Original Article

A Study on the Effectiveness of Task Oriented Strength Training to Enhance Upper Limb Motor Function in Children with Cerebral Palsy

Madeshwaran S[1], Senthil kumar N[2]

[1]Undergraduate, [2]Assistant Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical sciences, Chennai, Tamil Nadu, India.

How to cite this article: Madeshwaran S, Senthil kumar N. A Study on the Effectiveness of Task Oriented Strength Training to Enhance Upper Limb Motor Function in Children with Cerebral Palsy. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18, Year 2024.

Abstract

Background: A wide variety of static, non-progressive motor impairments, such as cerebral palsy, can develop from birth or infancy as a result of damage to the central nervous system's neuromotor components. Regulating motor activity frequently requires communication between the cerebral cortex, thalamus, basal ganglia, brain stem, Cerebellum, spinal cord, and linking sensory-motor pathways. Task-oriented training is utilized as a rehabilitation technique to hone motor skills and as a programme to enhance muscular function or strength. Objective of this study is to compare the effectiveness of Conventional therapy and task-oriented strength training in children with cerebral palsy.

Purpose: To compare the effectiveness of conventional therapy and task-oriented strength training in children with cerebral palsy.

Materials and Methods: A total of 48 subjects were included into the study based on the selection criteria and informed consent was obtained from the parents of the children. Group A (n=24) will be treated with Conventional shoulder exercises while Group B (n=24) will be treated with task-oriented strength training with weights. Outcome measures include Shoulder ROM and GMFCS Scale. Results should be tabulated and statistically analyzed. Both training programs will be given for 4 weeks, weekly 5 days from November 2022 to April 2023.

Result: Statistical analysis made with quantitative data revealed statistically significant differences between group A and group B. The test shows that subjects who received task oriented strength training have better effects in improving the motor function of children with Cerebral Palsy.

Key Words: Cerebral palsy, Task oriented training, Weights.

Introduction

Cerebral palsy (CP) is a common neurological problem in children, and it is used to describe a variety of movement disorders that result in a variety of activity limits. CP is the leading reason for motor disability in children, and it affects around 2 out of every 1000 live births. CP is the most common motor impairment that arises at a young age and affects 1 in 1000 infants.[1] A wide variety of static, non-progressive motor impairments, such as cerebral palsy, can develop from birth or infancy as a result of damage to the CNS neuro motor components. In general, coordination of motor activity is achieved through communication among the cerebral cortex,

Corresponding Author: Senthil kumar N, Assistant Professor, Saveetha College of Physiotherapy, Thandalam.

E-Mail: senthilresearch1980@gmail.com

thalamus, basal ganglia, brain stem, cerebellum, and connecting sensory-motor pathways.[2] The specific CP syndrome may only be recognized at 3-5 years of age, despite the fact that suggestive signs and symptoms may be present at a younger age. This is because the clinical characteristics of this entity change over time.[3] The management includes neurological rehabilitation (addressing muscle tone abnormalities and developing physical and occupational treatments) (such as epilepsy, cognitive decline, eyesight, hearing loss, growth, and digestive problems.) in addition to the diagnosis and treatment of comorbidities.[4]

The etiology of CP is intricate. Since the majority of cases of cerebral palsy (CP) were thought to be caused by new born brain hypoxia during delivery or during the postpartum period for more than a century, the occurrence of CP was seen as a barometer of the caliber of obstetric and neonatal care. Nearly 75% of instances of CP appear to be caused by prenatal causes, with new born and neonatal period risk factors accounting for 10% to 18% of cases.[5] Cerebral palsy is mostly diagnosed based on motor function and postural issues that start in early childhood and last all the way to the end of life; these issues are non-progressive but do alter with age.[6]

Aim

To compare the effectiveness of task-oriented strength training to enhance upper limb motor function in children with CP.

Material and Method

A total of 48 subjects were included into the study based on the selection criteria and informed consent was obtained from the parents of the children. The subjects were explained about the safety and simplicity of the study. Subjects were randomly allocated into two groups, Group A (n=24) were treated with Conventional shoulder exercises while Group B (n=24) were treated with task-oriented strength training with weights. Outcome measures include Shoulder ROM and GMFCS Scale. Results were tabulated and statistically analyzed. Both training programs were given for 4 weeks, weekly 5 days from November 2022 to April 2023.

Inclusion Criteria

- Diagnosis of cerebral palsy.
- Age between 4 and 8 years.
- Ability to walk with walking aids or orthosis.
- Ability to follow simple instructions.

Exclusion Criteria

- Illness before or during the study.
- Surgical procedure during/up to 1 year prior to the study.
- Inability to follow commands.
- Medical condition that precluded exercising.

Outcome Measures

Subjects were assessed for shoulder flexion ROM prior to their beginning of treatment as pre-test and again after the intervention as post-test,

- Gross motor function classification scale (GMFCS).
- Shoulder Range Of Motion.

Procedure

Forty-eight Children diagnosed with cerebral palsy were screened for inclusion and exclusion criteria. The parents were asked to sign the informed consent form. The instructions were told to the participants clearly. The patients were divided into two groups (Group A-24, Group B- 24. The pre and post-test values were measured by Shoulder ROM and GMFCS.

Control Group: (Group A) Conventional Therapy

1. Shoulder Flexion

- Place your chest to a wall. Walk your fingertips up the wall slowly until you feel a stretch. Maintain the stretch for 30 seconds. Return to your starting point.

2. Pendular Exercise

- Lean forward with one hand on a table or chair for support, keeping your back straight and your legs locked.
- Allow the arm to dangle freely, then gently swing the free hand back and forth then side to side and in circles. Repeat on the opposite side.

3. Crossover Arm Stretch

- Place one straight arm against the chest. Hold the arm above the elbow with the other hand.

Hold this position for 30 seconds, feeling a stretch in the back of the shoulder. Relax and do it again.

4. Elbow Flexion

- Hold two weights in each hand while standing erect. Pull the weight up to shoulder level while keeping the elbow tight to the body.
- Hold for 2 seconds before returning to the starting position in a controlled manner.

Protocol

- The subjects were made to perform each exercise twice, for a total of ten repetitions, 4-5 times a week.

Experimental Group: (Group B) Task Oriented Strength Training

1. Ball Games

- The subjects were asked to wear the weight cuffs and then asked to perform simple ball throwing and ball catching activities.

2. Drums Beating

- The subjects were asked to wear the weight cuffs and asked to perform drum beating using both the hands for 5-10 mins.

3. Building Blocks

- The subjects were asked to wear the weight cuffs and then asked to build 7-10 blocks.

4. Touch and Count the Numbers

Numbers were written on the wall in increasing order, and they were asked to count and touch the numbers one by one with the weight cuffs worn on their wrists.

5. Removing and Pasting Stickers

- With weight cuffs, subjects were asked to remove the stickers and asked to paste it in a notebook.

Protocol

- The subjects were instructed to perform each task, for a total of ten repetitions, 4-5 times a week.

Data Analysis

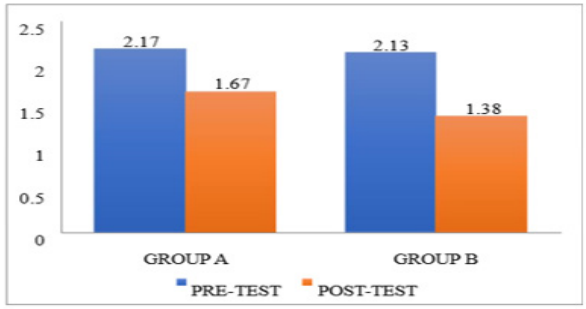

Fig-1 Comparing pre and post-test of both groups using GMFCS

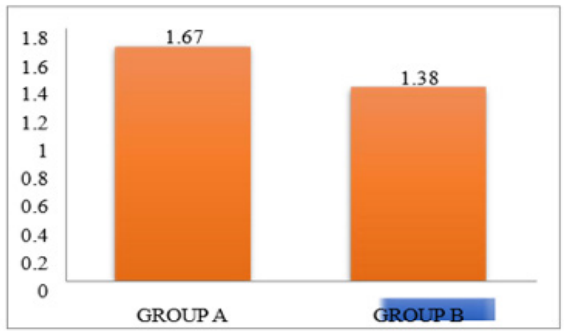

Fig-2 Comparing post-tests of both groups using GMFCS

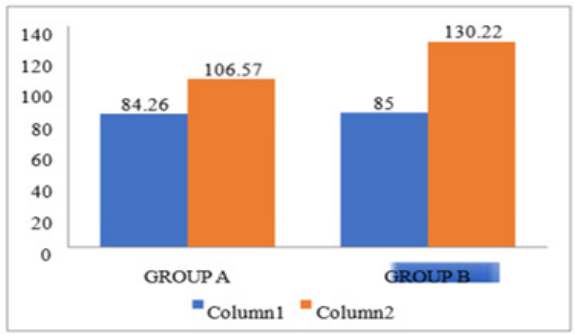

Fig-3 Comparing pre and post-test of both groups using Shoulder ROM

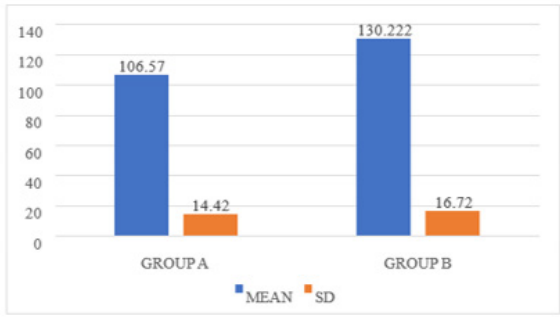

Fig-4 Comparing post-test of both groups using Shoulder ROM

Result

Based on the difference in mean of both the groups. GROUP A (Conventional Therapy) and GROUP B (Task Oriented Strength Training) the group which received Task Oriented strength training (group-b) were found to be having a lesser pain score than the group which received conventional therapy (group-a) post the intervention.

The result of study in Fig-1 Comparison of pre-test and post-test of GMFCS in both the groups (Group A- Conventional therapy, Group B Task oriented strength training) using unpaired t-test shows that, mean for group a pre -test was 2.1.7 post-test was 1.67 and group b pre-test was 2.13 post-test was 1.38.

Fig-2 Comparison of post-test of GMFCS in both the groups conventional therapy (Group A) and task oriented strength training (Group B) Using unpaired t test shows that, mean for post-test Group A was 1.67 Group B was 1.38.

Fig-3 Comparison of pre-test and post-test of Active Shoulder Flexion ROM in both the groups (Group A- Conventional therapy, Group B Task oriented strength training) using unpaired t-test shows that, mean for group a pre -test was 84.26 post-test was 106.57 and mean for group b pre-test was 85.00 and post-test was 130.22

Fig-4 Comparison of post-test of Active Shoulder Flexion ROM in both the groups conventional therapy (Group A) and task oriented strength training (Group B) Using unpaired t-test shows that, mean for post-test Group A was 106.57 Group B was 130.22 .

And this suggests that group B (Task Oriented Strength Training) performed considerably better than group A (Conventional Therapy). This strongly suggests that Task oriented strength training is effective in upper extremity function in children with CP.

Discussion

Cerebral palsy (CP) is a neurological disorder that impairs mobility and muscle tone. In many cases, the exact etiology is unknown, but the illness occurs when parts of the brain that control motor function develop abnormally or are damaged. CP affects about three out of every 1,000 live births. Children with CP typically exhibit evidence of motor delay before the age of two. CP is frequently not formally diagnosed until the age of two or three. Babies with cerebral palsy are frequently slow to reach developmental milestones such as rolling over, sitting, crawling, or walking. Certain reflexes that generally vanish in early infancy may also be present. TOT is a new rehabilitation training method based on motor control theory that emphasizes the goal of mimicking functional activities and considers the effect of the environment. Therapists provide specific tasks or activities for children with CP to accomplish in order to enhance their motor skills, based on individual abilities and training goals.

In 2009,Yasser Salem, Ellen M Godwinet al., conducted a study on Effects of task-oriented training on mobility function in children with cerebral palsy and concluded that there is a connection between using a task-oriented strength training programme and having successful functional results. The findings imply that a programme of task-focused strength training may be advantageous for children with cerebral palsy.[6] In October 2008, Eek MN, Tranberg et al., Treadmill exercise is helpful in enhancing gait and endurance in kids with CP, depending on the modalities used. In extremely young children with CP, treadmill exercise can be beneficial with some body weight support. .Aerobic endurance can be improved through endurance training. As long as the training program itself, effects tend to persist very briefly. 75% of one's maximum heart rate seems to be a safe training heart rate. Both parents and children with CP report experiencing more well-being after receiving massage. The best environment for balance training is one that is task-specific.[9] In May 2009 Bialik GM, Givon U. Reviewing the literature reveals that there is still much to learn about the neurological findings and limitations of CP. This might be feasible in the future with improved technology and knowledge of the nature of CP.[4]

In Aug 2004 Shapiro BK.A constructed the definition of cerebral palsy. A set of youngsters who were of interest to the researchers who created the criteria are defined by the interaction of the dimensions of severe disability non progressive lesions, and persistence. The range of motor

abnormalities that can exist is not fully covered by the concept of cerebral palsy. It highlights a specific area of the spectrum of motor dysfunction and establishes a category whose boundaries are established by a variety of motor dysfunctions.[2] In Mar 2004 Shevell MI, Bodensteiner JB. For the parents of children with physical and intellectual disabilities aged 3 to 6 years, ADLIC-D demonstrated acceptable reliability and validity. Through a detailed analysis of the functional skills required to carry out ADL, this instrument can serve as a guide for rehabilitation therapies in the clinical and research domains. [3]

Conclusion

Findings of this project indicated that the effectiveness of Task oriented strength training is effective in upper motor extremity function in children with CP varied greatly to the overall effectiveness of Shoulder ROM. This finding led me to the conclusion that Task oriented strength training is effective in upper extremity function in children with CP.

Ethical Clearance: This research was approved by ISRB committee ISRB number -03/002/2022/ ISRB/SR/SCPT

Funding: Self.

Conflict of Interest: Nil.

References

1. Vitrikas K, Dalton H, Breish D . Cerebral palsy : An Overview . American Family Physican 2020 Feb 15;101(4)
2. Shevell MI, Bodensteiner JB. Cerebral palsy: defining the problem. In Seminars in Pediatric Neurology 2004 (Vol. 11, No. 1, pp. 2-4). Elsevier BV.
3. Shapiro BK. Cerebral palsy: A reconceptualization of the spectrum. Journal of Pediatrics. 2004 Aug;145(2 SUPPL.):S3-7
4. Bialik GM, Givon U. Cerebral palsy: classification and etiology. Acta orthopaedica et traumatologica turcica. 2009;43(2):77-80.
5. ROSENBAUM P. A report: the definition and classification of cerebral palsy April 2006. Dev. Med. Child Neurol. Suppl..2007;109:8-14.
6. Pruitt DW, Tsai T. Common medical comorbidities associated with cerebral palsy. Physical Medicine and Rehabilitation Clinics of North America. 2009 Aug 1;20(3):453-67.