Research Article Summaries

1999-2009

NDTA™ is pleased to make the following research article summaries available as a NDTA™ Members-Only benefit. This bibliography was compiled and each article summarized in response to the many requests NDTA™ has received. It is the first report of research articles published by NDTA™ in over twenty years.

This bibliography includes summaries of articles from 1999-2009 identified through searches of on-line journal databases (such as PubMed) or NDTA™ member recommendations. Articles included in this bibliography are either experimental or quasi-experimental studies or systematic reviews with NDT as one of the treatments identified for study. All were published in English in a peer-reviewed journal. Each article was read in its entirety and then summarized for our members’ ease in identifying articles they may wish to read further for themselves.

It is important to note that all studies that met the criteria were included regardless of the quality of the research and that we have not provided any study critiques. We encourage the reader to carefully evaluate the contribution of each study to the research evidence on NDT based on analysis of such factors as the appropriateness of (a) the research design, (b) the control group, (c) those providing the NDT interventions, (d) the data analyses, and (e) the conclusions drawn by the researchers. All of the studies are relatively small and thus run the risk of not identifying a difference even when one exists. However, these small studies are a critical part of research development as they help determine the important questions and lay the groundwork for larger scale studies.

Those who wish to have more information about a specific study may access many of the original abstracts through PubMed free of charge. We have provided the PMID, the PubMed citation identifier number when available, to assist with this process.

Unfortunately, NDTA™ is not able to provide copies of the original articles because of copyright restrictions imposed by the journals. However, full length copies of articles may often be ordered for a fee through the library of local medical facilities and/or universities or colleges.

Our plan is to update the article summaries on an annual basis to keep this resource as useful as possible for our members. We hope that this resource is helpful to all NDTA™ members in seeking information on NDT-related research whether it be for self-study, graduate research, and/or clients and employers.

Marcia Stamer, NDTA Publications Committee Chair

Janet Powell, NDTA Research Committee Chair

July 15, 2010

The purpose of this study was to determine if ambulatory children with cerebral palsy (CP) could make changes in their gait toward normal parameters. A convenience sample of forty children enrolled as treatment participants in an 8-week NDT course was used. Pedographs were used to measure stride and step length, foot angle, base of support, cadence and velocity before and after twice-weekly treatments for six weeks. Treatment was individualized according to the principles of NDT with targeted functional outcomes. Results showed significant positive changes in stride and step length, foot angle and velocity. Improvements were also seen in base of support and cadence, but these results were not statistically significant. The authors noted the clinical value of low tech and low cost pedographs in measuring small changes in gait.


The purpose of this study was to examine the effect of Bobath therapy on the excitability of the spinal alpha motor neuron and on other measures of spasticity in adults post stroke. Ten patients who received ten, one-hour treatment sessions from therapists blinded to the purpose of the study were measured pre- and post treatment by electrophysiological response (H-reflex) of the ankle plantar flexors, original Ashworth scale (OAS), and passive and active ankle range of motion. There was no statistically significant effect of treatment on the excitability of the H-reflex on the hemiplegic side, but there was significant reduction of clinically assessed spasticity using the OAS and passive and active range of motion on the hemiplegic side. The authors offer conjectures for the discrepancy on outcome measures, suggesting that the Ashworth scale measures differing characteristics of spasticity and hypertonia than the H-reflex.


This article appraised systematic reviews of the effectiveness of various treatment interventions for children with cerebral palsy (CP). Twenty-one reviews were chosen using criteria from the Overview Quality Assessment Questionnaire. Six of these systematic reviews were judged as high methodological quality. Four systematic reviews of NDT were evaluated. Only one was judged as high quality (Brown & Burns, *British Journal of Occupational Therapy*, 2001). The systematic reviews by Butler & Darrah (*Dev Med Child Neurol*, 2001), Parette, Hendricks, & Rock (*Infants Young Child, 1991*), and Tirosh & Rabino (*Am J Dis Child, 1989*) were judged as low-quality systematic reviews. Brown and Burns’ review concluded, “the
current research...does not clearly demonstrate the efficacy or inefficacy of NDT as a treatment approach.” (p. 242). The authors of this appraisal of systematic reviews advise cautious interpretation of the findings of interventions for the heterogeneous condition of CP.


This study investigated the efficacy of an operationally defined NDT-based trunk co-activation protocol on the gross motor function of infants with posture and movement dysfunction. A licensed child life specialist compared outcomes to a group of infants who participated in a structured parent infant playgroup. Each group consisted of five infants (n=10). Infants were evaluated on the Gross Motor Function Measure (GMFM) by a reliable rater masked to group assignment. A repeated measures randomized block design was used. The researchers found that the fifteen day, ten hour total NDT-based treatment protocol significantly improved gross motor function compared to the infants in the play group. These skills were maintained in the three-week follow-up evaluation.


The aim of this study was to investigate the effectiveness of Bobath treatment alone or Bobath treatment in combination with electrical stimulation on plantar flexor spasticity in patients post stroke. Bobath therapy was restricted to inhibitory techniques called inhibitory reflex patterns by the authors. Neuromuscular electrical stimulation was applied to the tibialis anterior. Forty patients post stroke were recruited from one clinic and randomly assigned to either the Bobath therapy alone or Bobath therapy in combination with electrical stimulation. Each subject had the limb warmed before treatment. Measurements were taken daily by assessors blinded to group assignment and included the Modified Ashworth Scale, goniometric range of motion into dorsiflexion, dorsiflexion manual strength testing, and EMG measurement of the H-reflex of the hemiparetic leg. The authors state that the combination group showed lower ankle stiffness, higher range of motion and strength than the Bobath alone group. There were no differences in H-reflex amplitudes. The authors also state that effects were assessed immediately after treatment and no attempt was made to assess long-term effects. They also state that no functional measurements were taken and recommend this for future studies.

The purpose of this study was to compare treatment using the Adeli suit (AST) along with weight bearing and ambulation to neurodevelopmental treatment (NDT) for children with cerebral palsy. This small scale randomized controlled trial (n=24) found that both groups showed improvement in Gross Motor Function Measure-66 (GMFM-66) scores, which was sustained after nine months, greater than expected from maturation. There was no superior group between the two treatment approaches in skill acquisition or retention.


This systematic review of the effects of early intervention analyzed thirty-four studies of high-risk infants whose intervention focused on motor development prior to 18 months of age from the years 1966-2004. Twenty studies had level I evidence, although small sample size and large heterogeneity of degree and types of problems diminished the ability to generalize results and diminished statistical power. The evidence favoring early intervention was inconclusive, with no studies demonstrating the superiority of NDT over other interventions. The authors discuss the problems concerning the use of standardized outcome measures (such as the Bayley scales) that lack sensitivity in detecting small changes in development, the focus on comparing high-risk infants with age-equivalent scores, and the measurement of quantitative versus qualitative motor development changes.


This single-subject case study describes treatment and outcomes for a man with upper extremity (UE) function at grade 5 (severe involvement) assessed by the Motor Activity Log (MAL) and the graded Wolf Motor Function Test (gWMFT). He was also assessed with the UE portion of the Fugl-Meyer Motor Assessment (FMA), the Canadian Occupational Performance Measure and the modified Ashworth scale. The authors followed a protocol previously described for patients with Grade 5 function. Treatment was described in detail, including three weeks of constraint-induced movement therapy (CI therapy) combined with NDT. Measures on all tests and additional surveys were taken at baseline, three months, and one year. The patient made modest gains, retaining them for one year, on all tests. Most gains were made on the
Grade 5 MAL. The authors caution against generalizing outcomes to other patients and state they cannot separate the benefits of the combined treatments used.


This systematic review of the literature focused on management of upper limb dysfunction in children with cerebral palsy. Sixty papers were identified, with four of these randomized controlled trials and 44 prospective studies with objective outcome measures. Treatments included surgeries, pharmacotherapy, conductive education, constraint-induced therapy, splinting and casting, and physical and occupational therapy, including the use of NDT. With regards to NDT, this review cited two Law et al. studies (1991, 1997), which found NDT with casting at higher intensities of NDT treatment more effective than lower intensities and NDT with casts provided by occupational therapists more effective in older versus younger children. The review states that overall, the best evidence is for small treatment effects using occupational therapy and casting. The authors state that there is a paucity of randomized controlled trials for all treatments, requiring immediate action.


This systematic review of literature published in English after 1975 asks if NDT is an effective approach for pediatric clients, ages 0-18 years, diagnosed with neurological dysfunction. Several search strategies yielded 147 articles, of which the two authors selected 17 on the basis of inclusion of use of NDT as a treatment, report of clinical outcomes, and random group assignment. Twelve of seventeen studies had Level II evidence according to Sackett’s levels of evidence and four had Level I. The authors report, “evidence is still inconsistent, not definitive and unclear as to whether or not NDT is truly beneficial for paediatric clients diagnosed with, or at risk for, neurological dysfunction.” (p. 242) They conclude that, “at this time, [current research literature] does not clearly demonstrate the efficacy or inefficacy of NDT as a treatment approach.” (p. 242)


This state of the evidence report reviewed literature from 1956-2001 that reported a primary intervention of NDT with children with cerebral palsy (CP). Twenty-one research studies were reviewed and classified
according to levels of evidence. Fourteen of the twenty-one studies were coded as level one, i.e., definitive evidence. The authors concluded that there was no advantage in using NDT over other approaches. They also reported that there were substantial gaps in the evidence that must be clearly defined in future studies. They cautioned that the studies reviewed often had unclear population definitions, unclear treatment protocols and aims, and lacked reports of skill level of the therapists doing the intervention. The authors stated that an AACPDM review is not to be interpreted as a practice guideline and also cautioned that “absence of evidence of effectiveness in an evidence report should not be construed as proof that a treatment is not effective, rather, it may reflect areas in which more meaningful research is needed” (p. 778). See Antilla et al. for commentary on this systematic review and others.


The purpose of this study was to evaluate the effectiveness of functional electrical stimulation (FES) to subluxed shoulder joints post stroke. One hundred twenty patients who were post stroke and had shoulder subluxation (Grade II or III on the de Bats subluxation scale) were alternately assigned to a control group (n=60) or a group receiving FES (n=60). Both groups received conventional rehabilitation using the Bobath concept. Participants were assessed by pain reporting, range of motion, and radiographs of the affected shoulder at 6, 12, and 24 months. The FES group received five weeks of FES treatment (130 minutes/day the first week, with additional 10 minutes in weeks 2 and 3, and another 5 minutes added weeks 4 and 5). The amount and length of the Bobath treatment was not reported in this study. Results showed that the Bobath plus FES group had their maximum improvement in pain, subluxation, and movement at six months, with the control group making slower, but progressive improvement, reaching maximum effect at one year. Results were maintained at the two-year assessment.


The purpose of this study was to compare the outcome of forty patients chronic post-stroke using Bobath or gait trainer rehabilitation. This randomised, prospective study assigned patients to a control group that received twenty minutes of joint mobilization and twenty minutes of balance and gait training using the Bobath approach or an experimental group that received the same first twenty minutes treatment followed by twenty minutes on a gait trainer (REHA-STIM). Both groups received treatment for five weeks, five times a week. One assessor tested all patients and was blinded to group assignment. The Toulouse Motor Scale, Berg Balance Scale, Rivermead Motility Index, Fugl-Meyer Stroke Scale (lower limb and balance), Functional Ambulation Category, Barthel Index, 10 meter walk test and gait cycle parameters, Timed Up
and Go, 6 minute walking distance test, and step test were evaluated before and after treatment and at follow-up three months later. Both groups showed improvement in almost all tests with no statistically significant differences between groups.


The purpose of this study was to compare rehabilitation of patients with subacute stroke recovery using Bobath treatment alone or Bobath treatment with treadmill training. Fifty patients were randomly assigned to a group when they reached the rehabilitation phase of treatment. All patients received a total of thirty consecutive working days of 60 minutes of therapy each day. Walking velocity and capacity were the primary outcome measures, along with gross motor function measured using the Rivermead Motor Assessment. Groups were comparable at initial treatment. The group who received treadmill training plus Bobath treatment showed clinically significant improvements on walking velocity and capacity as compared to the Bobath only group. There was no difference between groups on gross motor functions, including gait quality and gait ability.


This randomized study compared two groups of patients post-stroke. Fifteen patients in each group received either Bobath therapy alone for 30 minute sessions for twenty consecutive work days or the same Bobath therapy plus an additional 30 minutes of robot-mediated therapy designed to move the hemiplegic shoulder and elbow slowly and with constant velocity and high repetitions. Outcome measures were the modified Ashworth scale of shoulder and elbow; the Fugl-Meyer scale, shoulder and elbow subsection; the Rivermead Motor Assessment- arm score; and the Functional Independence Measure (FIM™) self-care subsection. All outcome measure were performed by a therapist blinded to group assignment. The majority of outcomes improved for both groups, but the modified Ashworth scale for shoulder adductors and elbow flexors showed statistically significant change only in the group supplemented with robot-mediated therapy. The FIM™ self-care score started from a lower value and reached a better outcome in the control group.

The purpose of this study was to determine if maximal contraction of the quadriceps femoris muscle in children with spastic diplegic cerebral palsy (CP) increased spasticity. The authors state that the Bobaths believed this exercise would increase spasticity. NDT was defined in this study as based on reflex-hierarchy view of motor control with intervention aimed at preventing abnormal postures and excessive muscle co-contraction. The authors defined spasticity as velocity-dependent hyperexcitability of the muscle stretch reflex and measured limb movement before and after exercise with the pendulum test and EMG with surface electrodes. They found no increase in spasticity after exercise in twelve children with CP as compared to thirteen children without CP. The authors also noted that the Bobaths defined spasticity and hypertonus differently than in this study and noted that the children with CP did recruit the opposite lower extremity, upper extremities, trunk and facial muscles to assist with right quadriceps activity in a more pronounced way than subjects without CP.


The aim of this study was to compare patient outcomes post-stroke on health-related quality of life (HRQoL), depression, and shoulder pain. The study design involved twelve rehabilitation hospitals and was a prospective, non-randomized study. Rehabilitation using the Bobath approach was compared to a non-Bobath, task-oriented approach. No differences were found between groups on HRQoL or shoulder pain. After one year, fewer patients in the Bobath group (30%) than the non-Bobath group (43%) were depressed. Despite these findings, the authors concluded that, “The findings of this study, together with previous evidence, and taking the personal intensity and costs of BB [Bobath-based] therapy into account, shows that there is no place for this therapy in the stroke unit or in today’s healthcare.” (p. 631) The authors do not comment on the place and use of a task-oriented approach.


This prospective, non-randomised, parallel group design study aimed to compare the effect of treating stroke patients with the NDT approach versus a non-NDT approach during inpatient hospitalization of 25-26 days in the Netherlands. Patients (n=223) at hospitals where both nurses and physiotherapists used the NDT approach were compared to patients (n=101) treated at other hospitals with a non-NDT approach. The
primary outcome was “poor outcome” at 12 months post-stroke which they defined as Barthel index < 12 or death. At 12 months, the median Barthell index was 18 for the NDT group and 17 for the non-NDT group. Twenty-seven percent of the NDT group and 24% of the non-NDT group met the poor outcome criteria. Both before and after taking baseline age, living situation, education and modified Rankin scale, Barthel index, Mini-mental State Examination, and Center of Epidemiological Studies depression scale scores into account in the data analysis, the odds of the NDT group having a poor outcome were not significantly different from the odds for the non-NDT group. Despite the lack of statistical differences in the outcome for the two groups, the authors concluded that there “…seems to be little place for the NDT approach in the hospital treatment of patients with stroke.” (p. 792).


The purpose of this study was to investigate the effects of the Johnstone pressure splint (JPS) in combination with NDT in treatment of children with spastic diplegic cerebral palsy. The control group (n=17) received NDT alone and the treatment group (n=17) received NDT plus application of the JPS on elbow, knee, and/or ankle joints depending on the posture the child was working in. The children’s goniometric passive range of motion (ROM) was assessed in the lower extremities, spasticity was measured according to the Modified Ashworth Scale (MAS), and somatosensory evoked potentials (SEP) were performed on the posterior tibial nerve. Motor development was classified according to apedal, quadripedal, or bipedal. The rater was not blinded to group assignment. Treatment was five days per week for three months. Assessments were performed prior to treatment and after the three month treatment period. Both groups improved on all measures, but the treatment group was significantly higher for ROM in most lower extremity measurements and in the SEP values. The authors concluded that JPS in combination with NDT may effectively inhibit spasticity and abnormal movements as well as improving proprioceptive input in children with spastic diplegic cerebral palsy.


This pilot study investigated the effects of a six-week block of Bobath therapy for a convenience sample of fifteen children with cerebral palsy (CP) at the Bobath centers in England. Baseline measurements of these children showed representation of all five levels of functioning based on the Gross Motor Function Classification System. A repeated measures design assessed performance at six week intervals, and children acted as their own controls. Children improved significantly in gross motor and self-care skills, as measured by the Gross Motor Function Measure (GMFM) and the Pediatric Evaluation of Disability Index (PEDI),
with most improvements in areas of targeted goals. The authors concluded that the GMFM and PEDI complement each other because they measure different aspects of function.


This systematic review of randomized controls trials (RCTs) comparing the Bobath/NDT approach to other treatment approaches with adults post stroke found no evidence for the superiority of any approach. Sixteen studies met the authors’ rigorous criteria for RCTs, along with sufficient validity of the study and best evidence synthesis according to levels of evidence. The authors noted that there were methodological shortcomings and inappropriate randomization and blinding procedures in many of the studies reviewed. In addition, they noted that problems due to heterogeneity and variability of patient characteristics, outcome measures, and implementation strategies make statistical pooling of effect sizes unfeasible. No studies documented the clinical problem-solving process used by the Bobath therapists or the treatment strategies selected. The authors state that this is necessary, as the Bobath/NDT approach is defined as a clinical reasoning approach.


This double-blind study compared Bobath treatment and the Motor Relearning Programme (MRP) in two groups of adults with acute stage post-stoke hemiplegia. Patients were randomly assigned to the MRP group (n=33) or the Bobath group (n=28). Bobath treatment was defined as based on reflex-hierarchical theory while MRP was based on systems theory. The author compiled manuals from the literature about each approach to train physiotherapists for treatment. Patients were treated five days/ week for a minimum of forty minutes until hospital discharge. Patients were tested on the Motor Assessment Scale (MAS), the Sødring Motor Evaluation Scale (SMES), The Barthel ADL Index and the Nottingham Health Profile. Not all tests were done at the three test periods: (1) three days after admission, (2) two weeks thereafter, and (3) three months post stroke. Length of stay was significantly shorter for the MRP group with participants in this group slightly more independent at entry into the study. Patients in both groups showed significant improvements on the MAS and SMES, with the MRP group favored.

The authors assessed people post stroke who had participated in previous studies regarding type of physiotherapy during the acute stroke phase. Patients were assessed at one and four years post stroke on the Motor Assessment Scale, the Sødring Motor Evaluation Scale, the Barthel Index the Nottingham Health Profile, and the Berg Balance Scale. At one year post stroke, 15% of the MRP and 10% of the Bobath treated patients were receiving treatment. The percentage increased to 21%/31% at four years post stroke. Results indicated that patients lost functional independence progressively after initial stroke rehabilitation. Results also indicated no differences on these losses whether the initial approach was Bobath or Motor Relearning Programme (MRP).


The purpose of this case study was to describe the use of outcome measures on movement changes and gait changes in two adults post stroke. The author used the Motor Assessment Scale (MAS), the Motor Club Assessment (MCA), and the modified Ashworth scale to measure impairments before treatment and after conclusion of therapy (15 weeks for one patient, 19 weeks for the other). Three-dimensional computer assisted gait analysis was used to measure functional gait changes. Evaluation findings and treatment techniques based on the Bobath concept were detailed for both patients. The author was not the treating therapist. Positive changes in both movement patterns and walking occurred for both patients.


The purpose of this study was to describe experienced Bobath therapists’ main theoretical assumptions within the Bobath approach to treatment of patients with stroke and to note any departures from the Bobaths’ last writing about stoke in 1990. Eight peer-nominated therapists who had taken basic and advanced Bobath courses and with at least five years experience treating patients with stroke met in two focus groups for a two-hour session. Consensus was reached about three core concepts of defining Bobath: (1) analysis of normal movement, (2) control of tone, and (3) facilitation of movement. All agreed that recovery was based on neuroplasticity. When compared to the writings of the Bobaths in 1990, the study concluded that there have been changes or revisions in the approach in terminology and emphasis on the aspects of treatment.

This study investigated whether physiotherapy based on the Bobath concept changed kinetics and kinematics of gait, impairments, activity, and participation in nine patients post stroke. Therapy time and length were determined by experienced physiotherapists who took the Bobath three week adult hemiplegia course and advanced courses, and who had at least twelve years experience treating patients with stroke. There were no statistically significant changes in gait kinetics and kinematics for most measures, but there were significant changes in most impairment related measures (Motor Assessment Scale, Sodring Motor Evaluation Scale, and Step test). There were significant differences in activity level as measured by the Barthel Index and also the participation level as measured by the London Handicap Scores. The authors comment that perhaps it is time to stop asking which treatment approach works best and instead ask which combination of treatment techniques are most effective in gait training with people post stroke. They conclude that, “Further research comparing the different treatment strategies delivered within therapy programmes is required.” (p. 880).


The aim of this single-blind, randomized, controlled trial was to determine whether increasing the amount of physiotherapy soon after stroke resulted in improved recovery of arm function. Two hundred eighty-two patients were randomly assigned to one of three treatment groups. The Bobath approach, reflecting current British practice, was used in all three treatment groups, augmented by other approaches, but the intensity varied as did whether the two groups who received more intensive treatment were treated by a physiotherapist or a physiotherapist assistant. Qualifying patients were assessed at entry into the study on ten different measures. All patients showed improvement when assessed by an independent assessor blind to group assignment. The two groups with more intensive treatment (five weeks of 30-45 minute treatment sessions five times/week plus 10 additional hours) did not show any detectable benefits when tested. The authors note that heterogeneity of groups and severe levels of impairments of the majority of patients may have influenced results. They also note this study investigated functional outcome, whereas the strongest evidence of the effects of physiotherapy for stroke has been in measures of impairments.

This systematic review searched English language, peer-reviewed journal articles from 1966-2003 to determine the effectiveness of the Bobath concept on upper limb recovery after stroke. The authors reviewed 688 studies, of which eight met their inclusion criteria. Five of the eight were randomized controlled trials. The authors note the poor methodological quality of the studies in general. Issues included outcome measures without reported test-retest reliability, lack of consideration of external contextual factors such as the amount of Bobath training therapists received, variable treatment interventions under the encompassing term of Bobath therapy, and heterogeneity of the patients with stroke without stratification for their differences. The review found no evidence that Bobath therapy is more or less effective than other therapy approaches for upper limb rehabilitation following stroke.


This study compared the effects of robot-assisted movement training to NDT. This was a randomized controlled trial with a final follow-up at six months. Twenty-seven subjects received twenty-four one-hour sessions over a two-month period. Both groups were assessed by an occupational therapist blinded to group assignment. Assessments at one month, two months, and six months were performed using the upper-limb portion of the Fugl-Meyer, the Barthel Index, and the self-care and transfers sections of the FIM™. Strength and range of reach were assessed by computer measurement. Results showed statistically significant improvements in both groups, with the robot-assisted group showing statistically significant greater gains at two months when compared with the NDT group on the Fugl-Meyer, but no differences between groups at six months. The robot-assisted group also made larger gains at six months on the FIM™, which the authors state could be due to the ability to use compensatory movements on this test. The authors offer evidence supporting further research into robot-assisted movement therapy.


The purpose of this field-based investigation was to compare the effects of NDT and developmental service (DevS) model of normally sequenced motor milestones on the development of motor of children with Down syndrome and cerebral palsy. The authors explain that Down syndrome is an example of motor delay without grossly atypical movements, whereas cerebral palsy is a motor problem with substantial impairment
of control of movement. Five sites using the DevS model and four using NDT with 50 children (mean age at onset of study = 14 months) participating were followed. All NDT intervention was provided by NDT trained physical therapists, while the DevS interventions were provided by early interventionists or physical therapists who were not NDT trained. The Bayley Scale of Mental Development and the Peabody Developmental Motor Scales were administered by trained research assistants prior to the study interventions and one year later (average intervention sessions in the year = 40). An adapted version of the toddler Infant Motor Evaluation (TIME) was administered to rate quality of movement. Results indicated that both groups made the same rate of development changes on the norm-referenced tests (Bayley and Peabody) and on the TIME. The authors emphasize that having a specialized service provider (i.e., PT with NDT training) was no more effective than having an early interventionist provide services when gains were measured with these norm-referenced tests. The authors recommend that future studies evaluate the effectiveness of functional skill attainment and skill training.


This double-blind randomized controlled pilot study looked at sitting symmetry in people in acute inpatient post-stroke rehabilitation. There were ten participants in each of four groups: (1) control with standard rehab that did not include specific symmetry training in sitting, (2) visual feedback using the Balance Performance Monitor (BPM), (3) Bobath approach, and (4) task-related reach without feedback of performance. All participants were measured for ability to distribute weight symmetrically using the BPM on a daily basis during the two week, 30 minute per day treatments sessions and two weeks and twelve weeks post-treatment. The Barthel Index showed the superiority of the BPM group at the beginning of treatment, but no differences among groups at discharge, which was usually at about two weeks. After two weeks, the Bobath group made the most significant changes. At twelve weeks, the BPM group had the highest percentage of participants who could distribute weight symmetrically. The BPM was used in all groups to measure sitting symmetry. The authors note the following limitations of their study: (a) small size of groups, (b) more subjects in Bobath group who initially could not stand independently (the study also looked at transfer of sitting symmetry to standing symmetry), (c) the initial superiority of the BPM group on the Barthel Index, and (d) the familiarity of the BPM group with the testing equipment used to measure all groups. Of interest was the observation that in right or left hemiplegia with initial distribution of weight to the non-paretic side, responses to any treatment was significant, whereas in left hemiplegia with initial distribution of weight toward the paretic side, the majority did not respond significantly.

This review of fifteen studies (6 randomized controlled trials, 6 non-randomized controlled trials, and 3 case study series) examined the available evidence of NDT effectiveness versus other treatments. The authors concluded that there was no evidence supporting the effectiveness of NDT as the optimal treatment for adults with post-stroke hemiplegia nor is there evidence of non-efficacy.


This case report of two children with cerebral palsy with subluxed or dislocated hip(s) showed reduction of hip migration percentage after treatment: (1) with a custom molded sitting plaster cast designed to maintain pelvic and lower extremity alignment, support head and trunk weakness and reduce the femoral head in the acetabular cavity through hip abduction and (2) with postural management using NDT treatment twice per week. While the plaster cast is described in detail, the NDT treatment is mentioned as an active postural management program without further definition or description.


The aim of this single-blind, multicentre randomized controlled trial was to compare treatment length and type of intervention with 60 patients with arm impairment in the sub-acute phase after stroke. All groups were pre- and post-tested on the arm motor section of the Fugl-Meyer test, showing scores between 5 and 34 on the pretest. All groups received four weeks of standard rehabilitation treatment. Two of the three groups received an additional four weeks of twenty treatments lasting 45 minutes each. One group received therapy based on the Bobath approach, which was applied by experienced therapists using a study manual written by a Bobath instructor. The other augmented therapy group received a new, highly standardized training system called Arm BASIS, developed by the second author. The results showed all groups showed improvement, but neither augmented treatment group showed statistically significant gain in scores on the Fugl-Meyer compared to any other group. The Arm BASIS group, however, showed higher gains than the Bobath group on motor control. This gain did not transfer to arm function, and the authors note that there were no long term effects differences measured among groups.

The aim of this study was to record and characterize the motor cortex maps of patients after stroke on focal transcranial magnetic stimulation (fTMS) over a four-week period and to investigate whether any of these changes and motor recovery were dependent on the type and intensity of motor training. Twenty-eight patients were randomly assigned to three groups (standard rehabilitation, n=12, standard rehabilitation plus 20 additional sessions using Bobath therapy, n=5, and standard rehabilitation plus 20 additional sessions using an impairment-oriented arm rehabilitation called Arm BASIS, n=11). All patients were assessed on the arm motor section of the Fugl-Meyer test before and after the four-week intervention with a rater blinded to type of intervention. All received fTMS before and after treatment. Two experienced therapists provided with a training manual written by a senior Bobath instructor treated the patients in the Bobath therapy group. The Arm BASIS group received specific, repetitive impairment-oriented therapy program. All groups improved, but the Arm BASIS group improved 72% over baseline, while the no-intensified group improved 36% and the Bobath group 37%. to say this was written by the instructor—I’m assuming it’s the same manual as in the study above.


This systematic review aimed to determine whether there was a difference in global dependency and functional independence in patients with stroke depending on the therapeutic approach that was used. Of 8408 potentially relevant trials, 14 met the authors’ criteria for review. There was no approach, including the Bobath approach, which was shown to be advantageous over another in promoting recovery of disability following stroke. There was evidence that mixed approaches may be more effective than no treatment or placebo in the recovery of functional independence in this population. The authors comment that there is considerable debate regarding the current content of interventions based on the Bobath concept.


The purpose of this study was to promote verbal communication in children with cerebral palsy who had severe dysarthria and were within the typical limits of cognitive development. The four-year long prospective study followed ten children with athetoid, spastic, or ataxic cerebral palsy. All fell within the 50-80 percentile rank of the Peabody Picture Vocabulary Test prior to treatment in mainstreamed
preschools. The first author administered a Questionnaire for Dysarthria, which included items on oral praxies, respiratory control, phonation and voice characteristics, articulation, intelligibility of speech, and prosody characteristics using a four-level ordinal coding scheme. Following intervention, a spectrographic analysis was made of one sentence containing all the vocalic phonemes and consonants representative of Castillan Spanish. NDT was used throughout the four-year treatment period of 30 minutes, twice weekly, for eleven months each year. Oral praxies were targeted the first two years and found to be of limited success. The second approach focused on sensitivity and mobility of the articulatory organs, food mastication, and expiratory control. The authors concluded that the second approach, combined with NDT, was useful and that it was possible to assist young children with severe dysarthria from cerebral palsy to produce functional speech.


This case report details an eleven-session, 45 minutes per session treatment sequence over a three week period for a 78-year-old woman with hypertension, chronic stasis ulcers, chronic pulmonary disease, and hyponatremia who had a 30° thoracic kyphosis with her best attempt at upright standing at her rollator walker. Her initial Berg Balance Scale (BBS) score was 40/56. The author used techniques (well described in article) developed by NDT instructor Isabelle Bohmann as a manual for treatment of scapular position and upper extremity weight bearing after lack of success with other treatment. Results were standing kyphosis of 10°and improvement of the BBS score to 48/56.


The purpose of this study was to determine if babies born with extremely low weight (< 100 grams) who received occupational therapy based on sensory integration (SI) and the Bobath approach showed differences in neurological function at age four years as compared to those who did not receive these specific treatment approaches. There were sixty-three children in each of the two groups, who were assigned in a prospective case-controlled study. Children diagnosed with cerebral palsy or mental retardation were removed from the study. The Miller Assessment of Preschoolers (MAP) was used to measure effects. Babies in the SI/Bobath group were all treated by the same occupational therapist. The results did not show differences between groups on neurological development at age four using the MAP.

This purpose of this study was to determine whether neurodevelopmental treatment (NDT) and bilateral isokinetic training (BIT) increased spontaneous hand use and movement patterns in children with hemiplegia. The single-case time-series design was used with three children on an ABAC or ACAB design with B=NDT and C=BIT. Children were treated for a total of eight weeks, four times per week. Both NDT and BIT treatment session strategies were described in detail. Outcomes were assessed from videos by two raters who were blinded to the treatment phase. Results showed no changes in the way the children used their affected hand during NDT intervention, although in some cases the baseline performance was too high for improvements to be possible. With BIT, some generalizations and transfer of training effects were evident in two of the three children on some tasks.


The purposes of this single-subject study were twofold: (1) to evaluate the treatment effectiveness of physical therapy using the Bobath concept on two patients with multiple sclerosis (MS) who were in remission and (2) to evaluate the sensitivity to change on eight tests of impairment or function. Using an ABAA design, both patients showed improvements that were retained through the late follow-up measures. The Berg Balance Scale (BBS) and the Rivermead Visual Gait Assessment (RVGA) showed the greatest sensitivity to changes. One patient showed statistically significant changes on the BBS, and both showed clinical improvement on the RVGA.


This article presents a biomechanical analysis of four types of upper extremity slings often used to support the affected arm in adults post stroke. Two types of over-the-shoulder slings, the Bobath axial roll, and a wheelchair lapboard were analyzed. The authors note that both over-the-shoulder slings limit passive and active range of motion and may introduce excessive forces at the affected or unaffected shoulder, depending on how the sling is designed. Depending on how straps are adjusted, the forces on the affected shoulder may be beneficial or detrimental. The Bobath axial roll is noted to potentially reduce subluxation, considered a possible source of pain. A roll made too large may exert excessive lateral forces on the shoulder joint. The wheelchair lapboard distributes pressure well from elbow to wrist, but only if the patient is well aligned and stays well aligned. The author notes that these analyses do not take into account the
variety of materials supports may be made of or the amount of neuromuscular resistance or compliance that
varies with each person. Rather, it is an attempt at understanding the forces involved and the consequences
of using thee type of slings.

palsy: A systematic review. Clinical Rehabilitation, 18, 1-14. PMID: 14763715

This systematic review set out to determine if occupational therapy (OT) interventions improve outcomes
for children with cerebral palsy (CP). Seventeen studies were reviewed; seven were randomized controlled
trials. Case studies were not reviewed. Studies sometimes, but not always, included NDT as one treatment
approach. The authors conclude that they are unable to support or refute the efficacy of OT for children
with CP due to insufficient evidence. Small sample size, heterogeneity of subjects studied, and the
possibility of outcome measures that are insensitive to change may contribute to the findings, according to
the authors.

abilities for people with poststroke cognitive deficits. Physical Therapy, 85, 1020-1033. PMID: 16180951

The purpose of this study was to determine whether motor abilities in people post stroke who also sustained
cognitive impairments would improve more using a problem-oriented willed-movement (POWM) therapy
approach, which includes treatment of cognitive, perceptual, and motor dysfunction simultaneously, as
compared to NDT, which was defined as treatment to address postural tone, reflexes and reactions, and
movement patterns. Subjects in the study (n=47) were evaluated on the Mini-Mental State Examination and
the Stroke Rehabilitation Assessment of Movement and randomly assigned to the POWM or NDT group for
eight weeks of treatment, 5 to 6 times per week for 50 minute sessions. The primary investigator trained all
therapists in either of the two approaches to treatment. Results indicated significant improvements in
mobility for the POWM group versus the NDT group, except for upper extremity mobility. The authors
advise therapists to address perceptual and cognitive functions together with motor function in treatment.

neurodevelopmental treatment in gross motor function of children with cerebral palsy. Developmental
Medicine and Child Neurology, 46, 740-745. PMID:

The purpose of this study was to evaluate the efficacy of NDT on the gross motor function of children with
spastic cerebral palsy (CP) and to investigate the effect of intensity of NDT over a 16-week period. Thirty-
four children with Gross Motor Functional Classification System (GMFCS) Levels I-III were randomly
assigned to two groups after being matched for GMFCS level, age, sex, and spasticity distribution. The children in Group A received NDT treatment by an NDT trained therapist with at least ten years experience twice weekly for 50-minute sessions, and the children in Group B received NDT with the same skill level therapists five times a week for 50-minute sessions. An assessor blind to group assignment and treatment frequency scored each child on the Gross Motor Function Measure-66 (GMFM-66). Both groups showed statistically significant improvements in GMFM-66 scores, with Group B (i.e., the more intensive treatment protocol) scores significantly greater than Group A scores. The authors state that results support the efficacy of NDT with children with spastic CP and the need for its intensive application.


This purpose of this study was to compare the effects of sensory integrative (SI) therapy alone, SI with vestibular stimulation, and NDT treatments on children, ages 7-10, with Down syndrome. Forty-five children were assigned in order of admittance to a clinic to an experimental group. Subtests of the Ayres Southern California Sensory Integration Test (SCSIT) were used to assess sensory integration problems. Additional vestibular testing, a timed pegboard test, and walking speed times were also assessed. Treatment activities for each group were outlined in the study. All groups made statistically significant changes, but only in the specific areas treated, i.e. the SI alone group did not make significant changes in the vestibular system or walking subtests. The NDT group showed significant differences in all subtests. The authors conclude that all three approaches were effective and suggest that best practice include combining all three approaches.


This study compared Bobath based treatment to movement science based treatment outlined by Carr and Shepherd. The authors used blocked randomisation of 120 patients who were admitted to a rehabilitation stroke ward. Assessment was primarily with the Rivermead Motor Assessment and the Motor Assessment Scale. One assessor, blind to group assignment, assessed each subject initially and at one, three and six months after group allocation. Treatment continued as long as needed by each participant to reflect usual hospital practice. Treatment length was a median of 23 minutes treatment per weekday. There were no significant differences between the groups for any of the outcome measures.
This study investigated the similarities and differences between the Bobath treatment approach and a movement science based approach through systematic observation. Scheduled treatments for patients with stroke were assigned numbers, then chosen randomly for observation by four therapists, two familiar with each approach. Therapists scored physical and communication categories of treatment. These observations were tested for inter- and intra-rater reliability. Observations were judged as reliable in recording treatment content and differences between the two approaches were noted. The authors used these content descriptions to define Bobath and movement sciences approaches for their 2005 randomised controlled study comparing the effectiveness of the approaches.

The authors compared the outcomes of stroke patients after four weeks of physical therapy with forty-four patients randomly assigned to receive Bobath therapy or orthopedic therapy. Two levels of patients were studied in each group, i.e., one group (n=21) with Brunnstrom stage 2 and 3 recovery and one group (n=23) with stage 4 and 5 recovery. The Motor Assessment Scale, Berg Balance Scale, and Stroke Impact Scale were used to measure impairment and functional limitation level before and after the four week treatment period. All patients in both groups improved, but more patients in both levels in Bobath group demonstrated clinically meaningful change than did the patients in both groups receiving orthopedic treatment.

The purpose of this study was to investigate the effects of short-term electrical stimulation in conjunction with NDT exercises on sensory and functional recovery of the upper limb in patients with acute stroke. Thirty-six patients were assigned to a transcutaneous electrical nerve stimulation (TENS) group or to a control group in rank order. The control group received one hour of physical therapy each day for ten days with a therapist who used Bobath therapy. The second group received the same treatment plus an additional hour of TENS of the extensor digitorum communis and extensor carpi radialis. Proprioception, hand function, and hand movements were tested on non-standardized tests. Both groups showed considerable improvement in proprioception and hand movement, but there was no significant difference between
groups. The authors recommend studying reliability, validity, and sensitivity of their tests. They note the small sample size and short duration of treatment as limitations.