Effect of Neurodevelopmental Therapy in Gross Motor Function of Children with Cerebral Palsy

*Senthilkumar C.B, **Deepa B, ***Ramadoss
KMPT Student, **Assistant Professor, ***Head and Professor,
Department of Paediatric Physiotherapy, PSG Hospitals, Coimbato

Abstract

Background: Neurodevelopmentaltherapy (NDT) refers to those activities that enable the child to practice the perfect skills. These types of exercises are used to improve movement and postural reactions; thereby it improves gross motor function in children with cerebral palsy. The specific objective of the study is to evaluate the effect of NDT in gross motor function of children with cerebral palsy.

Methods: This study is a one group pre test post test design. 10 children with cerebral palsy were selected and assigned in one group. Pretest value of gross motor function was measured on first day of the NDT program. NDT was given three sessions a week, for three months. At the end of the NDT program, posttest gross motor function was measured.

Major Findings: A mean improvement in gross motor function after NDT was 10.84 with SD of 6.84 and the t value of 5.012 was observed in this study. The obtained t value was significant at the level of $p<0.001$.

Introduction

Cerebral palsy is defined as "a disorder of movement and posture due to a defect or nonprogressive lesion of the immature brain" (Bax M C O, 1964).

"Cerebral palsy describes a group of disorders of the development of movement and posture, causing activity limitation that is attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behaviour, and/or by a seizure disorder" (Martin Bax, 2005).

Cerebral palsy lesion is non progressive and causes variable impairment of the co-ordination of muscle action, with resulting inability of the child to maintain normal postures and perform normal movements (Martin C O Bax, 1980).

Cerebral palsy is classified clinically in terms of the part of the body involved likely monoplegia, hemiplegia, diplegia, quadriplegia and by the clinical perceptions of tone and involuntary movement like spastic, ataxic, athetoid (Robert B. Shepherd, 1995).

The heterogeneous spectrum of clinical syndromes characterized by alteration in muscle tone, deep tendon reflexes, primitive reflexes, and postural reactions (Blasco PA, 1994).

The range of gross motor skill outcomes for specific types of cerebral palsy with the gross motor function classification system (GMFCS) is a better indicator of gross motor functional impairment than the traditional categorization of cerebral palsy that specifies the number of limbs with neurologic impairment (Betty R. Vohr et al, 2005).

Among the scales available for assessing gross motor function in paediatric population, the gross motor functional measure scale is a useful and reliable instrument for assessing motor function and treatment outcome in cerebral palsy (Nordmark E, Hagglund G, Jarnlo GB, 1997).

Lack of isolated or discrete movements and fine motor coordination are delayed in younger able – bodied children as well as in older children with spastic type of cerebral palsy (Sophie levitt, 2004).

Neurodevelopmental / Bobath therapy (NDT)

Reprint Requests: Dr. Senthilkumar C. B.
MPT (Pediatric Neurology)
Department of Physiotherapy
Lovely Professional University, Phagwara
Punjab, Mob No: (0)9988361696
E-mail: cbsenthilkumar1981@gmail.com

was developed by Dr.Karel Bobath and Mrs.Berta Bobath as a "living concept". The NDT approach is not a set of techniques but more an understanding of the developmental process of motor control and the motor components which make up functional motor tasks. (Davis S, 1997).

Large diameter firm ball made of heavy rubber and provide mobile surface that aid in facilitating postural control and postural preparation of the child. The direction in which ball moved and the position of the child on ball can be varied to facilitate movement (Jane Styer Acevedo, 1992).

Methods

Study design

One group pre test post test design – A quasi experimental design.

A group of subjects was selected and a pre test for the gross motor function measures were taken. After that the children would undergo NDT program. After 3 months following NDT post test values for the gross motor function measures were taken. The values before and after the intervention were compared.

Study setting

The study was conducted in the Department of Pediatric rehabilitation, P.S.G.Hospitals an 810 bedded multi specialty health care system, P.S.G.Urban health centre, Ramakrishna mission vidhyalaya (IHRDC), coimbatore among the children with cerebral palsy for experimental group.

Poulation and sampling

The totality or aggregate of all individuals with the specified characteristic is known as population. Sampling refers to the choosing of a sample from a population.

In this study sample children were selected from the cerebral palsy population of Department of Paediatric Physiotherapy, P.S.G.Hospitals, P.S.G.Urban health centre, Ramakrishna mission vidyalaya (IHRDC), coimbatore. Sampling method used is sampling free technique.

Criteria for sample selection

Inclusive criteria

Age 1 year to 8 years.

Spastic cerebral palsy.

Children with monoplegic, hemiplegic, diplegic, quadriplegic types of cerebral palsy. .

Gross motor function classification system levels I, II and III.

Exclusive criteria

Children with contractures and deformities.

Severe mental retardation.

Uncontrolled epilepsy.

Instrument and Too for date collection

The gross motor function measure scale is a disease specific measure for child, consisting of 88 items in five domains (lying & rolling, sitting, crawling & kneeling, standing, walking running & jumping). It scores from 0 to 3 for each item. Total score is calculated by percentile of dimensional score.

Technique of date collection

In this study, the selected subjects were evaluated for gross motor function measure during the first visit. Following the first assessment the patients were administered NDT program (Annexure 5) which aims at improving gross motor function.

After 3 month follow up, assessments were taken at the end of 3 months after the first visit. The treatment duration for a child was 3 session per week into 3 months. The measures of gross motor function were compared before and after the administration of NDT program.

Technique of data analysis and interpretation

Data collected were analyzed using paired't' test to measure the changes between the pre and post test values within the group.

Data analysis and interpretation

Ten children received NDT was assessed with gross motor function measure scale before and after 3 months of treatment. The data are presented in the table and mean, standard deviation and t test were calculated.

In this study 4 female, 6 male children participated and age ranged from 1 to 8 years.

Data interpretation

Paired't' test was used to analyze the significant difference between the mean of the pre test values and mean of the post test values to determine the

outcome of the NDT program given after a period of 3 months. The statistical analysis was done for the measures collected by gross motor function measure scale.

From the Table 1, Graph 1and 2 it is inferred that there was gradual improvement in the gross motor function covered by the children after the NDT program. On analyzing the pre test and the post test values by paired 't' test, there is significant mean difference of 10.84 with Standard Deviation of 6.84 and the t value of 5.012 at $p<0.001$.

Results and discussion

The study aims to evaluate the effect of NDT program on the children with cerebral palsy. Among the 10 selected subjects 4 are female and 6 are male children.

The selected outcome measures are gross motor function measure scores. Data are collected at the baseline and 3 months after NDT program. The obtained data is analyzed by using the paired't' test.

Results shows that there is significant improvement in the gross motor function capacity as the calculated t value (5.012) for the gross motor function measure is in the table value at $p<0.001$.

The overall score of the gross motor function measure scale also shows similar trends of improvements. This indicates the change in gross motor function of children after NDT program.

Evidence shows that large number of cerebral palsy children experience gross motor function impairments due to the abnormal movement and postural reactions. This abnormal movement and postural pattern is referred as motor dysfunction. We also know that there are effective interventions for these abnormal movement and postural reactions.

NDT aimed at correcting the abnormality of movement and posture pattern in children with cerebral palsy is being advocated. Effect of such an intervention on health related motor functional capacity is being evaluated in the study. With the obtained results, it is evident that health related gross motor functional capacity is significantly improved.

The gross motor functional measure test is a simple yet an effective measure of gross motor functional capacity. It has been shown that even a unit in cerebral palsy gross motor function is clinically significant.

A significant improvement in gross motor function capacity of cerebral palsy children is evident after 3 months of NDT program in this study.

Improvements in gross motor function measures noticed in this study may be due to the reason that NDT program would have helped to reduce the disease symptoms and thereby improving the gross motor functional status in children with cerebral palsy.

Limitations

Small number of participants

Other activities in school, family and therapy schedule were not controlled.

Recommendations

Based on the outcome of the statistical analysis, it is suggested that the future studies can be modified to accommodate the following changes

To use same form of treatment for other types of cerebral palsy.

Other forms of motor function scales can be used for assessment.

EMG can be used for assessment.

Possible neural mechanism can be studied after NDT.

This study can be done for children with mental retardation also.

Summary and conclusion

Based on the analysis of data it can be interpreted that NDT produces significant improvement. In correlating with literature and statistical analysis, this study concludes that NDT has produced significant improvement in gross motor function in children with Cerebral palsy.

It is evident that such an intervention is effective and it helps in reducing disease symptoms and improves the general functional well being among these children with cerebral palsy.

In the future, further studies regarding NDT program will definitely strengthen growing body of knowledge. Therefore, from the literature available and statistical analysis of the data, it

accepted and stated as, "There is significant effect of neurodevelopmentaltherapy in gross motor function of children with cerebral palsy".

References

1. Abel MF, Damiano DL, CP Motor Study Group. Relationship among musculoskeletal impairments and functional health status in ambulatory cerebral palsy. J Pediat Orthop 2003:23: 535–541.

2. Bayley N. The Bayley Scales of lnfant Development. New York, the Psychological Corporation; 1969.

3. Beate Carriere, The Swiss Ball, First edition, Germany, Springer-Verlag Berlin Heidelberg, 1998:321-325.

4. Beckung E, Hagberg G. Correlation between ICIDH handicap code and Gross Motor Function Classification System in children with cerebral palsy. Dev Med Child Neurology 2000: 42: 669–673.

5. BK Mahajan. Methods in Biostatistics. 6th Ed. New Delhi: Jaypee Broth; 2004.

6. Boyce M'F', Gowland C, Rosenbaum PL, et al. Measuring quality of movement in cerebral palsy: a review. Phys There. 1991:813-819.

7. Boyce WF et al. The Gross Motor Performance Measure: validity and responsiveness of disease measure of quality of movement. Phys There 1995: 75: 603–613.

8. C.R. Kothari. Research Methodology – Methods and Techniques. 2nd Ed. New Delhi: New Age International (P) Ltd; 2004.

9. Damiano DL, Abel MF. Relation of gait analysis to gross motor function in cerebral palsy. Dev Med Child Neurology 1996: 38: 389–396.

10. Dennis J Matthews, Cerebral palsy, Pediatric Rehabilitation, Third Edition, Philadelphia, Hanley & Belfus.

11. Girolami GL. Evaluating the Effectiveness of a Neurodevelopmental Training Program to Improve Motor Control of High-Risk Preterm Infants. Chapel H111, NC: University of North Carolina at Chapel Hill; 1987.Master's thesis.

12. Haley SM, Coster WJ, Ludlow LH, et al. Pediatric Evaluation of Disability Inventory: Development, Standardization, and Administration Manual. Bopton, Mass: New England Medical Hospitals; 1992.

13. Harris SR. Early intervention: does developmental therapy make Coronary Heart Disease difference Topics in Ear 4 Childhood Education. 1988; 7:20-32.

14. Jane Styer –Acevedo, Physical therapy for the child with cerebral palsy, Pediatric Physical Therapy, Third Edition, Philadelphia, Lippincott Williams and Wilkins, 1992:107 – 162.

15. Lois Bly, Baby Treatment, first edition, USA, Therapy Skill Builders, 1999, 185-192.

16. Martin Bax et al, Proposed definition and classification of cerebral palsy, Developmental Medicine & Child Neurology August 2005,47:571-576.

17. Morris C, Galuppi BE, Rosenbaum PL, Reliability of family report for the Gross Motor Function Classification System.2004 July, 46(7): 455-460.

18. Morris C. (2002) A review of the efficacy of lower limb orthoses used for cerebral palsy. Dev Med Child Neurology 2002:44: 205–211.

19. Nancy Burns and Susan K. Grove. The practice of Nursing research conduct critique and utilization. 5th Ed. Pennsylvania: Elsevier; 2005.

20. Nordmark E, Hagglund G, Jarnlo GB. Reliability of the Gross Motor Function Measure in cerebral palsy. Scand J Rehabilitation Med 1997: 29: 25–28.

21. Nordmark E, Jarnlo GB, Hagglund G. Comparison of the Gross Motor Function Measure and Paediatric Evaluation of Disability Inventory in assessing motor function in children undergoing selective dorsal rhizotomy. Dev Med Child Neurology. 2000:42:245–252.

22. Palisano R, Campbell S, Harris S. Clinical decision-making in pediatric physical therapy. In: Campbell SK, Vander Linden DW, Palisano RJ, editors. Physical Therapy for Children: Philadelphia: WB Saunders. 1994:P183–185.

23. Palisano RJ et al. Validation of a model of gross motor function for children with cerebral palsy. Phys There 2000: 80: 974–985.

24. Palisano RJ, Rosenbaum PL, Walter S, et al. Development and reliability of a system to classify gross motor function in children with cerebral palsy. Dev Med Child Neurology. 1997:39:214-223.

25. Rosenbaum PL, Walter SD, Hanna SE, Palisano RJ, Russell DJ, Raina P, Wood E, Bartlett DJ, Galuppi BE. Prognosis for gross motor function in cerebral palsy: creation of motor development curves. JAMA 2002: 288: 1357–1363.

26. Russell DJ, Avery LM, Rosenbaum PL, Raina PS, Walter SD, Palisano RJ. Improved scaling of the Gross Motor Function Measure for children with cerebral palsy. Phys There 2000:80: 873–885.

27. Russell DJ, Rosenbaum PL, Avery LM, Lane M. Gross Motor Function Measure (GMFM-66 & GMFM-88) User's Manual. Clinics in Developmental Medicine No. 159. London: Mac Keith Press 2002.

28. Sandra J.Olney et al, Cerebral palsy, Physical therapy for Children, second edition, Philadelphia, W.B.Saunders Company, Suzann K.Campbell, 2000.

29. Stern FM, Gorga D. Neurodevelopmental treatment (NDT): therapeutic intervention and its efficacy. Infants and Young Children. 1988; l: 22-32. Inc; 1954:335-373.

30. Susan B.O'Sullivan, Strategies to improve motor control and motor learning, Physical rehabilitation, Fourth edition, New Delhi, Jaypee Brothers, 2001.

31. Wood E, Rosenbaum P. The Gross Motor Function Classification System for cerebral palsy: a study of reliability and stability over time. Dev Med Child Neurology 2000:42: 292–296.

32. World Health Organization ICF: International Classification of Functioning, Disability and Health. Geneva, WHO; 2001.

Table 1: Gross Motor Function Measure Sclae (N = 10)

S NO	PRETEST	POSTTEST	DIFFERENCE(d)
1	32.34	54.55	22.21
2	30.48	42.11	11.63
3	83.08	93.02	09.94
4	71.16	86.10	14.94
5	14.94	15.00	00.06
6	35.25	35.40	00.15
7	47.57	56.58	09.01
8	71.75	86.65	14.90
9	66.33	81.89	15.56
10	64.15	74.13	09.98
	Mean=10.84	S.D=6.84	t value=5.012

FIGURE1: GROSS MOTOR FUNCTION MEASURE (GMFM-88)