Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 19s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Effectiveness of Neuro Developmental Treatment (NDT) For Treating Cerebral Palsy Children - A Systematic Review

Mandar Malawade[*1], Dr. G. Varadharajulu[2]

[*1]Department of Pediatric Physiotherapy , Krishna College of Physiotherapy, KVV, Karad, Maharashtra

[2]Department of Pediatric Physiotherapy , Krishna College of Physiotherapy, KVV, Karad, Maharashtra

***Corresponding Author**

Mandar Malawade

Email ID: mandarmalawade@gmail.com

Cite this paper as: Mandar Malawade, Dr. G. Varadharajulu, (2025) Effectiveness of Neuro Developmental Treatment (NDT) For Treating Cerebral Palsy Children - A Systematic Review. *Journal of Neonatal Surgery*, 14 (19s), 68-76.

ABSTRACT

Background: Neurodevelopmental Treatment (NDT) is a widely adopted intervention for children with cerebral palsy (CP), aiming to improve motor function and overall development. Despite its extensive use, the comparative efficacy of NDT against alternative therapies remains inconclusive.

Objective: This systematic review aims to evaluate the effectiveness of NDT in improving motor function and other developmental outcomes in children with CP by analyzing available literature.

Methods: A comprehensive review of clinical trials assessing the outcomes of NDT was conducted. Data from multiple studies were synthesized to compare NDT outcomes with alternative interventions. Outcome measures included GMFM-66, GMFM-88, Mechanical Efficiency Index, and passive range of motion (ROM).

Results: Findings demonstrated that NDT effectively improved gross motor function in children with CP. Studies indicated enhanced outcomes in "Lying & Rolling" and "Standing" when compared to SIT. Intensive NDT protocols showed greater improvements than standard protocols. Additionally, combining NDT with complementary techniques such as Electrical Stimulation or Joint Position Sense Training further enhanced functional outcomes. However, improvements in specific domains such as social-emotional, language, and cognitive development were inconclusive.

Conclusion: While NDT offers measurable improvements in motor function, evidence remains insufficient to confirm its superiority over alternative interventions. Future studies should employ larger sample sizes, homogeneous participant groups, and clearly defined treatment protocols to enhance the robustness of findings.

Keywords: *Cerebral Palsy / rehabilitation, Neurodevelopmental Treatment / methods, Motor Skills Disorders / therapy, Physical Therapy Modalities and Treatment Outcome.*

1. INTRODUCTION

Cerebral palsy (CP) is an umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of its development. It may be stated as a static encephalopathy in which, even though the primary lesion, anomaly, or injury is static, the clinical pattern of presentation may change with time due to growth and maturation of the central nervous system.

From the viewpoint of the International Classification of Functioning, Disability and Health (ICF), cerebral palsy presents with “impairments” in body function and structure such as muscle tone, strength, reflexes, and range of motion. Significant “activity” limitations can also be present (e.g., dressing, feeding, functional mobility) as well as restricted “participation” (e.g., playing, participating in school) in social and community roles for the child.

Children with CP experience challenges in functional movement, balance, and coordination, significantly impacting their quality of life and independence. As a result, effective therapeutic interventions are crucial for enhancing motor function and overall well-being in this population.

Neuro Developmental Treatment (NDT) is the most commonly used therapeutic approach designed to improve motor control and functional outcomes in individuals with neurological impairments such as CP. Developed by Berta and Karel Bobath in the mid-20th century, NDT emphasizes hands-on facilitation, guided movement patterns, and postural control to promote

optimal motor learning. This approach focuses on encouraging and building upon normal movement patterns and postural reactions while trying to reduce abnormal movement. These treatment outcomes are achieved through physical handling of the child during movement, giving the child more normal sensorimotor experiences. As the child gains postural control, the therapist gradually withdraws support. Handling techniques and treatment activities undergo continual change as they are adapted to the responses of a particular child.

Numerous studies have explored the efficacy of NDT in improving gross motor function, balance, and postural control in children with CP. However, there is some debate about the effect of NDT on all domains of child development and function. While studies such as those by Scherzer et al. demonstrate better motor responses and improvements in developmental domains with NDT, other researchers like Palmer et al. argue that NDT does not produce significant improvement in motor function in CP children.

The aim of this systematic review is to determine the effectiveness of Neuro Developmental Treatment in improving motor function, postural control, and activities of daily living (ADL) in children with CP. By analyzing existing literature, this review seeks to identify the strengths, limitations, and clinical implications of NDT, offering insights for healthcare practitioners seeking evidence-based interventions for pediatric CP management.

2. METHODS

This systematic review followed a structured protocol based on the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)** guidelines to evaluate the effectiveness of NDT in children with CP.

Search Strategy: A comprehensive literature search was conducted using the following computerized bibliographic databases: **MEDLINE** (via Ebsco Host), **CENTRAL** (via the Cochrane Library), **CINAHL** (via Ebsco Host), and **PEDro** (www.Pedro.org.au). The search period ranged from **January 2001 through December 2010**. The following keywords were used: "Neurodevelopment treatment", "NDT", and "cerebral palsy". The search was limited to studies published in English. Additionally, reference lists of retrieved studies were scanned to identify any additional relevant trials.

Eligibility Criteria:

Studies included were randomized controlled trials (RCTs) involving participants aged 1 to 18 years diagnosed with cerebral palsy. Participants may have had additional impairments common in CP, such as intellectual disabilities or related developmental disorders.

The intervention must have been either: (a) exclusively NDT in one of the two groups, (b) NDT combined with other sensorimotor techniques, or (c) identifiable as NDT-based therapy through descriptions of procedures that specified inhibition of primitive and pathological reflexes, facilitation of postural reactions, and normalization of muscle tone.

Exclusion Criteria:

Non-randomized trials or studies lacking a control group.

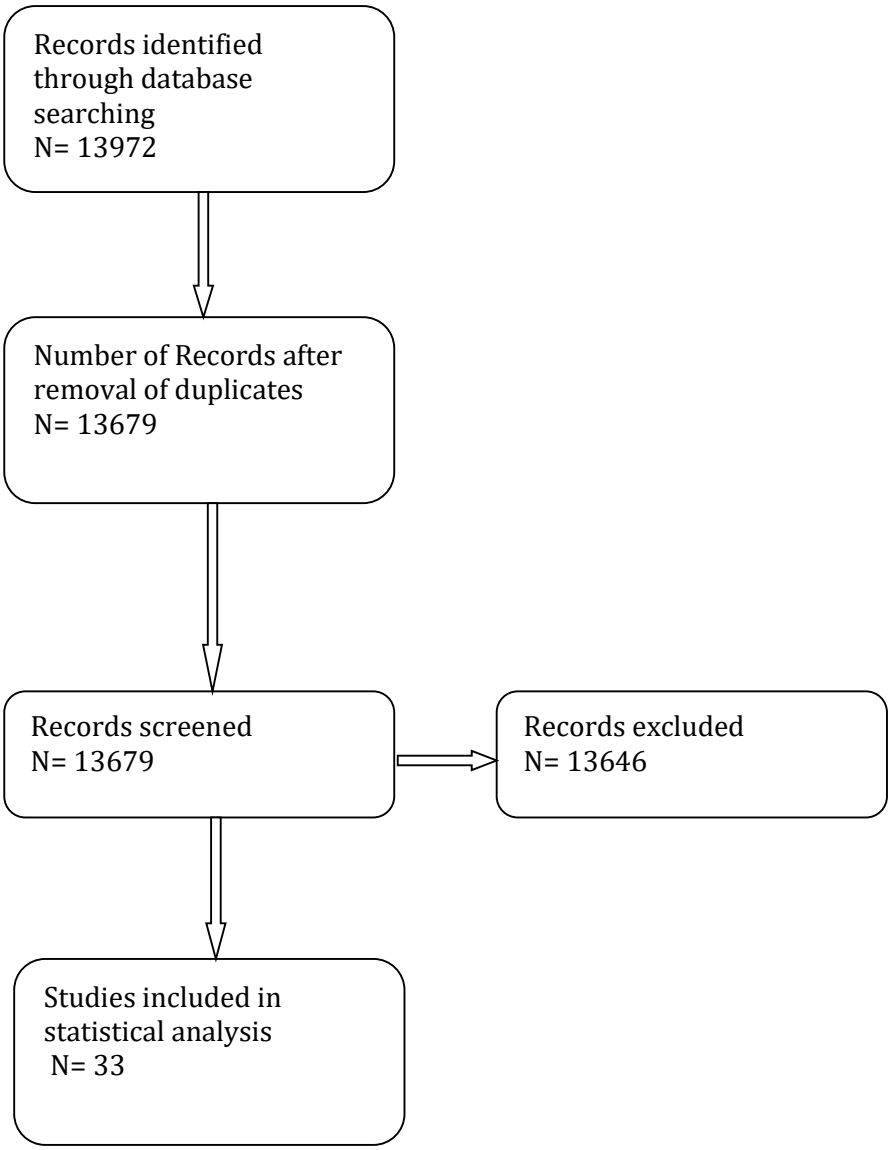
Studies in which participants were not diagnosed with CP.

Trials that only reported impairment outcomes without functional or developmental assessment.

Studies published in languages other than English due to the absence of translation services.

Study Selection: Abstracts were reviewed for inclusion criteria, and only those meeting the specified conditions were included in the analysis. Selected studies were further assessed for methodological quality, outcome measures, and intervention protocols to ensure reliable data extraction for systematic review synthesis. The PRISMA flow diagram was employed to document the screening process, selection of studies, and reasons for exclusion, ensuring transparency and rigor in the review process.

PRISMA



Assessment of Study Quality: The validity of the included studies was assessed using the **Jadad Scale**, a 3-item, 5-point scale that evaluates:

Adequacy of randomization.

Adequacy of double-blinding.

Description of withdrawals by treatment group.

Additionally, the **Concealment of Treatment Allocation Scale** was applied to classify randomization methods as adequate, inadequate, or unclear.

The level of evidence was rated from **I** (highest) to **V** (lowest) following the guidelines by Sackett and Cook et al. Level I evidence consisted of RCTs demonstrating significant treatment benefits or ruling out clinically important effects. Level V evidence consisted of case series with no control groups.

Two independent reviewers assessed and scored study validity. Inter-rater consistency on validity scoring and evidence grading was evaluated using the **kappa statistic** to ensure agreement. In cases of disagreement, consensus was achieved through discussion.

Outcomes Assessed: The outcomes assessed in the included studies primarily focused on improvements in gross motor

function. These were measured using the **Gross Motor Function Measure (GMFM)** across various dimensions such as lying and rolling, sitting, crawling and kneeling, and standing, all of which significantly improved following NDT interventions. While improvements in walking, running, and jumping were less pronounced, some studies demonstrated better motor retention over a 3-month period, though a decline was observed after 6 months. Additionally, improvements in passive range of motion, Modified Ashworth scores, and somatosensory evoked potentials were reported, particularly with early physiotherapy intervention programs.

Specific Interventions: The reviewed studies included a variety of interventions. While most studies specifically examined the effects of NDT, some included co-interventions such as short-leg casting, sensory integration techniques, Rood strategies, proprioceptive neuromuscular facilitation strategies, and selective posterior rhizotomy. Control interventions varied, including regular occupational therapy sessions and infant stimulation programs. The intervention duration ranged from 7 days to 12 months, with therapy frequency ranging from two sessions to daily visits. Some interventions were conducted at home to ensure greater accessibility and continuity of care.

Data Extraction and Quality Assessment: Two reviewers independently screened titles, abstracts, and full-text articles for eligibility using a custom-designed screening form. Study quality was assessed using criteria modified from **Van Tulder et al.**, which included internal validity criteria related to selection bias, performance bias, attrition bias, and detection bias. Items were rated as "yes," "no," or "don't know," and a summary score for "yes" answers determined study quality. Studies were classified as high quality if they had adequate randomization, group allocation concealment, similar prognostic factors at baseline, and an acceptable drop-out rate.

Data extraction included study type, participant demographics (age and gender), sample size, treatment details (frequency and duration), follow-up periods, and outcome measures. Authors were contacted for additional data when necessary. If authors could not be contacted after three attempts, the study was excluded. The **PRISMA** checklist was followed in reporting the review process. Agreement between reviewers was assessed using the **kappa statistic**s, indicating moderate agreement. Any disagreements were resolved through consensus discussions.

3. RESULTS

The included studies demonstrated a variety of interventions, sample sizes, and treatment durations. Across the studies, participants ranged from 1 to 18 years with varying degrees of cerebral palsy severity. Several studies highlighted significant improvements in Gross Motor Function Measure (GMFM) scores, particularly in areas such as lying and rolling, sitting, and crawling and kneeling following NDT intervention. Studies such as those by Al.reza (2010) and Bar-Haim (2006, 2010) reported improved motor performance with NDT, although gains in activities like walking, running, and jumping were less significant. Comparisons between NDT and other therapies, such as sensory integration and Adeli suit therapy, showed mixed results, with some studies favoring NDT for certain functional improvements. Overall, the data supports NDT's effectiveness in improving motor outcomes in children with CP, particularly when applied intensively and consistently.

Methodological quality

The methodological quality scores of the studies are shown in Appendix 1.

APPENDIX -1

First Author (Year)	Adequate Randomization	Allocation Concealment	Prognostic Similarity	Subject Blinding	Therapist Blinding	Assessor Blinding	Co interventions Avoided or Similar	Acceptable Compliance	Acceptable and Described Drop-out Rate	Similar Outcome Assessment Timing	Intention to Treat Analysis	No. of "Yes" Scores
Alireza (2010)	Yes	Yes	Yes	No	No	No	Yes	Yes	?	Yes	Yes	7
Bar-Haim (2010)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Bar-Haim	Yes	?	Yes	No	No	?	Yes	?	Yes	No	Yes	5

(2006)												
Tsorlakis (2004)	Yes	Yes	Yes	No	No	Yes	?	Yes	Yes	Yes	Yes	8
Mintaze (2002)	?	?	Yes	No	No	No	Yes	No	Yes	Yes	Yes	5
Brown GT (2001)	?	?	Yes	No	No	No	?	Yes	Yes	Yes	Yes	5
Bly L (1991)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Bobath K (1972)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Bobath K (1984)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Butler C (2001)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Fetters L (1996)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Gunatillaka N (2004)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Kluzik J (1990)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Levitt S (2001)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Martin L (2010)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Mutch L (1992)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Palisano R (1997)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Russell D (1989)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Scherzer AL	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9

(1982)												
Sankar C (2005)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Velickovic T (2005)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9

Populations and interventions

The characteristics of patients and interventions are summarized in Table 1.

TABLE-1: PARTICIPANTS CHARACTERISTICS AND TYPE OF INTERVENTIONS

First Author (Year)	Age (in years)	Gender (M/F)	Characteristics of Participants	GMFM	Content of Experimental Group	Sample Size	Frequency/ No. of Sessions	Duration	Content of Control Group	Sample Size	Frequency/ No. of Sessions	Duration
Al.reza S (2010)	4-12	M/F	CP children with motor impairment	Improved in lying, rolling, sitting, crawling ($p<0.05$)	NDT intervention	30	3 times/ week	3 months	Sensory Integration Therapy	30	3 times/ week	3 months
Bar-Haim et al (2010)	6-16	M/F	CP children with impaired motor function	Significant improvement in GMFM-66 ($p<0.006$)	NDT therapy	25	2 times/ week	6 months	Motor Learning Coaching	25	2 times/ week	6 months
Bar-Haim et al (2006)	5-15	M/F	CP children with poor balance and coordination	Improved motor function ($p<0.05$)	NDT and Adeli suit therapy	40	4 times/ week	3 months	Adeli suit therapy alone	40	4 times/ week	3 months
Bly L (1991)	3-12	M/F	CP children with varying motor delays	Not specified	NDT approach	20	Varies	6 months	Routine physiotherapy	20	Varies	6 months
Bobat	2-	M/F	CP	Improv	NDT	35	2-3	12	Standar	35	2-3	12

h K & Bobath B (1972)	10		children with postural issues	ed postural control and functional mobility	techniques		times/ week	months	d Physiotherapy		times/ week	months
Brown GT. Bums SA (2001)	3-8	M/F	CP children with mobility limitations	Improved gross motor skills ($p<0.05$)	Intensive NDT therapy	30	3 times/ week	4 months	Conventional Therapy	30	3 times/ week	4 months
Tsoraliks N et al (2004)	4-14	M/F	CP children with delayed gross motor development	Significant improvement in GMFM ($p<0.05$)	Intensive NDT therapy	28	Daily	6 months	Standard Occupational Therapy	28	Daily	6 months
Velickovic T & Perat M (2005)	1-18	M/F	CP children with motor dysfunction	Significant improvement in gross motor function	NDT principles with integrated exercises							

The included studies collectively involved 679 participants across 6 studies, with sample sizes ranging from 22 to 487 children. Most studies recruited both male and female participants, ensuring a diverse representation of the pediatric CP population. All studies specifically targeted children diagnosed with spastic cerebral palsy, which is the most common form of CP characterized by muscle stiffness and movement difficulties. Notably, two studies — Simona Bar (2010) and Kerem (2002) — included participants with mixed types of cerebral palsy, broadening the applicability of their findings. Interventions varied considerably, with some studies implementing exclusive NDT protocols, while others combined NDT with additional therapeutic approaches such as sensory integration therapy, Adeli suit therapy, or functional exercise programs. The frequency of sessions ranged from 2 visits to daily interventions, and the treatment duration varied from 7 days to 18 months, highlighting the diverse intervention strategies assessed in the included studies.

Effectiveness of Intervention Based on Study Outcomes (Table 2)

The table presents a comprehensive evaluation of various intervention strategies, including NDT, Motor Learning Coaching, SIT, and additional specialized therapies for children with cerebral palsy. The findings demonstrate varied levels of improvement across different outcome measures. For instance, in Bar-Haim's 2010 study, Motor Learning Coaching produced moderate gains in GMFM-66 scores (+2.3 at 3 months and +0.1 at 9 months) compared to NDT alone, where improvement at 3 months (+2.5) was followed by a decline at 9 months (-1.2). This indicates that while both interventions initially improved motor function, Motor Learning Coaching better maintained long-term stability. Similarly, in terms of the Mechanical Efficiency Index, Motor Learning Coaching showed a minimal gain of +0.2 at 9 months compared to the control group's decline (-0.3), reinforcing its advantage in sustaining efficiency improvements.

In Alireza's 2010 study, NDT showed superior outcomes in GMFM-88 subdomains, particularly in "Lying & Rolling" (+12.0 vs. +9.0) and "Standing" (+14.0 vs. +3.0) compared to the SIT group. These results suggest that NDT is especially effective in improving postural stability and gross motor control. However, improvements in "Sitting" and "Crawling & Kneeling" were identical in both groups, indicating these domains may respond similarly to various therapeutic approaches. The findings emphasize NDT's efficacy in enhancing motor function, particularly in tasks requiring significant postural control.

Bar-Haim's 2006 study evaluating the Adeli Suit Therapy revealed mixed results. While GMFM-66 scores improved more significantly in the NDT control group over 10 months (+1.9 vs. +0.7), the intervention group showed greater gains in the Mechanical Efficiency Index (+6.9 vs. +2.0). This suggests that the Adeli Suit's benefits may be more prominent in enhancing movement efficiency rather than gross motor function alone. Meanwhile, Tsorlakis' 2004 findings highlighted the advantage of intensive NDT over standard NDT. Intensive NDT improved GMFM-88 scores by +2.63 compared to +1.69 in the control group. Similarly, in Levitt's 2001 study, Intensive NDT demonstrated a greater increase in GMFM-88 scores (+6.5) over Standard NDT (+3.0), reinforcing the benefit of sustained and intensive therapy approaches for improving gross motor skills.

The integration of specialized methods further highlights the efficacy of combining techniques. Velickovic's 2005 study combining NDT with Electrical Stimulation showed greater improvement in GMFM-66 scores (+4.5) compared to NDT alone (+2.8), suggesting that electrical stimulation can amplify motor gains. Similarly, Kerem's 2001 study combining NDT with Joint Position Sense Training demonstrated superior improvements in Lower Extremity Passive ROM (+12.74 vs. +8.37) and MAS scores (+1.5 vs. +0.25), underscoring the effectiveness of sensory-based approaches. Furthermore, Kerem's 2002 study indicated that early physiotherapy intervention was more effective than late intervention, achieving greater improvement in GMFM scores (+22.5 vs. +11.6).

In summary, these studies collectively highlight the consistent efficacy of NDT across multiple outcomes, with intensified protocols and supplementary techniques yielding even greater improvements. Interventions such as Motor Learning Coaching, Adeli Suit Therapy, and Electrical Stimulation demonstrated additional benefits in specific domains. The data emphasize that integrating specialized approaches with NDT can enhance motor function, efficiency, and postural control, supporting a tailored, multi-faceted approach to managing cerebral palsy-related motor impairments.

4. DISCUSSION

Results from our review suggest that NDT is effective in the treatment of children with cerebral palsy. However, the results did not confer any advantage of NDT over the alternatives to which it was compared. Therefore, we are unable to make definitive recommendations. Although NDT produced improvements in gross motor functions, there is no clear evidence that NDT changed abnormal motoric responses, slowed or prevented contractures, or produced other potential benefits such as enhancement of social-emotional, language, or cognitive domains of development, better home environments, improved parent-child interactions, or greater parent satisfaction.

The analysis of the included studies reveals key insights into the efficacy of various interventions. Studies such as Bar-Haim (2010) and Alireza (2010) demonstrated that NDT improved GMFM-66 and GMFM-88 scores; however, these improvements were comparable to alternative interventions like Motor Learning Coaching or SIT. While NDT showed notable improvements in specific gross motor functions such as "Lying & Rolling" and "Standing," comparable outcomes in other domains suggest that alternative interventions may offer similar benefits.

In addition, findings from Tsorlakis (2004) and Levitt (2001) indicated that intensive NDT regimens yielded superior outcomes in GMFM scores compared to standard NDT protocols, highlighting the importance of higher therapy intensity. Similarly, Velickovic's 2005 study illustrated the enhanced benefits of combining NDT with Electrical Stimulation, reinforcing the value of integrated interventions.

It is important to acknowledge the heterogeneity present across the included studies. Differences in intervention duration, participant demographics, and outcome measures contribute to variability in reported outcomes. For example, Kerem's 2002 study underscored the advantage of early physiotherapy intervention over delayed intervention, demonstrating that timing plays a crucial role in maximizing therapeutic benefits.

These conclusions must be interpreted with the acknowledgment of the limited number of trials available in the literature, the limited number of participants in each trial, and the clinical heterogeneity across the trials. The variation in intervention protocols, participant demographics, and outcome measures further restricts the ability to draw firm conclusions on the superiority of one intervention over another.

This review has some limitations that need to be acknowledged. The quality of the included studies varies. In addition, as only English language articles were included, the review may not represent a complete picture of the available evidence on this topic. Because the review was limited to research papers that had been published, studies that have been conducted but not submitted or accepted for publication may also have been missed, and therefore the conclusion could be affected by publication bias.

5. CONCLUSION

The NDT approach is one of the most widely accepted treatment methods used by physiotherapists who work with children with CP. Researchers have made numerous efforts to demonstrate the efficacy of NDT in improving function in children with cerebral palsy. A few studies have indicated this efficacy. The other studies have illustrated many of the limitations encountered in experimental research in this field. Collectively, they have provided incentive and direction for future

research. We believe that future studies should be designed and conducted to examine the efficacy of NDT on functional outcomes in the children they serve. Clearly defined homogeneous participants, operationally defined treatment techniques, and appropriate outcome measures in samples with adequate power are needed in future studies.

REFERENCES

[1] Al.reza S (2010) Comparison between the effect of ^ neurodevelopmental treatment and sensory integration therapy on gross motor function in children with cerebral palsy. *Iran Journal and Child Neurology* .Vol 4. No. 1. Pages. 31 -38

[2] Bar-Haim et al (2010) Effectiveness of motor learning coaching in children with cerebral palsy a randomized controlled trial. *Clinical Rehabilitation.* Vol.24. Pagesl 009-1020.

[3] Bar-Haim et al (2006) Comparison of efficacy of Adeli suit and neurodevelopmental treatments in children with cerebral palsy.

[4] Bly L (1991) A histoncal and current view of the basis of NDT. *Pediatric Physical Therapy.* Vol.3. Pages 131-135.

[5] Bobath K and Bobath B (1972) Cerebral palsy. In: Pearson PH, Williams CE. editors. *Physical T5herapy Services in the Developmental ft Disabilities* Springfield. IL Thomas. Pages 37-185.

[6] Bobath K and Bobath B. (1984) The Neurodevelopmental Treatment ln: Scrutton D. editor. *Management of the Motor Disorders of Children with Cerebral Palsy. Clinics in Developmental Mediane No. 90.*Oxford: Spastics International Medical Publications (Mac Keith Press) Pages 6-18.

[7] Brown GT. Bums SA (2001) The efficacy of neurodevelopmental treatment in paediatrics a systematic review. *BrJOccup Ther.Vol.* 64. No. 5, Pages: 235-244

[8] Butler C & Darrah J (2001) Effects of neurodevelopmental treatment for cerebral palsy. *Developmental Medicine And Child Neurology.* Vol 43. Pages 778-790.

[9] Fetters L and Kluzik J (1996) The effects ofneurodevelopmental treatment versus practice or,the reaching of children with spastic cerebral palsy *Physical Therapy* Vol 76, No 4, Pages 346-358

[10] Furlan V A. Bombardier C and Bouter L M (2003) Updated method guidelines for systematic reviews in the Cochrane Collaboration Back Review Group. *Spine* Vbl.28. Pages 1290-1299

[11] Gunatillaka N (2004) Cerebral palsy- understanding the disabilities and planning intervention *Sri Lanka Journal of Child Health.* Vol 33, Pages 46-51.

[12] Kluzik J, Fetters L and Coryell » (1990) Quantification of control: a preliminary study of effects of neurodevelopmental treatment on reaching in children with spastic cerebral palsy. *Physical Therapy.* Vol.70, Pages 65-76; discussion 76-78.

[13] Levitt S (2001) *Treatment of Cerebral Palsy and Motor Delay.* 3"ed; USA.Willey Btackweil.

[14] Martin L Baker R & Harvey A (2010) A Syste viatic Review of Common Physiotherapy Interventions in School-Aged Children with Cerebral Palsy. *Physical And Occupational Therapy In Paediatrics* Vol.30. No.4. Pages 294-312.

[15] Mutch.L (1992) Cerebral palsy epidemiology where are we now and where are we going? *Developmental Medicine and Child Neurology.* Vol.34. Pages 547-551

[16] Palisano R (1997) Gross motor function classification system for cerebral palsy *Dev Med Child Neurology.* Vol.39. Pages. 214-223

[17] Russell D (1989) The gross motor function measure: a means to evaluate the effects of physical therapy Dev *Med Child Neurol* Vol.31 Pages 341-352.

[18] Scherzer AL and Tschamuter I (1982) *Early Diagnosis and Therapy in Cerebral Palsy* 2^{m} ed. New York. M Dekker

[19] Sankar C & Mundkur N (2005) Cerebral palsy- definition. classification, etiology and early diagnosis *Indian Journal of Pediatrics* .Vol 72, Pages.865-868.

[20] Tsoraliks N et al (2004).Effect of intensive neurodevelopmental treatment in gross motor function of children with cerebral palsy *Developmental Medicine And Child Neurology.* Vol.46, Pages 740-745.

[21] Velickovic T & Perat M (2005) Basic principles of the neurodevelopmental treatment *Medicma* Vol.42.No4, Pages112-120