RESEARCH ARTICLE

Therapeutic efficacy of neurodevelopmental technique versus conventional physiotherapy for the management of 3-8 years old cerebral palsy

Karthikeyan T*

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It is non-progressive neurological disorder mainly affecting human loco motor system the term refereed to Cerebral palsy. Cerebral palsy is not genetic or hereditary and parents do not need to worry about the condition being passed down within a family. The objective of study is to compare the motor abilities and self-care skills before and after in NDT approach group with conventional physical therapy group. The method of data collection is 30 CP children who is recruited for this study. The Type of study pre-test to post experiment design and duration of study is 8 weeks. The pre-test score is 41.33 and pre-test score is 50.33 of group A. The pre- test score is38.47and pre-test score is 50.93 of group A. This study suggests that intermittent NDT that is NDT versus conventional therapy in CP children leads to improvement in overall gross motor abilities and self- care skills. This study suggests that NDT is effective when the parents are giving more time for exercise in the home session and Conventional therapy will improve the overall body function which will help the children to perform a self-care activity.

Keywords: Cerebral palsy; conventional therapy; NDT

INTRODUCTION

Cerebral palsy is actually an umbrella term for several different types of physical disabilities. The term "cerebral" refers to the area of the brain that is affected by the disease. The disease often includes other connections in the brain involving the cortex and parts of the cerebellum as well. The term "palsy" refers to the disorder of movement.

Cerebral palsy causes damage to the motor control centers of the brain and can occur during different parts of pregnancy and birth. Approximately 75% of cerebral palsy cases occur during pregnancy and approximately 5% occur during birth. Additionally, it can occur after childbirth up to about age three. Cerebral palsy occurs in an average of 2 to 3 babies out of 1000 live births. There has also been a slight increase in these numbers in recent years.

The damage that is caused by the disorder will not worsen over time. However, secondary orthopedic conditions are common with this disorder. It is not uncommon for patients to develop arthritis and osteoporosis much sooner than typical adults. Unfortunately, much of the information on cerebral palsy is related solely to the pediatric patient rather than the adult patient. Cerebral palsy is not genetic or hereditary and parents do not need to worry about the condition being passed down within a family.

A group of permanent disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fatal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication and behaviour, by epilepsy and by secondary musculoskeletal problems."

Obviously this is a clinical definition meaning that cerebral palsy is a condition in which there may be abnormal brain development or injury to the brain as it develops. This can occur before, during, after birth or during early childhood.

Children with cerebral palsy have difficulties in controlling muscles and movements as they grow and develop. The nature and extent of these difficulties may change as children grow but cerebral palsy itself is not progressive: the injury or impairment in the brain does not change. However, the effects of the brain injury on the body may change over time for better or worse. Physiotherapy and other therapies can often help people with cerebral palsy reach their full potential and become more independent therefore children with cerebral palsy will often be referred to a therapist or see a multi- disciplinary team through referral to the local Child Development Centre.

Depending on the precise area of the brain that is affected, there may be associated difficulties which become obvious during development; for example, in vision, hearing, learning and behaviour. It is not unusual for a diagnosis not to be given until the child's motor development is nearly complete as doctors observe the child through the development stages of sitting, crawling and walking. There is currently no test before birth that will identify cerebral palsy.

Definition of cerebral palsy

Cerebral Palsy (CP) describe a group of permanent disorders of the develop ment of movements and posture causing activity limitation that are attributed to no nprogressive disturbance that occurred in the developing fetal or the infant brain. The motor disorder of CP is accompanied by disturbance of sensatio n, perception, cognition, communication and behaviour, epilepsy and by secondary musculoskeletal problems.

Incidence of CP in India

The incidence of CP is 2-2.5 cases per 1000 live births as given by government of Karnataka (Bangalore Children's Hospital) in 2002-03.

There are an estimated 25 lakhs children and people in India with CP, making it the commonest cause of disability

Medically it is important to remember that cerebral palsy

- Is not contagious.

Department of Physiotherapy, National Institute of Mental Health and Neurosciences Medical School, Bangalore, India

Correspondence: Karthikeyan T, Department of Physiotherapy, National Institute of Mental Health and Neurosciences Medical School, Bangalore, India; E-mail:- karthik_77in@yahoo.co.in

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- Is not hereditary.
- Is not life-threatening.

Spastic (70%-80% of cases): Quadriplegia (10%-15%): All 4 extremities are affected equally along with the trunk, Diplegia (30%-40%): Lower extremities are affected to a greater degree than the upper extremities, Hemiplegia (20%-30%): Involvement is observed on 1 side of the body, including an arm and a leg, onoplegia (rare): Involvement is noted in 1 limb, either an arm or a leg Dyskinetic (10%-15% of cases).

Characterized by abnormal movements

No particular ethnic groups seem to be at higher risk for CP. However, people of disadvantaged back-ground are at higher risk due to poorer access to proper prenatal care and advanced medical services. Characteristic Features of Spastic Cerebral Palsy.

Main motor characteristics

Hypertonus of clasp knife variety: If the spastic muscles are stretched at a particular speed they respond in an exaggerated fashion, they contract blocking the movement .The hyperactive stretch reflex may occur at the beginning, middle or near the end of range of movement. There are increased tendon jerks, occasional clonus and other signs of upper motor neuron lesions.

Abnormal postures: They are usually associated with the antigravity muscles which are extensors in the leg and the flexors in the arm. Hypertonus may be either spasticity or rigidity the overlap between the two is almost impossible to differentiate rigidity is recognized by a plastic or continuous resistance to passive stretch throughout the full range of motion.

Voluntary movement: Voluntary motion may be present but laboured. There may be weakness in the initiation of motion or during movement at different parts of its range. The groups of muscles or chains of muscles used in the movement patterns are different from those used in the normal children of same age either the muscles used in association are stereotyped and are occasionally seen in normal child, usually at an infantile level of movement or the association of muscles is abnormal. For example, extension-adduction-internal rotation is used in creeping and walking .this may be impossible in spastics who continue to use the same patterns at all times in the motor skills, another example is shoulder flexion-adduction with some external rotation in feeding and combing one's hair in the normal arm pattern. In the case of spastics the arm pattern is usually flexion-adduction with internal rotation of the elbow. In taking the step in walking the normal pattern is flexion-adduction-external rotation of hip whereas the spastic pattern is usually flexion-adduction-internal rotation of the hip. Other abnormal movement patterns occur as co-contraction of agonist with the antagonist, instead of normal relaxation of the antagonist; this blocks the movement or make it laboured. There are usually mass movement in which the child is unable to move the isolated joint. This absence of discrete movement is characteristic feature of many spastics.

Intelligence varies but generally more impaired than children with athetoid cerebral palsy, Perceptual problems, especially of spatial relationships, are more common in spastic type of cerebral palsy, Sensory loss occurs in the child with hemiplegia occasionally, Rib cage abnormalities and poor respiration may exist, Epilepsies are more common than in the other types of cerebral palsy.

- Quadriplegia all 4 limbs are involved.
- Diplegia all four limbs are involved. Both legs are more severely affected than the arms.
- Hemiplegia one side of the body is affected. The arm is usually more involved than the leg.
- Triplegia three limbs are involved, usually both arms and a leg.
- Monoplegia only one limb is affected, usually an arm.

Classification by movement disorder

Spastic CP-Spastic muscles are tight and stiff, and have increased resistance to being stretched. They become overactive when used and produce clumsy movements. Normal muscles work in pairs: When one group contracts, the other group relax to allow free movement in the desired direction. Spastic muscles become active together and block effective movement. This muscular "tug-of- war" is called co-contraction.

Spasticity may be mild and affect only a few movements, or severe and affect the whole body. The amount of spasticity usually changes over time. Therapy, surgery, drugs and adaptive equipment may help to control spasticity. Damage to the brain's cerebral cortex is generally the cause of spastic cerebral palsy.

Athetoid CP-Athetosis leads to difficulty in controlling and co-ordinating movement. People with athetoid cerebral palsy have many involuntary writhing movements and are constantly in motion. They often have speech difficulties. Athetoid cerebral palsy results from damage to the basal ganglia in the midbrain. It was once common as a result of blood type incompatibility, but is now rarely seen.

Ataxic CP-Ataxic CP is the least common form of cerebral palsy. People with ataxic CP have a disturbed sense of balance and depth perception. They usually have poor muscle tone (hypotonic), a staggering walk and unsteady hands. Ataxia results from damage to the cerebellum, the brain's major centre for balance and co-ordination.

Combined classifications

The classifications of movement disorder and number of limbs involved are usually combined (e.g. spastic diplegia). These technical words can be useful in describing the type and extent of cerebral palsy, but they are only labels. A label does not describe an individual. Premature birth is major risk factor for cerebral palsy, with infants born at the threshold of viability being 70 times more likely to be diagnosed with the disease then those born at term.

According to the united cerebral palsy, about 10% of children with cerebral palsy acquire the disorder after birth in U.S. it results from brain damage in first few months or years of life. Cerebral palsy often follows infection of brain such as bacterial meningitis or viral encephalitis or it may be result of a head injury. Due to breech births, vascular or respiratory problems in the infants during birth, physical birth defect such as faulty spinal bone formation, groin hernias or an abnormally small jaw bone, seizures shortly after birth, a low birth weight less than 2,500 grms or 5l bs.

The most commonly used classification system describes the type of tone abnormality and the limb involvement .by tone abnormalities it is classified as spastic, diskinetic, hypotonic, and mixed. By limb involvement it is diplegia, quadriplegia, triplegia, hemiplegia.

Children with cerebral palsy are treated with physical therapy to facilitate motor development and to improve their independence in motor skills, self-care, plays, and leisure activities. There are different approaches have been developed (eg, Neurodevelopmental Therapy (NDT), the vojta method, conductive education, sensory integrative therapy) that differ in their specific treatment strategies, but aim at leading children with cerebral palsy towards the greatest degree of independence possible.

There are many approaches in the management of cerebral palsy. Out of which Neuro Developmental Therapy (NDT) is more important and essential aspect in spastic cerebral palsy management. The study has been shown that NDT therapy three times of week for period of 12 weeks is effective. My aim of study is to see the same effect in five times a week in period of 8 weeks can lead to maintain motor abilities and self- care functions but three times a week for a period of 12 weeks is long term and economical and time consuming for the patient. So purpose of this study is to know whether five times a week for a period of 8 weeks is effective or not to maintain motor abilities and self-care functions.

Objective of study

To compare the motor abilities and self-care skills before and after in NDT approach group with conventional physical therapy group.

MATERIALS AND METHODS

Source of data

- Methods of collection of data.
- Population: Children diagnosis with CP Sample.
- Design: Randomized block design Sample size: 30.
- Type of study: Pre-test to post experiment design.
- Duration of study: 8 weeks.

Inclusion criteria

- Children with diagnosis of cerebral palsy.
- Age group between 3 to 13 years.
- Children classified in levels I-IV at the gross motor function classification system 9GMFCS0.
- Subjects are able to accept and follow verbal instructions.
- Mild to moderate cerebral palsy.
- Both genders.

Exclusion criteria

- Subject with instable seizures.
- Subjects with surgical procedure up to 3 months.
- Subjects they have received treatment for spasticity.
- Subjects if they are suffered from other diseases that interfered with physical activity.
- Subject whose family fell uncomfortable or unable to respond interview and questionnaire.
- Children with less than normal IQ.

Material used

- Gross Motor Function Major Scale (GMFM).
- The Paediatric Evaluation of Disability Inventory (PEDI).
- Couch.
- Physio ball, mat, Canadian Occupational Performance Measure (COPM).

Intervention to conduct participants

Informed consent will be taken from parents of CP child. Children who meet the inclusion criteria will be assigned two group based on randomized sampling of baseline measurement will be taken using pediatric disability inventory and gross motor functional measurement scale. The intervention will be started with both groups together with steps in discussing and formulating problems and goals with the parents using Canadian Occupational Performance Measure (COPM) and Goal Attainment Scaling (GAS). Intervention will be in both groups carried out 5days in week for 2 months. Measurement are taken prior to intervention and after 2 months of intervention.

Group A

NDT approach: Concept was developed by k bobath is based on neuro developmental techniques and it views development as dynamic, sequential cephalo caudal, proximal distal, automatic before conscious responsive and lastly adaptive. BOBATH believed in inhibiting the primitive reflex pattern using promotion movements in normal patterns as well as combination.

Group B

Conventional therapy: In the conventional therapy group intervention focuses primarily on improving body function and structure as the starting point of intervention children will be treated with normal movement pattern and postural handling, maintaining ROM and joint alignment through stretching, co-ordination, balance, casting and splinting.

Out-come measure

- Gross Motor Functional Measure Scale (GMFMS).
- The Paediatrics of Disability Inventory (PEDM).
- Functional skills, caregiver, assistance and modification of the environment.

The outcome variables will be analyzed using a one-tailed repeated-measures analysis of variance. Alpha will be set as 0.05. To compare the groups' improvements, effect sizes will be calculated using the difference scores (the score on last follow-up assessment minus the score on the pre-test measurements) of both groups with Cohen's Guidelines as the reference.

Figure 1: Gross Motor Functional Measure Scale (GMFMS).

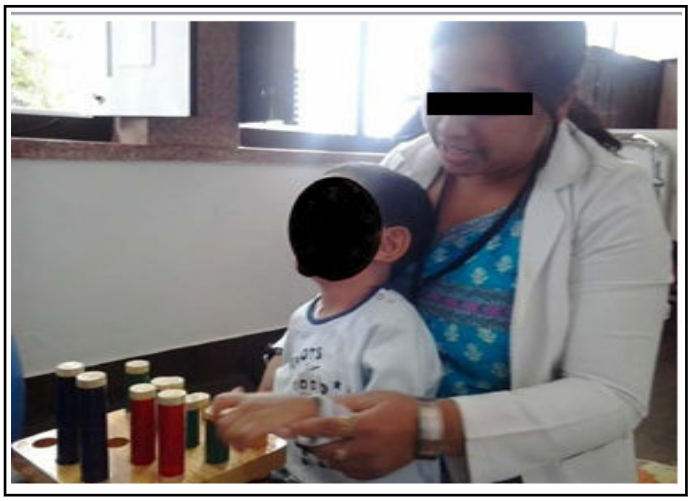

Figure 2: The Paediatrics of Disability Inventory (PEDM).

Figure 3: Functional skills, caregiver, assistance and modification of the environment.

RESULTS

Group A: NDT

Group B: Conventional therapy

Table 1: Gender distribution of Subjects.

Gender	Group B (No. of Subjects)	Percentage of distribution	Group A (No. of Subjects)	Percentage of distribution
Males	9	0.6	7	0.4667
Females	6	0.4	8	0.5333
Total	15	1	15	1
Chi-square	P<0.001		P<0.001	

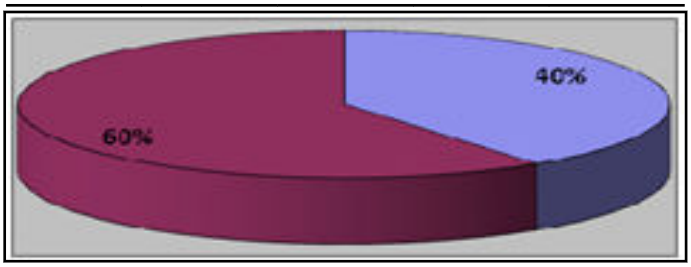

Figure 4: Gender distributions of the subjects.

The above table shows that the study is carried out on total of 15 children in each group consisting 9 male and 6 female subjects in Group B; 8 females and 7 male subjects in Group A with statistically significant difference in subjects taken with p<0.001. The above graph shows that 40% of females and 60% of males were studied in group B. The above graph shows that 530% of females and 47% of males were taken in group A.

Table 2: Age Distribution of the children studied.

Age in years	Group A (No of subjects)	Percentage	Group B (No of subjects)	Percentage
44654	1	0.0667	0	0
44685	5	0.3333	0	0
44717	2	0.1333	5	0.3333
44748	4	0.2667	6	0.4
44780	3	0.2	4	0.2667
Total	15	1	15	1
Mean	5.26±1.32	-	5.89±0.63	-
Min-Max	44776	-	44747	-

The above table shows that in Group A there were 1 subjects in age group between 3-4 years and 5 in age group between 4-5 years, 2 in age group between 5-6 years, 3 in age group between 7-8 years with mean age of the subjects were 5.26 years. In Group B there were 5 subjects in age group between 5-6 years and 6 in age group between 6-7 years, 4 in age group between 7-8 years with mean age of the subjects were 5.89 years shown in (figure-2).

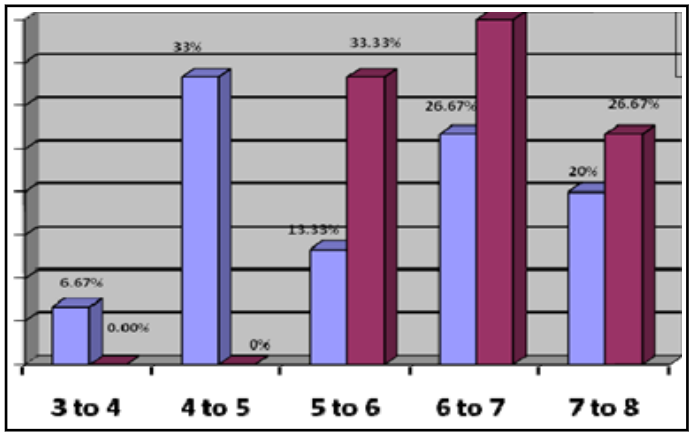

Figure 5: Age Distribution of the subjects studied.

The above graph shows that in Group A there were 6.67% of subjects were in age group between 3-4 years and 33% were in age group between 4-5 years, 13.33% were in age group between 5-6 years, 26.67% were in age group between 6-7 years. In Group B there were 33.33% subjects wherein age group between 5-6 years and 40% were in age group between 6-7 years, 26.67% were in age group between 7-8years.

Table 3: GMFM level of the children studied.

Level	Group A (No of subjects)	Percentage	Group B (No of subjects)	Percentage
II	2	13.30%	6	40%
III	6	40%	5	33.30%
IV	7	46.70%	4	26.70%
Total	15	100%	15	100%

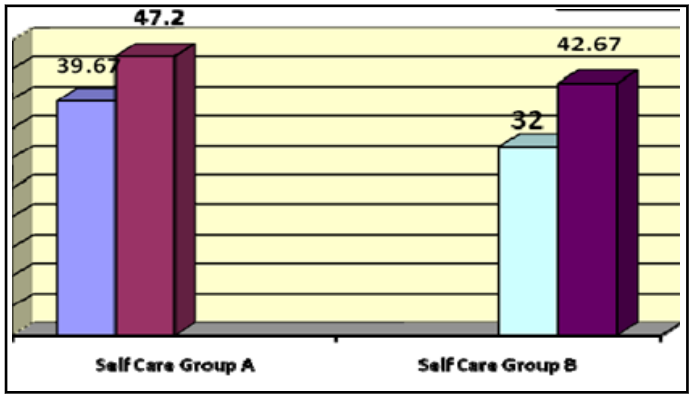

Figure 6: Analysis of functional skill: Self- care domain within the Group A and Group B (Pre to post analysis) Pre Intervention Group A Past Intervention Group A Pre Intervention Group B Past Intervention Group B.

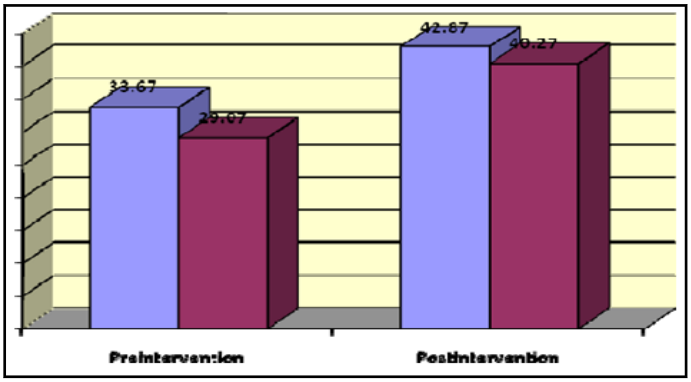

Figure 7: Comparison of Mobility domain of functional skills between the Group A and Group B.

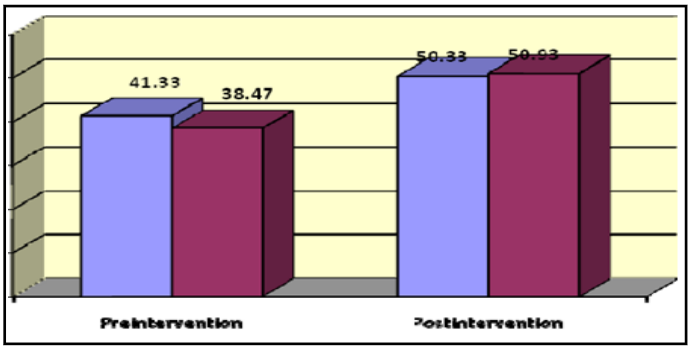

Figure 8: Comparison of Social function domain of functional skills between the Group and Group B.

The above graph shows that there is a statistically significant difference in means of social function domain in Group A and in Group B and there is no statistically significant difference when analyzed pre and post intervention.

DISCUSSION

This study aimed to compare the effectiveness of NDT versus conventional Therapy. The study has focused the role of conventional therapy and NDT in the cerebral palsy children. The following outcome variables of scale GMFM- 66 (p=0.00) and PEDI (p=0.00) between the group was found to be highly significant at 6 months.

Thus all the children with Spastic CP in both the groups were assessed on GMFM-66 I areas of Lying and Rolling, sitting, standing, walking, running and jumping At 3 months and 6 months. Highly significant differences are seen in between control and experimental groups.

GMFM is consistent in the measurement of gross motor skills and those children with cerebral palsy exhibit stable gross motor skills during repeat measurement when the time of day, therapists, and evaluation setting were held constant. The GMFM was administered twice, within a one-week time period, to twenty-one children with cerebral palsy. So this proves that this scale will be helpful in future analysis of treatment efficacy using the GMFM as an outcome measure. Neurodevelopment treatment used in this study consisted of handling techniques, inhibition and facilitation techniques, weight shifting and weight bearing, integration of activities, positioning and adaptive equipment.

Throughout the trial, NDT intervention for both groups was based on the fundamental and current principles of the approach, as it has evolved more recently.

In this study parents are taught correct handling techniques, positioning the child in antideformity position in bed, chair and on floor, activities which improves gross and fine motor hand functions , play activities which improve gross motor and visual perceptual skills like ball catching and throwing, ball kicking, memory games etc. Are given as a home programme.

Treatment strategies involving both parents and children have been shown to be most effective in achieving an enhanced developmental outcome.

Respective studies have suggested that Parent/caregiver education is one of the main elements of the intervention which is intended to facilitate the parent-child relationship, enable the parent to handle/assist with their child's difficulties, and give an intensive period for practice of activities.

The parent journey of adjustment and their capacity to participate in activities to improve their child's abilities. Initially, parents were coming to grips with the diagnosis, and this precluded their full involvement in home activities. However, at a point of breakthrough, they entered a phase of high participation interpreted as striving to maximize. Parental participation is necessary in promoting the psychosocial well-being of children.

After reviewing the literature concerning people with cerebral palsy and the effects of strength training on muscle strength, mobility, gait function, spasticity, and self-concept, there seems to be a positive correlation between "progressive, task-oriented strength training" in a community setting and improvements in the dependent variables. There is also evidence of the relationship between lower body strength training and motor functioning, while there wasn't any evidence of strengthening exercises increasing spasticity. It is important that parents as well as physical educators have an idea of where weaknesses generally are in children with cerebral palsy, and what exercises will work on those areas of concern. The same sequence and concluded that with early treatment we have the chance to integrate active normal sensory-motor experiences before abnormal movement patterns have become a habit. NDT is a successful approach but we should not think that we can cure a brain lesion or cerebral palsy, or that we can change all cases to only “minimal” cerebral palsy. If the treatment is started before abnormal patterns of movement have become established, we can help the child to organize his potential abilities in what for him is the most normal way.

CONCLUSION

This study suggests that intermittent NDT that is NDT versus conventional therapy in CP children leads to improvement in overall gross motor abilities and self -care skills. If there is no carryover immediately following treatment session, the positive effects of NDT is debatable. Outcomes as seen on components of Gross Motor Function Measure at three and six months, the physical Therapist has been able to establish higher scores in gross motor skills and self-care activities. This study suggests that NDT is effective when the parents are giving more time for exercise in the home session. And Conventional therapy will improve the overall body function which will help the children to perform a self-care activity.

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