stabilization producing inconsistent reliability outcomes. Changes in strength measurements in children with CP should take into account measurement error for particular muscle groups. Changes should be determined for separate muscle groups and limbs, and reported relative to body weight. Different testing positions may be required for greater reliability. 2007 Blackwell Publishing Ltd.

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**Publication Type:** Journal: Article

**Source:** EMBASE

**Full Text:**
Available in *fulltext* at [EBSCO Host](https://www.ebscohost.com)
Available in *fulltext* at [ProQuest (Legacy Platform)](https://www.proquest.com)

**Title:** Cerebral palsy - Are the definitions of the gross motor functional classification system too broad?: Commentary

**Citation:** Nature Clinical Practice Neurology, June 2007, vol./is. 3/6(314-315), 1745-834X;1745-8358 (Jun 2007)

**Author(s):** Russman B.S.

**Language:** English

**Publication Type:** Journal: Short Survey
**Title:** Use of a low-cost, commercially available gaming console (Wii) for rehabilitation of an adolescent with cerebral palsy

**Citation:** Physical Therapy, October 2008, vol./is. 88/10(1196-1207), 0031-9023 (October 2008)

**Author(s):** Deutsch J.E., Borbely M., Filler J., Huhn K., Guarrera-Bowlby P.

**Language:** English

**Abstract:** Background and Purpose. The purpose of this retrospective and prospective case report is to describe the feasibility and outcomes of using a low-cost, commercially available gaming system (Wii) to augment the rehabilitation of an adolescent with cerebral palsy. Patient and Setting. The patient was an adolescent with spastic diplegic cerebral palsy classified as GMFCS level III who was treated during a summer session in a school-based setting. Intervention. The patient participated in 11 training sessions, 2 of which included other players. Sessions were between 60 and 90 minutes in duration. Training was performed using the Wii sports games software, including boxing, tennis, bowling, and golf. He trained in both standing and sitting positions. Outcomes. Three main outcome measures were used: (1) visual-perceptual processing, using a motor-free perceptual test (Test of Visual Perceptual Skills, third edition); (2) postural control, using weight distribution and sway measures; and (3) functional mobility, using gait distance. Improvements in visual-perceptual processing, postural control, and functional mobility were measured after training. Discussion and Conclusions. The feasibility of using the system in the school-based setting during the summer session was supported. For this patient whose rehabilitation was augmented with the Wii, there were positive outcomes at the impairment and functional levels. Multiple hypotheses were proposed for the findings that may be the springboard for additional research. To the authors' knowledge, this is the first published report on using this particular low-cost, commercially available gaming technology for rehabilitation of a person with cerebral palsy. 2008 American Physical Therapy Association.
important difference values were used to interpret data. RESULTS: Clinically significant improvements were documented in functional mobility, walking endurance, range of motion, muscle strength, and/or pain reduction for all 4 patients. CONCLUSIONS: Aquatic PT used as an adjunct to land-based PT interventions may be effective in improving outcomes in patients with physical disabilities.

Publication Type: Case Reports, Journal Article, Research Support, Non-U.S. Gov't

Source: MEDLINE

Title: Effects of aquatic aerobic exercise for a child with cerebral palsy: single-subject design.

Citation: Pediatric Physical Therapy, 2009, vol./is. 21/4(336-44), 0898-5669;1538-005X (2009)

Author(s): Retarekar R, Fragala-Pinkham MA, Townsend EL

Language: English

Abstract: PURPOSE: The purpose of this study was to evaluate the effects of an aquatic aerobic exercise program for a child with cerebral palsy. METHODS: A 5-year-old girl with spastic diplegia classified at level III on the Gross Motor Function Classification System participated in this single-subject A-B-A design study. The aquatic aerobic exercise intervention was carried out 3 times per week for 12 weeks at an intensity of 50% to 80% of heart rate reserve. The Canadian Occupational Performance Measure, Gross Motor Function Measure, and 6-minute walk test were used as outcomes. RESULTS: Statistically significant improvements were found in the participation, activity, and body function components of the International Classification of Functioning, Disability, and Health model. Improvements in functional abilities and walking endurance and speed were recorded. CONCLUSION: These findings suggest that an aquatic aerobic exercise program was effective for this child with cerebral palsy and support the need for additional research in this area.

Publication Type: Case Reports, Journal Article

Source: MEDLINE

Title: Continuous postural management and the prevention of deformity in children with cerebral palsy: an appraisal.

Citation: Developmental Medicine & Child Neurology, February 2009, vol./is. 51/2(105-10), 0012-1622;1469-8749 (2009 Feb)

Author(s): Gough M

Language: English

Abstract: Continuous postural management programmes are commonly used for children with cerebral palsy (CP) in Gross Motor Function Classification System levels IV and V, with the aim of preventing musculoskeletal deformity. There is a lack of evidence to support their use in this capacity and a possibility that children with CP who are most likely to develop deformity may be least able to comply with a continuous postural management programme. The implications for the child and family of such a programme in terms of increased demands and potential discomfort are discussed within the framework of the International Classification of Functioning, Disability and Health. A shift in focus in the use of postural management from an emphasis on body structure towards the environment and participation of the child with CP is suggested.

Publication Type: Journal Article, Review
Abstract: Cerebral palsy (CP) describes a group of disorders of posture and movement that occur early in life. Although the disturbance in the developing brain is non-progressive, motor function may change over time. From the outset, parents want to know whether their child will walk. Although walking is valued by individuals of all ages, youth with CP may be more concerned with mobility; getting from place to place in a safe and efficient manner to do things with other people. The objective of this presentation is to provide a lifespan perspective of gross motor function of individuals with CP. The perspective is informed by two longitudinal studies, the Ontario Motor Growth Study and the Adolescence Study of Quality of Life, Mobility and Exercise, completed at the CanChild Centre for Childhood Disability Research. The rate of gross motor development among children with CP is highest at younger ages. Children approach the upper limit of their motor capacity at approximately 3-6 years of age depending on Gross Motor Function Classification System (GMFCS) level. Children and youth in Levels I and II maintain motor capacity; while children in Levels III, IV, and V demonstrate peak motor capacity at 7-9 years of age before declining an average of 5-8 points on the GMFM-66. By 3 years of age, almost all children in Level I walk at home, school, and outdoors. By age nine, the probability of walking is high in all settings for children and youth in Level II. Children and youth in Level III demonstrate variability in usual method of mobility in all settings. For children in Level IV, the probability of using powered mobility increases with age. Only a small percentage of children and youth in Level V mobilize (powered mobility) without physical assistance of a person. Youth spoke of constantly adapting to situations that often reflected a lack of control over the environment and having to plan ahead to go places and do things. The findings provide evidence of prognosis for gross motor function and have implications for decisions on goals, outcomes, services, and supports. Personal and environmental factors are important when making decisions on mobility including attitudes and beliefs regarding walking and wheeled mobility. The preferred method in one setting may not optimize participation in another setting. Task accommodations, environmental modifications, and assistive technology are interventions that have the potential to optimize activity and participation. Implications for adulthood are discussed.
Abstract: The purpose of this study was 1) to test whether an orthosis, which provides postural stability of the trunk and guides the leg movements during walking (Norsk Funktion-walker orthosis [NFWO]), would enable nonambulant children with cerebral palsy with poor or no leg coordination and with little or no trunk control to walk on their own, 2) to investigate if there is an increase in motor function and activity while using a NFWO, and 3) defining requirements for a successful provision. Ninety-three children (39 girls, 54 boys; mean age 7.6 years; 67 with bilateral spastic, 10 with dyskinetic, 10 with mixed, 6 with ataxic cerebral palsy; Gross Motor Function classification System level 4: 45, level 5: 48) were provided with a NFWO. The following assessments were carried out immediately before and 3 months after using the NFWO: WeeFIM walking score; independence rating by parents or caregivers; aims or expectations of parents or caregivers; at a mean interval of 265 days after provision: mean daily walking distance (meters). With the NFWO, 78 children (84%) became ambulatory, 10 children (11%) used it exclusively as a dynamic standing frame only, and 5 children (5%) returned the NFWO. The mean daily walking distance was 99 m (2-463 m). The mean WeeFIM walking score of 1.99 (SD 0.83) without the NFWO increased to 4.42 (SD 1.00) with the NFWO indoors and to 3.71 (SD 1.24) (p less than 0.001) outdoors. Independence rating by parents or caregivers reflected a highly significant increase in independent, mobility with the NFWO compared with locomotion without ambulatory aides (p less than 0.001) and of bilateral hand function (p less than 0.001). No significant increase in the mobility was found when comparing former mobility aides (wheelchair, tricycle) with the NFWO. The ability to cross obstacles did neither significantly increase with the NFWO. Successful indication for a NFWO depends on 1) the child’s motivation to walk and the support of the environment to achieve independent walking mobility through the use of this assistive tool, 2) the ability for selective reciprocal leg movements, and 3) no flexion contractures of hips and knees above 20 degrees and a foot dorsiflexion of at least neutral -0 degrees. The NFWO proved to be a useful ambulatory aid in the children with cerebral palsy with severe gait impairment to increase independent mobility.

Publication Type: Journal Article

Source: AMED

Title: Muscle plasticity in children with cerebral palsy in response to intensive activity: A pilot study

Citation: Developmental Medicine and Child Neurology, September 2009, vol./is. 51/(17), 0012-1622 (September 2009)

Author(s): Moreau N.G., Stanley C., Miros J., Scholtes S., Teefey S., Brunstrom Hernandez J., Damiano D.L.

Language: English

Abstract: Background/Objectives: Intensive massed practice is the theoretical framework behind many evidence-based therapies, such as constraint-induced movement therapy, with typical frequency and duration of 6 hour/day for 2 weeks (Taub, 1999). Intensive, activity-based interventions have the potential to increase activity and participation levels in children with CP through specific changes at the muscle level. However, the duration of intensive activity to effect changes in lower extremity muscle architecture in CP is unknown. The purpose of this pilot study was to investigate the effects of an intensive sports and recreation day camp on muscle architecture of the quadriceps (important for upright standing, posture, and gait) and on functional mobility. Design: Cross-sectional; repeated-measures. Participants and Setting: Convenience sample of 11 children with CP (age:11.8 +/- 3.2 years) within gross motor function classification system (GMFCS) levels I (n=1), II (n=2), III (n=6), IV (n=2) participated in an intensive sports and recreation camp, 6 hour/day, 5 days per week performing weight-bearing activities such as soccer, tennis, ice skating, dance, basketball, martial arts, and also swimming. Activities were modified for participants as needed in order to achieve the highest level of activity. Duration of participation varied between 1 and 6 weeks. Materials/Methods: Cross-sectional area (CSA), muscle thickness, and fascicle angle of the rectus femoris (RF) were measured at 50% of thigh length using ultrasound imaging before and after participation in the camp. Functional measures included the timed 25 ft. walk test and Timed Up and Go (TUG) test for GMFCS levels I-III. Linear regression analysis was used to test the effect of the duration of intensive activity on the percentage change (pre to post) in muscle architecture and functional measures (a level=0.05). Results: The duration of activity significantly predicted the percentage increase in RF CSA (r=0.74) and fascicle angle (r=0.62). The linear increase in
CSA was significantly correlated with the increase in fascicle angle (r=0.94). The time to complete the 25 ft. walk test and the TUG was improved as a function of the duration of attendance (r=0.75 and r=0.57). Conclusions/Significance:

Linear increases in CSA and fascicle angle as a function of the duration of activity were accompanied by improvements in functional mobility as measured by the timed 25 ft. walk test and the TUG. Although it is generally accepted that neural adaptations occur in the early stages of muscle loading, the linear increases in CSA indicate that muscle hypertrophy is evident earlier than the literature suggests. These results also suggest that an increase in fascicle angle is one mechanism by which the muscle hypertrophies. Furthermore, intensive lower extremity activity-based intervention of at least 4 weeks appears necessary to invoke measureable changes in both muscle architecture and function. These guidelines may be useful in planning future activity-based interventions for the lower extremity. (Graph presented).

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)

Title: Classification of cerebral palsy: Association between gender, age, motor type, topography and gross motor function

Citation: Arquivos de Neuro-Psiquiatria, December 2009, vol./is. 67/4(1057-1061), 0004-282X;1678-4227 (December 2009)


Language: English

Abstract: The goal of this study was to assess the relation between gender, age, motor type, topography and gross motor function, based on the Gross Motor Function System of children with cerebral palsy. Trunk control, postural changes and gait of one hundred children between 5 months and 12 years old, were evaluated. There were no significant differences between gender and age groups (p=0.887) or between gender and motor type (p=0.731). In relation to body topography most children (88%) were spastic quadriplegic. Most hemiplegics children were rated in motor level I, children with diplegia were rated in motor level III, and quadriplegic children were rated in motor level V. Functional classification is necessary to understand the differences in cerebral palsy and to have the best therapeutic planning since it is a complex disease which depends on several factors.

Publication Type: Journal: Article

Source: EMBASE

Title: Sitting and standing performance in a total population of children with cerebral palsy: a cross-sectional study

Citation: BMC musculoskeletal disorders, 2010, vol./is. 11/(131), 1471-2474 (2010)

Author(s): Rodby-Bousquet E., Hagglund G.

Language: English

Abstract: Knowledge of sitting and standing performance in a total population of children with cerebral palsy (CP) is of interest for health care planning and for prediction of future ability in the individual child. In 1994, a register and a health care programme for children with CP in southern Sweden was initiated. In the programme information on how the child usually sits, stands, stands up and sits down, together with use of support or assistive devices, is
recorded annually. A cross-sectional study was performed, analysing the most recent report of all children with CP born 1990-2005 and living in southern Sweden during 2008. All 562 children (326 boys, 236 girls) aged 3-18 years were included in the study. The degree of independence, use of support or assistive devices to sit, stand, stand up and sit down was analysed in relation to the Gross Motor Function Classification System (GMFCS), CP subtype and age. A majority of the children used standard chairs (57%), could stand independently (62%) and could stand up (62%) and sit down (63%) without external support. Adaptive seating was used by 42%, external support to stand was used by 31%, to stand up by 19%, and to sit down by 18%. The use of adaptive seating and assistive devices increased with GMFCS levels (p < 0.001) and there was a difference between CP subtypes (p < 0.001). The use of support was more frequent in preschool children aged 3-6 (p < 0.001). About 60% of children with CP, aged 3-18, use standard chairs, stand, stand up, and sit down without external support. Adding those using adaptive seating and external support, 99% of the children could sit, 96% could stand and 81% could stand up from a sitting position and 81% could sit down from a standing position. The GMFCS classification system is a good predictor of sitting and standing performance.

**Publication Type:** Journal: Article

**Source:** EMBASE

**Full Text:**
Available in full text at EBSCO Host
Available in full text at BioMedCentral
Available in full text at National Library of Medicine

**Title:** Changes in two children with cerebral palsy after intensive suit therapy: a case report

**Citation:** Pediatric physical therapy : the official publication of the Section on Pediatrics of the American Physical Therapy Association, March 2010, vol./is. 22/1(76-85), 1538-005X (2010 Spring)

**Author(s):** Bailes A.F., Greve K., Schmitt L.C.

**Language:** English

**Abstract:** PURPOSE: The purpose of this case report was to investigate effects of intensive suit therapy on gait, functional skills, caregiver assistance, and gross motor ability in children with cerebral palsy. CASE DESCRIPTION: Two children with spastic diplegia classified at level III on the Gross Motor Function Classification System participated. Outcomes were assessed using dimensions D and E of the Gross Motor Function Measure, the Pediatric Evaluation of Disability Inventory, and instrumented gait analysis. INTERVENTION: Each child participated in the Therasuit Method, 4 hours a day, 5 days a week for 3 weeks. OUTCOMES: Very small improvements in function were noted in dimension D of the Gross Motor Function Measure and Pediatric Evaluation of Disability Inventory Self-care Domain with decreased function in other areas. Improved walking speed, cadence, symmetry, joint motion, and posture were found with gait analysis. CONCLUSION: Further investigation is needed of the suit itself, and intensive therapy programs in children with cerebral palsy.

**Publication Type:** Journal: Article

**Source:** EMBASE

**Title:** Factors influencing postural management for children with cerebral palsy in the special school setting

**Citation:** Developmental Medicine and Child Neurology, March 2010, vol./is. 52/(28-29), 0012-1622 (March 2010)

**Author(s):** Sprod J., Maher C., Evans K., Bostock S.
Abstract: Objective: As young children with cerebral palsy spend much of their time at school, postural management to minimise postural abnormality and enhance function\(^1\) in this setting will provide a good start to the teenage years. This study aimed to investigate the factors influencing postural management in special schools in South Australia, including suggestions for improvement. Design: A purpose-designed, cross-sectional, descriptive survey was carried out between October and December 2007. Method: Ethical approval was granted by the Women’s and Children’s Human Research Ethics Committee. The survey tool included four main areas: demographics, perceived benefits of postural management, factors facilitating or hindering the implementation of postural management programs, and suggestions for improvement. An expert panel confirmed face validity of the survey tool, which was piloted with three participants prior to the main study. Therapists at Novita Children’s Services identified clients with cerebral palsy, level 4 or 5 on the Gross Motor Function Classification System (GMFCS),\(^2\) aged 5-12 years, who attended special schools or special units within South Australia. Survey data were analysed using frequencies, means and ranges for closed-ended items, and descriptive analysis for open-ended items as described by De Vaus.\(^3\) Results: Of the 48 therapists, and 27 teachers identified as eligible and sent surveys, 43 therapists and 18 teachers responded (81% response rate). Respondents identified a range of benefits. On average therapists listed a mean of 5 benefits while teachers listed a mean of 3, with therapists suggesting more position changes per day as optimal, compared to teachers. Barriers identified included lack of availability of appropriate equipment (n=19), education staff lacking the time, knowledge and/or skills to carry out the programme (n=27), and insufficient communication between education and therapy staff (n=8). Integration of postural management into the daily routine (n=6), provision of a written programme (n=8), and increased communication (n=8) were cited as facilitators. Suggested changes were specific instructions regarding positioning, and an increased focus on positioning programs. Teachers proposed better timetabling of postural management programs, and both groups advocated for improved access to appropriate equipment. Conclusion: This study identified barriers and facilitators to the implementation of postural management programs in special schools in SA, and this will guide therapy input. Practical solutions highlighted were increased training for school staff, timetabling of postural management into students’ routines, and provision of written postural management programs.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)

Title: Hip displacement and quality of life in severe cerebral palsy

Citation: Developmental Medicine and Child Neurology, March 2010, vol./is. 52/(17), 0012-1622 (March 2010)

Author(s): Zarrinkalam R., Rice J., Russo R., Brook P.

Language: English

Abstract: Objective: Hip displacement (HD) is the second most common musculoskeletal deformity affecting children with Cerebral Palsy (CP). It may be associated with dislocation, painful arthritis and mobility and postural problems. The primary aim of this study was to investigate the relationship between HD in individuals with severe CP, and caregiver-reported pain symptoms associated with daily activity, mobility/posture and overall quality of life, as described in the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD). The secondary aims were to identify differences in these outcomes in comparing surgical and non-surgical management for HD. Design: In this cross-sectional study 25 participants (50 hips) from an eligible total of 57 non-ambulant children with CP [Gross Motor Functional Classification System, (GMFCS) levels IV and V], born between 1988 and 1998 were recruited from a state-based population register, and had a hip at risk based on their most recent hip radiograph. Method: Parents/caregivers completed the CPCHILD questionnaire. A blinded assessment of hip Migration
Percentage (MP) and a morphological hip classification was made for each hip from plain anteroposterior hip radiographs. Statistical analysis included linear modeling and Pearson correlations. Results: Mean age was 14.96 years (SD=2.73), 68% were male; GMFCS level IV (28%) and V (72%). Neither Severity of HD nor GMFCS level had any significant effect on pain or quality of life (QOL). Significant positive correlation was found between mobility/posture and comfort (correlation=0.523, P=0.0073) but no significant correlation between mobility/posture and QOL (correlation= 0.31 and P=0.13). Surgery was found to have a significant effect on mobility/posture (P=0.025) but not comfort level (P=0.11) or QOL (P=0.64). Significant positive correlation was noted between QOL and comfort (correlation=0.712, P<0.001). Conclusion: QOL and pain scores are not affected by the severity of hip displacement or undertaking constructive hip surgery. Further evaluations in larger cohort-based populations are indicated to further describe the relevant factors leading to pain and lower QOL in these individuals.

**Publication Type:** Journal: Conference Abstract

**Source:** EMBASE

**Full Text:**
Available in *fulltext* at EBSCO Host
Available in *fulltext* at ProQuest (Legacy Platform)

**Title:** Improving sitting balance and functional skills in children with cerebral palsy - An evidence-based approach to assessment and intervention

**Citation:** Developmental Medicine and Child Neurology, March 2010, vol./is. 52/(4), 0012-1622 (March 2010)

**Author(s):** Woollacott M., Saavedra S., Butler P.

**Language:** English

**Abstract:** Children with more severe forms of cerebral palsy (GMFCS Levels IV, V) are unable to sit independently and as a consequence may have difficulty performing most tasks requiring head orientation and manipulation skills, all of which require sitting postural control as a foundation. Currently there is minimal research on the efficacy of both assessment and treatment methods for this population that attempt to evaluate and treat control within specific segments of the trunk. A new assessment tool has been designed to test sitting balance in this population, to determine the level at which these children with severe CP are able to control the head/trunk. This tool, the Segmental Assessment of Trunk Control (SATCo) tests children at seven levels of trunk support for steady state, reactive and anticipatory balance control abilities (Butler et al. submitted). In addition, recent research supports the efficacy of a method (Butler, 1998) of training individual segments of the trunk in order to gain sequential control of the trunk segments for upright sitting balance in this population. In this method secure support is provided just below the point where sitting control becomes difficult and children are then given training for both anticipatory posture control during voluntary movements and reactive posture control when the base rocks underneath them and they must recover their sitting balance. Data show improvements in the kinematics of trunk control when compared prior to and after 6 months of segmental spinal training.

**Publication Type:** Journal: Conference Abstract

**Source:** EMBASE

**Full Text:**
Available in *fulltext* at EBSCO Host
Available in *fulltext* at ProQuest (Legacy Platform)

**Title:** Outcomes of soft tissue surgery for equinus foot deformity in patients with cerebral palsy

**Citation:** European Journal of Paediatric Neurology, November 2010, vol./is. 14/6(550), 1090-3798 (November 2010)
Author(s): Shibata T., Gose S., Shibano K.

Language: English

Abstract: Our aim in this study was to analyse the result of soft tissue surgery for equinus foot deformity in patients with cerebral palsy. Of ninety-six patients who had surgery for 151 equinus feet, passive range of motion of lower extremity, way of ambulation, orthosis, and revision surgery were reviewed. Fourteen patients were in GMFCS level 1, 43 were in level 2, 31 were in level 3, three were in level 4, and five were in level 5. A mean age of surgery was 8.8 years. The mean passive dorsiflexion of the foot with the knee in extension was -16 degrees and -1 degrees with the knee in flexion. At a mean follow-up of 3.6 years, passive dorsiflexion was -4 degrees with the knee in extension and 10 degrees with the knee in flexion. Six feet of four children (three in GMFCS level 1; one in level 2) were performed revision surgery at a mean age of 12.5 years. 35.3% of the feet performed surgery under six years and 11.4% of the feet performed surgery and or over six years were deteriorated at the follow-up. 6.3% of the feet of which follow-up period was under six years and 27.3% of the feet of which the follow-up period was and or over six years were deteriorated at the follow-up. A mean external rotation angle of the hip decreased from 35 degrees to 23 degrees in deteriorated foot group, however it was kept in 30 degrees at follow-up in improved foot group. Age at surgery and follow-up period were significant factors in the outcome of the surgery. Gross motor function of the patients in addition to the foot deformity influences the decision making of the revision surgery. Unstable standing posture caused by equines foot deformity is one of the factors of in-toeing gait.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Title: Effects of hippotherapy on gait parameters in children with bilateral spastic cerebral palsy

Citation: Archives of Physical Medicine and Rehabilitation, May 2011, vol./is. 92/5(774-779), 0003-9993 (May 2011)

Author(s): Kwon J.-Y., Chang H.J., Lee J.Y., Ha Y., Lee P.K., Kim Y.-H.

Language: English

Abstract: Objectives: To evaluate the effects of hippotherapy on temporospatial parameters and pelvic and hip kinematics of gait in children with bilateral spastic cerebral palsy. Design: Nonrandomized prospective controlled trial. Setting: Outpatient therapy center. Participants: Children (N=32) with bilateral spastic cerebral palsy, Gross Motor Function Classification System level 1 or 2. Intervention: Hippotherapy (30min twice weekly for 8 consecutive weeks). Main Outcome Measures: Temporospatial parameters and pelvic and hip kinematic parameters in 3-dimensional motion analysis, Gross Motor Function Measure (GMFM)-88, and score for dimensions D (standing) and E (walking, running, jumping) of the GMFM, GMFM-66, and Pediatric Balance Scale (PBS). Results: Hippotherapy significantly improved walking speed, stride length, and pelvic kinematics (average pelvic anterior tilt, pelvic anterior tilt at initial contact, pelvic anterior tilt at terminal stance). Scores for dimension E of the GMFM, GMFM-66 and PBS also increased. Conclusions: Hippotherapy provided by licensed health professionals using the multidimensional movement of the horse may be used in conjunction with standard physical therapy for improvement of gait and balance in children with bilateral spastic cerebral palsy. 2011 American Congress of Rehabilitation Medicine.

Publication Type: Journal: Article

Source: EMBASE
Cerebral Palsy AND Hip Surgery AND GMFCS

Search Summary

Databases
- AMED
- Medline
- CInahl
- EMBASE

Key Terms
- ‘GMFCS’; “Gross Motor Function Classification System”, Disability Evaluation
- Cerebral Palsy
- ‘Hip Surgery’; Hip Joint/su; Arthroplasty, Replacement Hip;

Limits
- English Language Only
- Aged 0-18

Search Results

Title: Changes in hip spasticity and strength following selective dorsal rhizotomy and physical therapy for spastic cerebral palsy.

Citation: Developmental Medicine & Child Neurology, April 2002, vol./is. 44/4(220-6), 0012-1622;0012-1622 (2002 Apr)

Author(s): Engsberg JR, Ross SA, Wagner JM, Park TS

Language: English

Abstract: Hip adductor spasticity and strength in participants with cerebral palsy (CP) were quantified before and after selective dorsal rhizotomy (SDR) and intensive physical therapy. Twenty-four participants with cerebral palsy (CP group) and 35 non-disabled participants (ND controls) were tested with a dynamometer (OP group: mean age 8 years 5 months, 13 males, 11 females; ND group: mean age 8 years 6 months, 19 males, 16 females). According to the Gross Motor Function Classification System (GMFCS), of the 24 participants with CP, eight were at level I, six were at level II, and 10 participants were at level III. For the spasticity measure, the dynamometer quantified the resistive torque of the hip adductors during passive abduction at 4 speeds. The adductor strength test recorded a maximum concentric contraction. CP group spasticity was significantly reduced following SDR and adductor strength was significantly increased after surgery. Both pre- and postoperative values remained significantly less than the ND controls. Spasticity results agreed with previous studies indicating a reduction. Strength results conflicted with previous literature subjectively reporting a decrease following SDR. However, results agreed with previous objective investigations examining knee and ankle strength, suggesting strength did not decrease following SDR.

Publication Type: Clinical Trial, Journal Article, Research Support, U.S. Gov't, P.H.S.

Source: MEDLINE

Full Text: Available in fulltext at ProQuest (Legacy Platform)

Source: MEDLINE

Title: Leg lengthening as part of gait improvement surgery in cerebral palsy: an evaluation using gait analysis.
Abstract: Eleven children with hemiplegic or an asymmetric diplegic cerebral palsy who had a preoperative leg length discrepancy of more than 2.5 cm underwent gait improvement surgery which included leg length equalisation. Sagittal plane kinematics and kinetics before and about 3 years after surgery for the lengthened limb and contralateral limb were evaluated. Preoperatively the unaffected limb had excessive stance phase flexion at the hip and knee, and dorsal flexion at the ankle joint. These changes could be partially reversed to produce a kinematic gait pattern comparable to age matched normal controls on the uninvolved side after equalisation of leg length.

Language: English

Citation: Gait & Posture, January 2006, vol./is. 23/1(83-90), 0966-6362;0966-6362 (2006 Jan)
Abstract: The aim of this study was to assess the rate of hip dislocation at different ages in children with bilateral spastic cerebral palsy attending special schools in southern Derbyshire, UK, between 1985 and 2000. The medical notes of 110 individuals (68 males, 42 females) were obtained. They were divided into four groups according to the Gross Motor Function Classification System (GMFCS). We determined whether or not their hips were dislocated at the ages of 5, 10, and 15 years, and the kind of surgery performed in each case. The percentage of individuals with one or both hips dislocated increased with age and with severity of disease. Of those in GMFCS Level II (n=18), none had dislocations; Level III (n=16), none had dislocations at ages 5 and 10, but 11% had by the age of 15; Level IV (n=35), 8% had dislocations by age 5, 19% by age 10, and 30% by age 15; Level V (n=41), 22% had dislocations by age 5, 48% by age 10, and 50% by age 15. Forty-two per cent of individuals with hip dislocation had not had previous preventive surgery. Twenty-one per cent of hips operated on still proceeded to dislocation. We conclude that there was a high rate of hip dislocation, especially in GMFCS groups Levels IV and V, and that this often occurred very early. Preventive surgery avoided dislocation in many children. However, orthopaedic referral was often not made before dislocation was discovered, or the referral was made too late for surgery on soft tissue to be successful. These results may be compared with those from current programmes of hip management, involving radiological surveillance and early use of conservative and surgical interventions.

Publication Type: Journal Article

Source: MEDLINE

Full Text: Available in fulltext at ProQuest (Legacy Platform)

Title: A classification system for hip disease in cerebral palsy

Citation: Developmental Medicine and Child Neurology, 2009, vol./is. 51/3(183-192), 0012-1622;1469-8749 (2009)

Author(s): Robin J., Graham H.K., Baker R., Selber P., Simpson P., Symons S., Thomason P.

Language: English

Abstract: In population-based studies, hip displacement affects approximately one-third of children with cerebral palsy (CP). Given the extreme range of clinical phenotypes in the CP spectrum, it is unsurprising that hip development varies from normality, to dislocation and degenerative arthritis. Numerous radiological indices are available to measure hip displacement in children with CP; however, there is no grading system for assessing hip status in broad categorical terms. This makes it difficult to audit the incidence of hip displacement, determine the relationship between hip displacement and CP subtypes, assess the outcome of intervention studies, and to communicate hip status between health care professionals. We developed a categorical, radiographic classification of hip morphology based on qualitative indices and measurement of the key continuous variable, the migration percentage of Reimers. One hundred and thirty-four radiographs were reviewed of 52 female and 82 male adolescents with CP who were at, or close to, skeletal maturity (mean age 16y 1mo [SD 1y 4mo] range 14y to 19y 1mo). Twenty-nine were classified at Gross Motor Function Classification System level I, 25 at level II, 27 at level III, 24 at level IV, and 29 at level V. A classification system was developed to encapsulate the full spectrum of hip...
morphology in CP, with and without intervention. 2008 The Author Journal compilation 2008 Institute of Australian Geographers.

Publication Type: Journal: Article

Source: EMBASE

Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)

Title: Long term outcomes of orthopaedic surgery in cerebral palsy
Citation: Developmental Medicine and Child Neurology, February 2009, vol./is. 51/(36-37), 0012-1622 (February 2009)
Author(s): Graham H.K.
Language: English

Abstract: The years teach much which the days never know' (Ralph Waldo Emerson) 'Nothing spoils results like follow-up' (Robert B Salter) The 2005 revised definition of cerebral palsy includes the statement that 'the motor disorders of CP are often accompanied by disturbances of sensation, perception, cognition, communication and behaviour, by epilepsy and by secondary musculoskeletal problems'. In children with cerebral palsy, abnormal postures and gait patterns are usually dynamic in early childhood but gradually become fixed as the musculoskeletal pathology progresses. Thus, cerebral palsy can be considered to be a 'static encephalopathy' but associated with 'progressive musculoskeletal pathology'. The impact of the secondary musculoskeletal pathology may not become apparent until the second decade or later. The long term effects of fixed contractures, torsional malalignments in long bones, and instability of the hip joint and mid foot, can only be determined by systemic long term follow-up. Similarly the results of orthopaedic management of the progressive musculoskeletal pathology also requires long term follow-up, at least to skeletal maturity but preferably into the third and fourth decades. At the Hugh Williamson Gait Laboratory our follow-up protocols following single event multilevel surgery (GMFCS I - III) include baseline assessments, full instrumented gait analysis assessment of outcome at 12 months post multilevel surgery, followed by yearly 2D video based assessments until five years when another instrumented gait analysis is carried out. We have recently commenced assessing teenagers and young adults at 10 years post multilevel surgery. In addition to instrumented gait analysis our assessment protocol includes GMFCS, FMS, FAQ and questionnaires assessing health related quality of life (HRQoL). In our orthopaedic management of the non-ambulant child (GMFCS IV and V), we have made a major investment in the identification and systematic follow-up of a cohort of children born between 1990 and 1992. The long term results of reconstructive hip surgery in the '90-92' cohort will be presented for the first time at this meeting. This study confirms what many have suspected, 'size does matter . The outcome of reconstructive surgery was found to be dependent on surgical volume. It is not just the surgical expertise which is important but the multidisciplinary team infrastructure, supporting the efforts of orthopaedic surgeons in hip surveillance, early detection, preventative and reconstructive surgery.

Publication Type: Journal: Conference Abstract
Source: EMBASE

Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)

Title: Hip surveillance in Tasmanian children with cerebral palsy.
Citation: Journal of Paediatrics & Child Health, July 2009, vol./is. 45/7-8(437-43), 1034-4810;1440-1754 (2009 Jul-Aug)
Author(s): Connelly A, Flett P, Graham HK, Oates J
Language: English

Abstract: BACKGROUND: Children with cerebral palsy (CP) are at risk of hip subluxation. Over time, subluxation can lead to dislocation, deformity and pain. Hip surveillance in the form of an X-ray and clinical examination of this 'at risk group' can identify early subluxation. Early subluxation can be treated, preventing hip dislocation in many cases.
Hip surveillance in CP commenced in Tasmania in 1992. AIMS: To audit the hip surveillance data to date, perform a literature review to understand the emerging evidence for prevention and management of hip subluxation in CP and update hip surveillance guidelines. METHODS: New guidelines were written and distributed, and an audit of the previous 12 years performed by review of medical files and X-rays. RESULTS: Two hundred and eighteen children had been involved in the hip surveillance programme. Fifteen cases of dislocation were recorded in this time. The incidence of subluxation and surgery, as well as the gross motor function classification system (GMFCS) level, was recorded. CONCLUSION: Data from Tasmania showed a similar incidence of hip subluxation according to GMFCS level, and frequency of different surgical interventions as other recent audits. Some children with minor subluxation improved without orthopaedic intervention once weight bearing occurred, which had not before been appreciated. Migration percentage alone is not adequate to fully describe the outcome of hip subluxation. More appropriate measures of outcome in terms of quality of life for children with CP need to be developed.

Publication Type: Journal Article
Source: MEDLINE
Full Text: Available in fulltext at EBSCO Host

Title: Hip displacement and quality of life in severe cerebral palsy
Citation: Developmental Medicine and Child Neurology, March 2010, vol./is. 52/(17), 0012-1622 (March 2010)
Author(s): Zarrinkalam R., Rice J., Russo R., Brook P.
Language: English
Abstract: Objective: Hip displacement (HD) is the second most common musculoskeletal deformity affecting children with Cerebral Palsy (CP). It may be associated with dislocation, painful arthritis and mobility and postural problems. The primary aim of this study was to investigate the relationship between HD in individuals with severe CP, and caregiver-reported pain symptoms associated with daily activity, mobility/posture and overall quality of life, as described in the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD). The secondary aims were to identify differences in these outcomes in comparing surgical and non-surgical management for HD. Design: In this cross-sectional study 25 participants (50 hips) from an eligible total of 57 non-ambulant children with CP [Gross Motor Functional Classification System, (GMFCS) levels IV and V], born between 1988 and 1998 were recruited from a state-based population register, and had a hip at risk based on their most recent hip radiograph. Method: Parents/caregivers completed the CPCHILD questionnaire. A blinded assessment of hip Migration Percentage (MP) and a morphological hip classification was made for each hip from plain anteroposterior hip radiographs. Statistical analysis included linear modeling and Pearson correlations. Results: Mean age was 14.96 years (SD=2.73), 68% were male; GMFCS level IV (28%) and V (72%). Neither Severity of HD nor GMFCS level had any significant effect on pain or quality of life (QOL). Significant positive correlation was found between mobility/posture and comfort (correlation=0.523, P=0.0073) but no significant correlation between mobility/posture and QOL (correlation= 0.31 and P=0.13). Surgery was found to have a significant effect on mobility/posture (P=0.025) but not comfort level (P=0.11) or QOL (P=0.64). Significant positive correlation was noted between QOL and comfort (correlation=0.712, P<0.001). Conclusion: QOL and pain scores are not affected by the severity of hip displacement or undertaking constructive hip surgery. Further evaluations in larger cohort-based populations are indicated to further describe the relevant factors leading to pain and lower QOL in these individuals.

Publication Type: Journal: Conference Abstract
Source: EMBASE
Full Text: Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)

Title: Long-term followup of total hip arthroplasty in patients with cerebral palsy.
Citation: Clinical Orthopaedics & Related Research, July 2010, vol./is. 468/7(1845-54), 0009-921X;1528-1132 (2010 Jul)
Author(s): Raphael BS, Dines JS, Akerman M, Root L
Language: English
Abstract: BACKGROUND: Patients with cerebral palsy (CP) are at risk for hip arthrosis secondary to the loss of joint congruity. QUESTIONS/PURPOSES: We asked whether THA relieved pain, improved function, and provided durable
improvements.METHODS: We retrospectively identified 56 patients (59 hips) with CP who had THAs for painful hips. Chart review determined the preoperative, postoperative, and current functional levels. All patients or caregivers completed a questionnaire, including a modified Gross Motor Function Classification System mobility scale and qualitative reports of pain and satisfaction. Pain levels were measured on a visual analog scale at three times: preoperative, postoperative, and current. The average age of the patients at the time of surgery was 30.6 years. Minimum followup was 2 years (average, 9.7 years; range, 2-28 years).RESULTS: Pain relief was obtained in all patients. All patients returned to preoperative function (59) and 52 patients returned to prepain functional status (88%). Seven patients underwent acetabular component revisions, and two patients had a femoral stem component revision. The 2-year implant survival was 95%, and 10-year survivorship was 85%.CONCLUSIONS: THA can provide durable relief and improved function in patients with CP with severe coxarthrosis.LEVEL OF EVIDENCE: Level IV, therapeutic study. See the Guidelines for Authors for a complete description of levels of evidence.

Publication Type: Journal Article
Source: MEDLINE
Full Text: Available in fulltext at ProQuest (Legacy Platform)
Available in fulltext at National Library of Medicine

Title: Outcome of single-event multilevel surgery in 121 children with cerebral palsy using the Movement Analysis Profile and the Gait Profile Score
Citation: Developmental Medicine and Child Neurology, September 2010, vol./is. 52/(78-79), 0012-1622 (September 2010)
Author(s): Rutz E., Tirosh O., Baker R., Passmore E., Graham H.K.
Language: English
Abstract: Background/Objectives: The natural history of gait in children with bilateral spastic cerebral palsy (CP) is one of deterioration. Single Event Multilevel Surgery (SEMLS) is performed to prevent deterioration and to improve gait in patients with bilateral involvement of the lower extremities. The aim of this study is to investigate the short-term outcomes of a large cohort of children with CP using the Movement Analysis Profile (MAP) and the Gait Profile Score (GPS) after SEMLS. Hypothesis: The SEMLS approach is effective to improve gait in children with bilateral spastic CP in one major operative session. Design: Retrospective cohort study. Participants and Setting: All 121 diplegic patients with GMFCS level II or III (48 girls/73 boys; mean age 10.7+/−2.7 y at time of SEMLS) who had SEMLS at a tertiary care institution between 1995 and 2008 were included in this study. Materials/Methods: From the 3D gait data the MAP and GPS were calculated for all participants. A change of one(Figure presented)standard deviation (1.31degree ) in the overall GPS compared preoperative to postoperative was defined as clinically significant. The median value of the GPS for healthy children is 5.2degree . The mean number of surgical procedures per SEMLS session was 7.6+/−2.1. Eighty patients were GMFCS level II and 41 patients were GMFCS level III. The significance level was set at alpha =0.05. Results: The mean interval between the first gait analysis and surgery was 7.3+/−6.0 months. The mean follow-up was 1.3+/−1.0 year. The mean overall GPS preoperative was 15.5+/−3.9degree and the mean overall GPS postoperative was 11.2+/−2.5degree. The change in GPS was 4.3+/−3.7degree. Figure 1 shows the MAP for all patients (left and right side) compared preoperative to postoperative. There is a statistical significant change in theMAP for pelvic obliquity, hip flexion, hip rotation, knee flexion, ankle dorsi-/plantar-flexion, foot progression and the overall GPS compared preoperative to postoperative. 74.4% (n=90) of the patients showed a clinical significant improvement, 22.3% (n=27) of the patients showed no change, and 3.3% (n=4) of the patients showed a deterioration at short-term follow-up reflected by the GPS (see figure 2). These four patients showed improvements in the overall GPS at later follow-up examinations (2x 2y, 1x 3y, and 1x 5 y).
Conclusions/Significance: Gait problems in children with bilateral spastic CP can be improved in one major operative session with the SEMLS approach in this large cohort of121 children. Seventy-five percent of the patients showed a clinical significant improvement, 22% of the patients showed no change, and 3% of the patients deteriorated at short-term follow-up reflected by the overall GPS. A 42% improvement in overall gait was shown in this study.
Publication Type: Journal: Conference Abstract
Source: EMBASE
Full Text: Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)
Title: Reliability of physical examination in the measurement of hip flexion contracture and correlation with gait parameters in cerebral palsy

Citation: Journal of Bone and Joint Surgery - Series A, January 2011, vol./is. 93/2(150-158), 0021-9355;1535-1386 (19 Jan 2011)

Author(s): Lee K.M., Chung C.Y., Kwon D.G., Han H.S., Choi I.H., Park M.S.

Language: English

Abstract: Background: This study was undertaken to determine the validity and reliability of the physical examination tests commonly used to measure hip flexion contracture in patients with cerebral palsy who are able to walk. Methods: Thirty-six consecutive patients (twenty-two male and fourteen female patients), with a mean age (and standard deviation) of 9.8 +/- 3.9 years, who had cerebral palsy (level I, II, or III on the Gross Motor Function Classification System) and thirty-seven children without cerebral palsy (nineteen male and eighteen female subjects), with a mean age of 10.0 +/- 3.0 years, were enrolled prospectively for this study. Hip flexion contracture was determined by three physical examination tests: the Thomas test, the prone hip extension test (the Staheli test), and the hamstring shift test. Three-dimensional gait analysis was performed in all subjects. The interobserver reliabilities of the three physical examination tests were determined with use of three observers. Convergent validity was assessed by evaluating the relationships between the findings on physical examination and kinematic and kinetic gait variables (maximum hip extension during stance and hip flexor index) and three-dimensional modeled psoas lengths.

Results: The Thomas test showed the highest intraclass correlation coefficient (0.501 in patients and 0.207 in controls) and the smallest mean absolute difference (5.8 degree in patients and 1.2 degree in controls). The Staheli test was found to be the most valid method in the patient group (r = 0.568 with hip flexor index), whereas the Thomas test was the most valid in the control group (r = 0.526 with maximum hip extension in stance, and r = 0.532 with the hip flexor index). The hamstring shift test had the lowest intraclass correlation coefficient and the lowest convergent validity. Conclusions: While the Thomas test showed the highest intraclass correlation coefficient and the smallest mean absolute difference, the Staheli test was the most valid method for detecting hip flexion contractures in patients with cerebral palsy. Although the Staheli test cannot be used for intraoperative assessment, we recommend that this test be included in preoperative physical examinations to determine the role of a hip flexion contracture in the abnormal gait of patients with cerebral palsy. Copyright 2011 by The Journal of Bone and Joint Surgery, Incorporated.

Publication Type: Journal: Article

Source: EMBASE

Cerebral Palsy AND Hip Surgery AND General Rehabilitation/Therapy

Search Summary

Databases
- AMED
- Medline
- Cinahl
- EMBASE

Key Terms
- ‘Hip Surgery’; Hip Joint/su; Arthroplasty, Replacement Hip;
- Cerebral Palsy
- ‘Rehabilitation’; ‘Therapy’

Limits
- English Language Only
- Aged 0-18

Search Results

Title: Changes in hip spasticity and strength following selective dorsal rhizotomy and physical therapy for spastic cerebral palsy.
Abstract: Hip adductor spasticity and strength in participants with cerebral palsy (CP) were quantified before and after selective dorsal rhizotomy (SDR) and intensive physical therapy. Twenty-four participants with cerebral palsy (CP group) and 35 non-disabled participants (ND controls) were tested with a dynamometer (OP group: mean age 8 years 5 months, 13 males, 11 females; ND group: mean age 8 years 6 months, 19 males, 16 females). According to the Gross Motor Function Classification System (GMFCS), of the 24 participants with CP, eight were at level I, six were at level II, and 10 participants were at level III. For the spasticity measure, the dynamometer quantified the resistive torque of the hip adductors during passive abduction at 4 speeds. The adductor strength test recorded a maximum concentric contraction. CP group spasticity was significantly reduced following SDR and adductor strength was significantly increased after surgery. Both pre- and postoperative values remained significantly less than the ND controls. Spasticity results agreed with previous studies indicating a reduction. Strength results conflicted with previous literature subjectively reporting a decrease following SDR. However, results agreed with previous objective investigations examining knee and ankle strength, suggesting strength did not decrease following SDR.

Publication Type: journal article

Source: CINAHL

Full Text: Available in fulltext at ProQuest (Legacy Platform)
Abstract: 'Children are our future' Nelson Mandela 'With the realisation of one's own potential and self confidence in one's ability, one can build a better world' His Holiness the XIV Dalai Lama

The 3rd International Cerebral Palsy Conference brings together researchers, clinicians and persons with cerebral palsy from 32 countries around the world. There are six major themes of the conference brought together to high-light current thinking and to look forward to the future in the management of children with cerebral palsy (CP). As CP is the leading cause of childhood disability with an incidence of 1 in 500 live births, it is of major importance. Management of long-term disability and the burden of care on both the health care system and families are substantial. Recently the financial cost of CP was estimated at Aus$1.47 billion with Aus$124.1 million attributed to direct program costs. Families and individuals with CP accommodate approximately 43% of these costs and the various levels of government the remainder (Access Economics 2008). One major theme of the conference is to understand the aetiology and pathogenesis of CP. To that end the inaugural World Congress of Cerebral Palsy Registers will be held with specific keynote speakers on the causal pathways of CP (Blair), genomic susceptibility and environmental triggers (MacLennan), neuroprotective strategies and preconditioning (Ferriero), prevention of CP (Nelson) and outcomes from large population based studies and groups of CP Registers in Europe such as SCPE (Cans and Krageloh Mann), Scandinavia CPUP (Nordmark) and the US. A second theme provides a strong link between the basic sciences and the clinical implications with presentation of the animal models ofCP (Walker), and seminars on neuroprotection (Colditz, Walker). Directly linked to the basic science them is an update on advanced neuroimaging techniques (Krageloh-Mann, Cioni, Guzzetta) and current research on neural plasticity in the young child with CP (Krageloh-Mann). A third major them is upper limb rehabilitation with different models presented in seminars and workshops linked to the neuroscience of hand function (Eliasson). It is increasingly recognised that evidence based medicine needs to move beyond the small short term randomised controlled clinical trial to long term outcomes. We include a theme of long term outcomes of treatments including orthopaedic surgery (Graham) and more than 10 years follow up of Selective Dorsal Rhizotomy (Bjornsen). Further translation into clinical practice is facilitated by the presentation of international consensus evidence based clinical practice guidelines on the use of Botulinum Toxin A, the Australasian Hip surveillance guidelines and Osteopenia in Cerebral Palsy. The scope of the conference begins with early intervention in the neonate (Cioni) and long term outcomes of the infant born preterm (Anderson) to early diagnosis of General Movements (Cioni and Guzzetta) and covers the broad spectrum of measurement of Gross Motor Function (Palisano) and Bimanual Hand Use (Krumlinde-Sundholm) across the lifespan. Mutual understanding will be further developed with the presentation of classification guidelines for Manual Ability (Eliasson), the Spastic Hip (Robins), and Communication Function. Our focus on outcome measures continues to focus on the ICF as a model with greater emphasis on the measurement of participation and interventions that may influence quality of life. A final theme is an emphasis on preventative strategies such as positive parenting for parents of children with a disability (Sanders). Current approaches to advocacy and promotion of research in the US will be highlighted (Chambers) and we will commence with influencing government to make child health a priority (Stanley) and understanding what parents and clinicians what to know in 2009 (Rosenbaum).

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text: Available in fulltext at EBSCO Host
Available in fulltext at ProQuest (Legacy Platform)

Title: Hip subluxation and dislocation in cerebral palsy -- a prospective study on the effectiveness of postural management programmes.

Citation: Physiotherapy Research International, 01 June 2009, vol./is. 14/2(116-127), 13582267

Author(s): Pountney TE, Mandy A, Green E, Gard PR

Language: English
Abstract: Background and Purpose. Hip subluxation and dislocation are common sequelae in children with bilateral cerebral palsy and are currently managed by surgical interventions. This study aimed to investigate the effectiveness of early postural management programmes on hip subluxation and dislocation at five years, and the need for treatment in children with bilateral cerebral palsy, and to compare these findings with a historical control group. Methods. A prospective cohort study followed 39 children who commenced using postural management equipment under 18 months of age. Levels of ability, type and amount of equipment use and treatments were recorded every three months. At 30 and 60 months, the hips were X-rayed and the hip migration percentage was measured. The results were compared with the historical control group. Results. Children who used equipment at recommended and moderate levels had a significantly less chance of both hips being subluxed than those using equipment at minimal levels (two-tailed Fisher’s exact chi(2) p = 0.024). The frequency of children with hip problems was significantly less in the intervention group in comparison to the historical control group at five years (chi(2) = 11.53, df = 2, p = 0.006). The frequency of children receiving bilateral or unilateral treatments, i.e. surgery, use of a hip and spinal orthosis and/or botulinum toxin injections, in the intervention group was significantly less compared to the historical control group (two-tailed Fisher’s exact p = 0.001). Conclusion. The early provision of postural management equipment has a role to play in reducing the number of hip problems and therefore the need for treatment of hip subluxation/dislocation in cerebral palsy at five years of age. Copyright (c) 2009 John Wiley & Sons, Ltd.

Publication Type: journal article
Source: CINAHL
Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at EBSCO Host

Title: Transcutaneous electrical nerve stimulation of hip adductors improves gait parameters of children with spastic diplegic cerebral palsy

Citation: Neurorehabilitation, 2010, vol./is. 26/2(115-22), 1053-8135 (2010)

Author(s): AlAbdulwahab SS, Al-Gabbani M

Language: English

Abstract: Background: Reduction of spasticity in hip adductor muscles is one of the essential factors to improve standing, gait, and personal hygiene of children with spastic diplegic cerebral palsy (CP). Surgical and medical methods have been commonly used for such purposes. These methods are expensive, required special skill and have side effects. Objective: To study the effect of conventional TENS on spasticity in hip adductors and gait parameters of children with spastic diplegic CP. Subject: An experimental group of twenty seven ambulant children with spastic diplegic CP and control group of fifteen healthy children were voluntary participants in the study. Methods: The experimental group received two different TENS management programs. The 1st TENS program was a one-time trial management program that included an ongoing application of conventional TENS on bilateral hip adductors during passive hip abduction, and during walking for a pre-determined distance. The 2nd TENS program was a one-week trial management program that included 15 minutes of ongoing application of conventional TENS on bilateral hip adductors during walking, three sessions a day for a week. The effects of the TENS program was assessed using the Modified Ashworth Scale, the balance master system and visual observations of knee positions. Results: A significant improvement was recorded in spasticity of hip adductors, gait parameters and knees position of the experimental group. Conclusion: Functional application of TENS to hip adductors of children with spastic diplegic CP can reduce spasticity and improve gait pattern.

Publication Type: Journal Article

Source: AMED

Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at EBSCO Host
Title: Australasian Academy of Cerebral Palsy and Developmental Medicine 5th Biennial Conference

Citation: Developmental Medicine and Child Neurology, March 2010, vol./is. 52/, 0012-1622 (March 2010)

Language: English

Abstract: The proceedings contain 100 papers. The topics discussed include: attitude and disability equals quality of life; should we give up the term quality of life?; understanding development of balance and postural control in typical children and children with cerebral palsy - current concepts; improving sitting balance and functional skills in children with cerebral palsy - an evidence based approach to assessment and intervention; genetic and environmental risk factors that contribute to cerebral palsy; impact of preterm birth on motor development in early infancy; a randomized trial of novel upper limb rehabilitation in children with congenital hemiplegia; quantifying upper limb reaching in children with hemiplegic type cerebral palsy: 3D motion analysis and computed jerk; pathogenesis of congenital hemiplegia: relationship between brain structure and upper limb function; survivorship analysis of adductor surgery to prevent hip displacement in children with cerebral palsy; and alterations in muscle length in severe crouch gait after single event muscle level surgery.

Publication Type: Journal: Conference Review

Source: EMBASE

Full Text:
Available in full text at EBSCO Host
Available in full text at ProQuest (Legacy Platform)

Title: Survivorship analysis of adductor surgery to prevent hip displacement in children with cerebral palsy

Citation: Developmental Medicine and Child Neurology, March 2010, vol./is. 52/(16), 0012-1622 (March 2010)

Author(s): Yu X., Desai S., Shore B., Thomason P., Wolfe R., Selber P., Graham H.K.

Language: English

Abstract: Objective: Past literature evaluating the long-term outcomes of hip adductor surgery in children with cerebral palsy in preventing hip displacement is limited its follow-up period (maximum 39mo) and has not assessed possible predictors related to successful outcomes.1,2 This study reviews the success of hip adductor surgery in preventing hip displacement from the perspective of an extended follow-up and the gross motor function classification system (GMFCS). Design: Study of therapy; retrospective cohort audit. Method: Consecutive series of children with cerebral palsy aged 2-10 years who had primary adductor surgery at a tertiary children's hospital between January 1994 and December 2004. These children had hip migration percentages (MP) >30% and been followed up for a minimum 12 months post-operatively. Demographic data reviewed included gender, MP at time of primary surgery, GMFCS level, age at time of surgery and type of adductor release procedure performed. Outcome variables assessed were type of subsequent failure, time of failure after primary procedure, and length of follow-up. A Cox proportional hazards survivorship analysis was constructed to chart the time course of progression to further surgery over time according to GMFCS level. Results: Three hundred and thirty children underwent hip adductor surgery. The number of children per GMFCS Graph presented. level was 33 Level II, 55 level III, 103 level IV, and 139 level V. The average age at time of primary surgery was 4.19 years, mean MP at time of primary surgery 43.16%, and mean length of post-operative follow-up was 7.10 years. Eighty two children had adductor longus and gracilis lengthening alone, 97 also had an iliopsoas release, 97 had psoas tenotomy and phenolisation of the obturator nerve, and 54 had a psoas tenotomy and neurectomy of the anterior branch of the obturator nerve (in addition to longus & gracilis lengthening). At time of audit 106 children (32%) did not require further surgery ('surgery success'). Thirty one were in children of GMFCS level II (94%), 27 level III (49%), 28 level IV (27%), and 20 level V (14%). The survivorship analysis (Fig. 1) revealed differences in 'surgery success' rates, according to GMFCS, particularly
apparent beyond 3 years post-operatively. Conclusion: The GMFCS is crucial in predicting the outcomes of adductor surgery in preventing further hip displacement. Current treatment strategies need to be evaluated to ensure they undertake long-term post-operative follow up, particularly for children GMFCS levels VI and V, and provide appropriate prognostic counseling in light of these findings.

**Publication Type:** Journal: Conference Abstract

**Source:** EMBASE

**Full Text:**
Available in *fulltext* at EBSCO Host
Available in *fulltext* at ProQuest (Legacy Platform)

**Title:** A randomized, double-blind, placebo-controlled study on the effects of botulinum toxin A in ambulant adults with spastic cerebral palsy

**Citation:** Developmental Medicine and Child Neurology, September 2010, vol./is. 52/(43-44), 0012-1622 (September 2010)

**Author(s):** Maanum G., Jahnsen R., Stanghelle J.K., Sandvik L., Keller A.

**Language:** English

**Abstract:** Background/Objectives: Botulinum toxin A (BoNT-A) can improve function and delay the need for orthopaedic surgical intervention in children with cerebral palsy (CP). Effects in adults with CP are less investigated. This study aimed to assess the short term effect of BoNT-A after 8 weeks in adults with spastic CP experiencing declined walking compared to adolescence. Design: A randomized, double blind, placebo controlled trial with parallel group design. Participants and Setting: Adults with spastic CP, GMFCS level I-III, were recruited through advertisement in newspapers and on the websites of the Norwegian CP-Association and Sunnaas Rehabilitation Hospital. Inclusion criteria: Spastic uni- or bilateral CP, 18 to 65 years, no cognitive impairments, declined walking compared to adolescence, walking without aids for minimum 20 m in functional equinus and/or pathological knee extension or flexion pattern, accepting no changes in other treatments during the study period, no other disease affecting walking, no BoNT-A treatment in the last 6 months, no orthopaedic surgery in the last 18 months, no skeletal/joint deformity with indication for orthopaedic surgery, and no planned pregnancy. The study was a single centre study at Sunnaas Rehabilitation Hospital in Norway, financed by the Norwegian Eastern Health Region, and registered in ClinicalTrials.gov (NCT00432055). Materials/Methods: Of 201 respondents, 66 with mean age 37 years (SD=11.4) were enrolled and received injections of either BoNT-A (n=33) or Placebo (n=33). Standardized doses were injected into individualized injection site(s) following objective evaluation (clinical examination and gait analysis). Primary outcome measures: Ankle sagittal kinematics at initial contact, peak dorsiflexion in stance and peak dorsiflexion in swing with corresponding knee- and hip kinematics (Vicon Motion System), and Health related quality of life (SF-36). Secondary outcome measures: Visual Analogue Scale (VAS) for spasticity, Timed Up and Go, 6-minute Walk Test, and Global Scale of perceived effect. Analysis of covariance (ANCOVA) was used for continuous variables and Fisher's exact test with Relative Risk (RR) for the Global Scale. Results: The study had one dropout. BoNT-A treatment did not result in significant changes in either of the primary outcomes. In the secondary outcomes the BoNT-A group demonstrated an advantage for the VAS-spasticity [mean difference=9.6, p=0.03, (95%CI=1.2;18.0)], and the number rating themselves as better by Global Scale were 19/32 in BoNT-A versus 9/33 in placebo group [RR=2.19, p=0.02, (95%CI=1.96; 2.44)]. No adverse events occurred. Conclusions/Significance: The short term effect of BoNT-A treatment failed to show any benefit over placebo for lower limb sagittal kinematics and SF-36. The results from the secondary outcomes demonstrate that adults with CP have positive effects of BoNT-A. Studies with longer treatment period and post injection rehabilitation are warranted to document the functional benefits of BoNT-A.

**Publication Type:** Journal: Conference Abstract
Title: Trunk and hip muscle activity in early walkers with and without cerebral palsy A frequency analysis

Citation: Journal of Electromyography and Kinesiology, October 2010, vol./is. 20/5(851-9), 1050-6411 (2010 Oct)

Author(s): Prosser LA, Lee SC, Barbe MF, VanSant AF, Lauer RT

Language: English

Publication Type: Journal Article

Source: AMED

Title: A regressed phase analysis for coupled joint systems

Citation: Gait and Posture, January 2011, vol./is. 33/1(136-9), 0966-6362 (2011 Jan)

Author(s): Wininger M

Language: English

Publication Type: Journal Article

Source: AMED

Title: Outcome evaluation of surgery treatment by means of gait analysis in children with cerebral palsy: The normality pattern is not an effective term of comparison

Citation: Gait and Posture, April 2011, vol./is. 33/(S19-S20), 0966-6362 (April 2011)

Author(s): Neviani R., Costi S., Borghi C., Faccioli S., Ferrari A.

Language: English

Abstract: Introduction Among the treatments available for the rehabilitation of the alterations of walking in children affected by cerebral palsy (CP), multilevel surgery is one of the most effective and used solutions despite its irreversible nature. Literature provides increasingly evidences of the large benefits afforded by gait analysis (GA) in the process of surgery decision making and in the choice of the most appropriate surgery technique [1]. However, besides the diagnostic process, GA can be used in order to measure accurately and effectively the outcome of the treatment [1]. The aim of the present study is to demonstrate how deviations in the kinematic pattern of walking provoked by a surgery treatment can determine (i) an improvement in the motor performance and (ii) an increase in the autonomy level in action, also when they vary in the opposite direction with respect to the normal pattern.

Materials and methods 15 dipelgic children with purely spastic forms of CP (age range 7-17 years) classified in one of the four forms of diplegia proposed by [2] and addressed by a clinical examination to undergo a functional surgery treatment on the lower limbs, participated in the study. The aim of the surgery treatment was to improve the motor performance and the autonomy level in walking. The treatments adopted included tendon and muscular lengthenings, and interventions of skeleton correction. The motor performance exhibited by the subjects was
measured both by means of the Gross Motor Function Measure 88 (GMFM) by using only the dimension D and E [3], and of GA, the day before (session PRE) and after six months (session POST) the surgery intervention. The kinematics of at least three gait cycles for each limb was acquired through the protocol Total3DGait [4] by means of an 8 cameras ViconMX+ system (Vicon Motion System, UK). The 9 kinematic variables relative to the sagittal, frontal and transverse plane rotations of the hip, knee and ankle and the 4 kinematic variables relative to the rotations on the sagittal and frontal plane of the segments pelvis and trunk obtained during the PRE and POST sessions were compared with respect to the normality bands [4]. In particular, for each of the 13 kinematic variables considered, sets of 3 mean waveforms were computed from the gait cycles acquired in the two sessions PRE and POST and from the normality bands. For each subject, the approach of the 13 mean waveforms of the POST session towards the normality, with respect to the ones of the session PRE, was computed in terms of offset (Off) and Range of Movement (ROM). In particular, positive values of Off and ROM indicate that the POST mean waveforms move closer to the normal ones in both absolute and range terms. Results The obtained GMFM values were positive in 13 out of 15 cases, with a percentage mean value of 3.4 and a standard deviation of 6.1. Table 1 reports the mean and the standard deviation values relative to Off and ROM obtained from the 13 kinematics variable considered for each of the 15 enrolled subjects. Discussion The obtained GMFM data, revealed an improvement in functional autonomy level in action in 13 out of 15 cases. On the (Table presentd) contrary, the elevated values of the standard deviations together with mean values close to 0 of Off and ROM parameters, demonstrate that the kinematic waveforms obtained in the POST session did not approach the normality pattern homogeneously among the different joints of a single subject. Therefore, the comparison of the GA data with respect to the normality bands was not effective in the assessment of the outcome. In agreement with the criteria used in the classification of the diplegic forms proposed by [2], a comparison with respect to pathologic bands is suggested. In particular, the pathologic bands should be conceived (i) from the walking pattern of subjects characterized by the highest values of GMFM reachable on the scheme of a certain form and (ii) taking into consideration that the main core of each of the four forms is the least modifiable.

**Publication Type:** Journal: Conference Abstract

**Source:** EMBASE

**Title:** Effect of weight-bearing in abduction and extension on hip stability in children with cerebral palsy

**Citation:** Pediatric Physical Therapy, June 2011, vol./is. 23/2(150-7), 0898-5669 (2011 Summer)

**Author(s):** Martinsson C, Himmelmann K

**Language:** English

**Abstract:** Purpose: To study the effect of 1 year of daily, straddled weight-bearing on hip migration percentage (MP) and muscle length in children with cerebral palsy who were nonambulatory. Methods: Participants stood upright in maximum tolerated hip abduction and hip and knee extension 1/2 to 1 1/2 hours per day for 1 year. Controls, matched for age, motor ability, and surgery, were derived from a national cerebral palsy follow-up program. Results: Participants using straddled weight-bearing after surgery had the largest decrease in MP (n = 3, 20 controls; P = .026). Children using straddled weight-bearing at least 1 hour per day for prevention also improved (n = 8, 63 controls; P = .029). Hip and knee contractures were found only in controls. Conclusion: Straddled weight-bearing, 1 hour per day, may reduce the MP after adductor-iliopectos-tenotomies or prevent an MP increase and preserve muscle length in children with cerebral palsy who did not need surgery. Larger studies are needed to confirm the results.

**Publication Type:** Journal Article

**Source:** AMED
Hip Surgery AND Hydrotherapy/Postural Management

Search Summary

Databases
- AMED
- Medline
- CInahl
- EMBASE

Key Terms
- ‘Hip Surgery’; Hip Joint/su; Arthroplasty, Replacement Hip;
- ‘Postural Management; Hydrotherapy; ‘Aquatic Physiotherapy’

Limits
- English Language Only
- Aged 0-18

Search Results

Title: Effect of intervention on development of hip posture in very preterm babies

Citation: Archives of Disease in Childhood, July 1991, vol./is. 66/7 (1991 Jul)

Author(s): Downs JA, Edwards AD, McCormick DC, Roth SC, Stewart AL

Language: English

Publication Type: Journal Article

Source: AMED

Full Text:
Available in fulltext at Highwire Press
Available in fulltext at Highwire Press
Available in fulltext at National Library of Medicine

Title: Management of hip posture in cerebral palsy

Citation: J R Soc Med, March 1992, vol./is. 85/3(150-1) (1992 Mar)

Author(s): Clarke AM, Redden JF

Language: English

Publication Type: Journal Article

Source: AMED

Full Text:
Available in fulltext at EBSCO Host
Available in fulltext at National Library of Medicine

Source: AMED
Title: Home exercises are as effective as outpatient hydrotherapy for osteoarthritis of the hip

Citation: Br J Rheumatol, September 1993, vol./is. 32/9(812-5) (1993 Sep)

Author(s): Green J, McKenna F, Redfern EJ, Chamberlain MA

Language: English

Publication Type: Journal Article

Source: AMED

Title: Pronation and postural support

Citation: American Chiropractor, 2002, vol./is. 24/4(35-6), 0194-6536 (2002)

Author(s): Danchik J

Language: English

Publication Type: Journal Article

Source: AMED

Title: Treatment of the painful chronically dislocated and subluxated hip in cerebral palsy with hip arthrodesis

Citation: Journal of Pediatric Orthopaedics, July 2003, vol./is. 23/4(529-534), 0271-6798 (Jul 2003)

Author(s): De Moraes Barros Fucs P.M., Svartman C., De Assumpcao R.M.C., Kertzman P.F.

Language: English

Abstract: The purpose of this study was to evaluate 14 painful dislocated hips in patients with spastic cerebral palsy, treated with hip arthrodesis and internal fixation. The mean age at the surgical procedure was 15 years and 5 months. The mean follow-up period was 5 years and 3 months. All patients showed bone union, pain relief, and postural improvement. Hip arthrodesis is a reasonable option in treating painful spastic subluxated and dislocated hips in patients with cerebral palsy, especially if it is unilateral and the patient has weight-bearing function.

Publication Type: Journal: Article

Source: EMBASE

Title: Comparison between electro-acupuncture and hydrotherapy, both in combination with patient education and patient education alone, on the symptomatic treatment of osteoarthritis of the hip

Citation: Clinical Journal of Pain, May 2004, vol./is. 20/3(179-85), 0749-8047 (2004 May-Jun)

Author(s): Stener-Victorin E, Kruse-Smidje C, Jung K

Language: English
Abstract: OBJECTIVES: The aim of the study was to evaluate the therapeutic effect of electro-acupuncture (EA) and hydrotherapy, both in combination with patient education or with patient education alone, in the treatment of osteoarthritis in the hip. METHODS: Forty-five patients, aged 42-86 years, with radiographic changes consistent with osteoarthritis in the hip, pain related to motion, pain on load, and ache were chosen. They were randomly allocated to EA, hydrotherapy, both in combination with patient education, or patient education alone. Outcome measures were the disability rating index (DRI), global self-rating index (GSI), and visual analogue scale (VAS). Assessments were done before the intervention and immediately after the last treatment and 1, 3, and 6 months after the last treatment. RESULTS: Pain related to motion and pain on load was reduced up to 3 months after last the treatment in the hydrotherapy group and up to 6 months in the EA group. Ache during the day was significantly improved in both the EA and hydrotherapy group up to 3 months after the last treatment. Ache during the night was reduced in the hydrotherapy group up to 3 months after the last treatment and in the EA group up to 6 months after. Disability in functional activities was improved in EA and hydrotherapy groups up to 6 months after the last treatment. Quality of life was also improved in EA and hydrotherapy groups up to 3 months after the last treatment. There were no changes in the education group alone. DISCUSSION: In conclusion, EA and hydrotherapy, both in combination with patient education, induce long-lasting effects, shown by reduced pain and ache and by increased functional activity and quality of life, as demonstrated by differences in the pre- and post-treatment assessments.

Publication Type: Journal Article

Source: AMED

Title: Mini-Symposium: Childrens Orthopaedic Surgery. (V) the Hip in Cerebral Palsy

Citation: Current Orthopaedics, August 2006, vol./is. 20/4(286-93), 0268-0890 (2006 Aug)

Author(s): Murray AW, Robb JE

Language: English

Abstract: Deformity and displacement of the hip is the second most common orthopaedic problem to affect children with cerebral palsy. The severity and incidence of hip pathology increases with the severity of cerebral palsy and up to 70% of patients with total body involvement cerebral palsy suffer from hip displacement. Hip deformity can also be problematic in patients who walk as it results in rotational malalignment of the lower limb in gait. Awareness of the problems and appropriate screening permits timely intervention. This may involve management of muscle tone or soft tissue procedures. In more advanced cases of hip displacement and deformity, femoral and pelvic osteotomies are usually required. The goals of treatment range from improving the efficiency of gait to prevention of severe postural problems and pain in the most severely affected.

Publication Type: Journal Article

Source: AMED

Title: Land-based versus pool-based exercise for people awaiting joint replacement surgery of the hip or knee: Results of a randomized controlled trial

Citation: Archives of Physical Medicine and Rehabilitation, March 2009, vol./is. 90/3(388-94), 0003-9993 (2009 Mar)

Author(s): Gill SD, McBurney H, Schulz DL

Language: English
Abstract: Objective: To compare the preoperative effects of multidimensional land-based and pool-based exercise programs for people awaiting joint replacement surgery of the hip or knee. Design: Randomized, single-blind, before-after trial. Setting: Physiotherapy gymnasium and hydrotherapy pool. Participants: Patients awaiting elective hip or knee joint replacement surgery. Interventions: Land-based (n=40) or pool-based exercise program (n=42). Each 6-week program included an education session, twice-weekly exercise classes, and an occupational therapy home assessment. Main Outcome Measures: Participants were assessed immediately before and after the 6-week intervention, then 8 weeks later, Primary outcomes were pain and self-reported function (Western Ontario and McMaster Universities Osteoarthritis Index) and patient global assessment. Secondary outcomes were performance-based measures (timed walk and chair stand) and psychosocial status (Medical Outcomes Study 36-Item Short-Form Health Survey mental component score). Pain was also measured before and after each exercise class on a 7-point verbal rating scale. Results: Although both interventions were effective in reducing pain and improving function, there were no postintervention differences between the groups for the primary and secondary outcomes. However, the pool-based group had less pain immediately after the exercise classes. Conclusions: While our multidimensional exercise-based interventions appeared to be effective in reducing disability in those awaiting joint replacement surgery of the hip or knee, there were no large differences in the postintervention effects of the interventions. However, pool-based exercise appeared to have a more favorable effect on pain immediately after the exercise classes.

Publication Type: Randomized Controlled Trial

Source: AMED

Title: Hip subluxation and dislocation in cerebral palsy - a prospective study on the effectiveness of postural management programmes.

Citation: Physiotherapy Research International, June 2009, vol./is. 14/2(116-27), 1358-2267;1358-2267 (2009 Jun)

Author(s): Pountney TE, Mandy A, Green E, Gard PR

Language: English

Abstract: BACKGROUND AND PURPOSE: Hip subluxation and dislocation are common sequelae in children with bilateral cerebral palsy and are currently managed by surgical interventions. This study aimed to investigate the effectiveness of early postural management programmes on hip subluxation and dislocation at five years, and the need for treatment in children with bilateral cerebral palsy, and to compare these findings with a historical control group.METHODS: A prospective cohort study followed 39 children who commenced using postural management equipment under 18 months of age. Levels of ability, type and amount of equipment use and treatments were recorded every three months. At 30 and 60 months, the hips were X-rayed and the hip migration percentage was measured. The results were compared with the historical control group.RESULTS: Children who used equipment at recommended and moderate levels had significantly less chance of both hips being subluxed than those using equipment at minimal levels (two-tailed Fisher’s exact chi(2) p = 0.024). The frequency of children with hip problems was significantly less in the intervention group in comparison to the historical control group at five years (chi(2) = 11.53, df = 2, p = 0.006). The frequency of children receiving bilateral or unilateral treatments, i.e. surgery, use of a hip and spinal orthosis and/or botulinum toxin injections, in the intervention group was significantly less compared to the historical control group (two-tailed Fisher’s exact p = 0.001).CONCLUSION: The early provision of postural management equipment has a role to play in reducing the number of hip problems and therefore the need for treatment of hip subluxation/dislocation in cerebral palsy at five years of age.

Publication Type: Controlled Clinical Trial, Journal Article, Research Support, Non-U.S. Gov't

Source: MEDLINE

Full Text:
Title: Postural control in patients with total hip replacement

Citation: Eur J Phys Rehabil Med, September 2009, vol./is. 45/3(327-33), 1973-9087 (2009 Sep)


Language: English

Publication Type: Journal Article

Source: AMED

Full Text: Available in fulltext at ProQuest (Legacy Platform)

Title: Hip displacement and quality of life in severe cerebral palsy

Citation: Developmental Medicine and Child Neurology, March 2010, vol./is. 52/(17), 0012-1622 (March 2010)

Author(s): Zarrinkalam R., Rice J., Russo R., Brook P.

Language: English

Abstract: Objective: Hip displacement (HD) is the second most common musculoskeletal deformity affecting children with Cerebral Palsy (CP). It may be associated with dislocation, painful arthritis and mobility and postural problems. The primary aim of this study was to investigate the relationship between HD in individuals with severe CP, and caregiver-reported pain symptoms associated with daily activity, mobility/posture and overall quality of life, as described in the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD). The secondary aims were to identify differences in these outcomes in comparing surgical and non-surgical management for HD. Design: In this cross-sectional study 25 participants (50 hips) from an eligible total of 57 non-ambulant children with CP [Gross Motor Functional Classification System, (GMFCS) levels IV and V], born between 1988 and 1998 were recruited from a state-based population register, and had a hip at risk based on their most recent hip radiograph. Method: Parents/caregivers completed the CPCHILD questionnaire. A blinded assessment of hip Migration Percentage (MP) and a morphological hip classification was made for each hip from plain anteroposterior hip radiographs. Statistical analysis included linear modeling and Pearson correlations. Results: Mean age was 14.96 years (SD=2.73), 68% were male; GMFCS level IV (28%) and V (72%). Neither Severity of HD nor GMFCS level had any significant effect on pain or quality of life (QOL). Significant positive correlation was found between mobility/posture and comfort (correlation=0.523, P=0.0073) but no significant correlation between mobility/posture and QOL (correlation= 0.31 and P=0.13). Surgery was found to have a significant effect on mobility/posture (P=0.025) but not comfort level (P=0.11) or QOL (P=0.64). Significant positive correlation was noted between QOL and comfort (correlation=0.712, P<0.001). Conclusion: QOL and pain scores are not affected by the severity of hip displacement or undertaking constructive hip surgery. Further evaluations in larger cohort-based populations are indicated to further describe the relevant factors leading to pain and lower QOL in these individuals.

Publication Type: Journal: Conference Abstract

Source: EMBASE
Abstract: Aims. The aim of this study was to investigate the balance of the standing position and the motor responses by means of dynamic posturography (DP) in patients affected by hip osteoarthritis and treated by total hip replacement (THR). Methods. Data obtained from THR patients were compared with those of control adult groups of age-matched subjects with normal hearing and no history of audiovestibular symptoms. The statistical tests used were paired and unpaired Student’s t-test. Significance was set for P<0.05. The study was carried out at the Department of Otorhinolaryngology and Department of Physiatrics and Rehabilitation of the A. Gemelli University Hospital of Rome (Italy). Twenty-three consecutive patients, without cochleo-vestibular or neurological pathologies (screened by accurate case-history), affected by hip osteoarthritis and treated by THR were enrolled. The main outcome measure were Sensory Organization Test (SOT), Motor control test (MCT) and Adaptation test (AT) obtained by means of Equi-Test Dynamic Posturography System by NeuroCom (Int. Inc., Clackamas, OR, USA). Results. When analyzing the SOT and MCT, no statistically significant differences were observed between patients and controls. In the AT, the sway energy score decreased in the course of the test in an up and down perturbation both in healthy and in THR patients. Conclusion. These data confirm a normal postural control and symmetrical responses in THR patients and confirm the absence of a detectable relationship between balance problems and fall risk. These results could be justified by an irrelevant role of intracapsular proprioceptors in maintaining balance. Moreover DP could be useful in osteo-articular diseases for understanding balance, evaluating surgical outcome and monitoring the rehabilitation program.

Map of Medicine
Map of Medicine is a collection of evidence-based, practice-informed care maps which connect all the knowledge and services around a clinical condition. The care maps can be customised to reflect local needs and practices by commissioners looking to devise new care pathways:

- Cerebral Palsy

NHS Evidence Highlights
Cerebral Palsy AND GMFCS AND Hydrotherapy/Postural Management
NHS Evidence is a NICE ran search engine which only searches NICE/NHS approved resources. A search has been undertaken and can be viewed by clicking here. It is recommended that you view this search.

Cerebral Palsy AND Hip Surgery AND GMFCS
NHS Evidence is a NICE ran search engine which only searches NICE/NHS approved resources. A search has been undertaken and can be viewed by clicking here. It is recommended that you view this search, and you can amend it by using NHS Evidence’s left hand menu.

Cerebral Palsy AND Hip Surgery AND General Rehabilitation/Therapy
NHS Evidence is a NICE ran search engine which only searches NICE/NHS approved resources. A search has been undertaken and can be viewed by clicking here. It is recommended that you view this search, and you can amend it by using NHS Evidence’s left hand menu. The most relevant results are listed below. Please click on the titles to view in full:

- A systematic review of the evidence for hip surveillance in children with cerebral palsy
  Source: Database of Abstracts of Reviews of Effects
  Publisher: Centre for Reviews and Dissemination
  Publication Date: 01 Sep 2008
  Publication Type: Systematic reviews
  Description:
  Bibliographic details

Status
This record is a structured abstract written by CRD reviewers. The original has met a set of quality criteria. Since September 1996 abstracts have been sent to authors for comment. Additional factual information is incorporated into the record. Noted as [A:.....].

CRD summary
This review found that hip surveillance based on widely available radiological methods can identify children with cerebral palsy who are most at risk of subluxation. Limitations in the review, especially the lack of detail about the included studies, make it difficult to comment on the reliability of these findings.

Indexing status
Subject indexing assigned by NLM
Index terms
Adolescent; Cerebral Palsy /complications /physiopathology; Child; Child, Preschool; Hip Dislocation /complications /diagnosis /surgery; Infant; Quadriplegia /complications; Research Design; Risk Factors; Walking /physiology

Muscle strengthening is not effective in children and adolescents with cerebral palsy: a systematic review

Source: Database of Abstracts of Reviews of Effects
Publisher: Centre for Reviews and Dissemination
Publication Date: 13 Apr 2011
Publication Type: Systematic reviews

Description:
Bibliographic details

Status
This record is a structured abstract produced by CRD. The original has met a set of quality criteria. Since September 1996 abstracts have been sent to authors for comment. Additional factual information is incorporated into the record. Noted as [A:.....].

CRD summary
This high-quality review found that strengthening interventions did not improve strength or activity and did not appear to increase spasticity in children with cerebral palsy. The review was limited by a relatively small number of studies. The possibility of studies being missed from the review means that the results should be interpreted with caution.

Indexing status
Subject indexing assigned by NLM
Index terms
Adolescent; Biofeedback (Psychology) /physiology; Cerebral Palsy /physiopathology /therapy; Child; Child, Preschool; Electric Stimulation Therapy; Female; Humans; Male; Muscle Strength /physiology; Physical Therapy Modalities; Resistance Training; Treatment Outcome; Young Adult

Effectiveness of static weight-bearing exercises in children with cerebral palsy

Source: Database of Abstracts of Reviews of Effects
Publisher: Centre for Reviews and Dissemination
Publication Date: 01 Dec 2008
Publication Type: Systematic reviews

Description:
Bibliographic details

Status
This record is a structured abstract written by CRD reviewers. The original has met a set of quality criteria. Since September 1996 abstracts have been sent to authors for comment. Additional factual information is incorporated into the record. Noted as [A:.....].

CRD summary
This review concluded that there was limited evidence in this area, but there were some positive effects of weight-bearing exercise in children with cerebral palsy. Methodological weaknesses in the review process, combined with small sample sizes, mean that these conclusions should be treated with caution.

Indexing status
Subject indexing assigned by NLM
Index terms
Cerebral Palsy /physiopathology /rehabilitation; Child; Exercise Therapy /methods; Humans; Treatment Outcome; Weight-Bearing

The effectiveness of passive stretching in children with cerebral palsy
Source: Database of Abstracts of Reviews of Effects
Publisher: Centre for Reviews and Dissemination
Publication Date: 30 Nov 2007
Publication Type: Systematic reviews
Description:
Bibliographic details
Status
This record is a structured abstract written by CRD reviewers. The original has met a set of quality criteria. Since September 1996 abstracts have been sent to authors for comment. Additional factual information is incorporated into the record. Noted as [A:....].

CRD summary
The authors concluded that there was limited evidence that manual stretching can increase range of motion, reduce spasticity and improve walking in children with cerebral palsy, and further research is required. Evidence for some outcomes was very limited and a more cautious conclusion might have been more appropriate.

Indexing status
Subject indexing assigned by NLM
Index terms
Cerebral Palsy /complications /physiopathology /rehabilitation; Child; Child, Preschool; Humans; Muscle Spasticity /etiology /rehabilitation; Physical Therapy Modalities; Range of Motion, Articular /physiology

Hip Surgery AND Hydrotherapy/Postural Management
NHS Evidence is a NICE ran search engine which only searches NICE/NHS approved resources. A search has been undertaken and can be viewed by clicking here. It is recommended that you view this search, and you can amend it by using NHS Evidence’s left hand menu. The most relevant results are listed below. Please click on the titles to view in full:

Efficacy of hydrotherapy in fibromyalgia syndrome: a meta-analysis of randomized controlled clinical trials
Source: Database of Abstracts of Reviews of Effects
Publisher: Centre for Reviews and Dissemination
Publication Date: 09 Jun 2010
Publication Type: Systematic reviews
Description:
Bibliographic details
Status
This record is a structured abstract produced by CRD. The original has met a set of quality criteria. Since September 1996 abstracts have been sent to authors for comment. Additional factual information is incorporated into the record. Noted as [A:....].

CRD summary
This review concluded that there was moderate evidence that hydrotherapy had short-term beneficial effects on pain and health-related quality of life in fibromyalgia syndrome patients. This was a generally well-conducted review
and the findings reflected the evidence, but as acknowledged by the authors the reliability of the pooled results may have been compromised by a paucity of good quality data.

Indexing status
Subject indexing assigned by NLM
Index terms
Balneology; Climatotherapy; Fibromyalgia /rehabilitation; Humans; Hydrotherapy /methods; Quality of Life; Randomized Controlled Trials as Topic /methods; Research Design; Treatment Outcome

Is hydrotherapy cost-effective? A randomised controlled trial of combined hydrotherapy programmes compared with physiotherapy land techniques in children with juvenile idiopathic arthritis

Source: Health Technology Assessment Database
Publisher: Centre for Reviews and Dissemination
Publication Date: 05 Oct 2005
Publication Type: Health technology assessments
Description:

Components of effective randomized controlled trials of hydrotherapy programs for fibromyalgia syndrome: a systematic review

Source: Database of Abstracts of Reviews of Effects
Publisher: Centre for Reviews and Dissemination
Publication Date: 09 Feb 2011
Publication Type: Systematic reviews
Description:

Hydrotherapy: review on the effectiveness of its application in physiotherapy and occupational therapy

Source: Health Technology Assessment Database
Publisher: Centre for Reviews and Dissemination
Publication Date: 06 Apr 2006
Publication Type: Health technology assessments
Description:
Bibliographic details

Status
This is a bibliographic record of a published health technology assessment. No evaluation of the quality of this assessment has been made for the HTA database.

Indexing status
Subject indexing assigned by CRD
Index terms
Hydrotherapy; Musculoskeletal Diseases /therapy

Trip Database Highlights
The TRIP Database is a clinical search tool designed to allow health professionals to rapidly identify the highest quality clinical evidence for clinical practice.

Cerebral Palsy AND Hip Surgery AND General Rehabilitation/Therapy
A search has been undertaken and can be viewed by clicking here. The most relevant links are listed below:
- A review of the efficacy of lower-limb orthoses used for cerebral palsy

Hip Surgery AND Hydrotherapy/Postural Management
A search has been undertaken and can be viewed by clicking here. The most relevant links are listed below:
- Effect of multiple physiotherapy sessions on functional outcomes in the initial postoperative period after primary total hip replacement: a randomized controlled trial
- Land-based versus pool-based exercise for people awaiting joint replacement surgery of the hip or knee: results of a randomized controlled trial

Google Advanced Search Highlights
Cerebral Palsy AND GMFCS AND Hydrotherapy/Postural Management
A search using Google’s advanced search functions has been undertaken and can be viewed by clicking here and by clicking here. It is recommended you have a look at this search, but the most relevant results are listed below:
- Guidance on good practice for 24hr postural management
- Muscle Strengthening in Cerebral Palsy
- To Assess the Effectiveness of Postural Management Programmes ...
- Patterns of postural deformity in non-ambulant people with cerebral ...
- Continuous postural management and the prevention of deformity in ...
- Postural Muscle Dyscoordination in Children With Cerebral Palsy
- Postural muscle dyscoordination in children with cerebral palsy ...
- Patterns of postural deformity in non-ambulant people with cerebral ...

Cerebral Palsy AND Hip Surgery AND GMFCS
A search using Google’s advanced search functions has been undertaken and can be viewed by clicking here and by clicking here. It is recommended you have a look at this search, but the most relevant results are listed below:
- Manchester Hip Surveillance Pathway for Children with Cerebral Palsy
- Cerebral Palsy - Clinical trial details - NHS Choices
- Muscle Strengthening in Cerebral Palsy
- Proximal femoral geometry in cerebral palsy : a population-based ...
- Neurogenic hip dislocation in cerebral palsy: quality of life and ...
- Characteristics of children with hip displacement in cerebral palsy ...
Cerebral Palsy AND Hip Surgery AND General Rehabilitation/Therapy
A search using Google’s advanced search functions has been undertaken and can be viewed by clicking here and by clicking here. It is recommended you have a look at this search, but the most relevant results are listed below:

- To Assess the Effectiveness of Postural Management Programmes ...
- Cerebral Palsy Hip Surgery Pathway Final Version – May 2007
- Treating complex movement disorders in children with cerebral palsy
- Neurogenic hip dislocation in cerebral palsy: quality of life and ...

Hip Surgery AND Hydrotherapy/Postural Management
A search using Google’s advanced search functions has been undertaken and they can be viewed by clicking here and clicking here. It is recommended you have a look at this search, but the most relevant results are listed below:

- Hydrotherapy Clients
- The effect of postural management on hip dislocation and spinal ...
- The private wing at Wrightington Hospital
- Physiotherapy for Children
- Night Time Postural Management