

Effectiveness of Lower Limb Strengthening for Children with Spastic Diplegic Cerebral Palsy using Stationary Cycling

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Abstract:

Objectives: To evaluate the efficacy of stationary bicycling intervention for children with spastic diplegia has significant improvement in gross motor function of standing and walking.

Design: Experimental design, convenient sampling method.

Settings: The study was conducted at the Spastic Society of Tamil Nadu, Taramani, and Chennai.

Procedure: 30 Subjects with age group 8-15 years with spasticity score 1 and 1+ in hip and knee extensors and ankle plantar flexors, ability to walk independently indoors and with good or fair voluntary control in lower limbs are divided into two groups, one group is controlled where as other was an experimental group.

Results: The significant results of this study shows that p value of group-B is lesser than 0.01 and group-A shows lesser than 0.000.

Conclusion: The study concludes that there was significant improvement of motor activity in both groups. The results of the subjects who trained with stationary cycling shown good motor recovery than control groups.

I. INTRODUCTION

CEREBRAL PALSY [CP] is a neurological disorder caused by a static lesion to the immature brain that is characterized by deficits in movement and postural control. Because of impairments such as weakness, spasticity, and in coordination many people with CP have difficulty in activities such as propelling their wheelchairs, walking independently, negotiating steps and running. It is a non-progressive neurological disorder affecting approximately 1.5-2.5 per 1000 born in India.

Many children with CP quickly become exhausted because of disease impact on muscle which requires high energy expenditure often lack endurance and suffer from muscle weakness. Spasticity was once thought to be the primary contributor to the motor dysfunction noted.

Conventional physiotherapy constitutes Bobath techniques such as quadripod, kneeling, half kneeling and standing were maintained for 15-20 minutes, passive and active stretching

and strengthening program were given. Current research indicates the resistive exercises are evolving as an effective intervention in improving strength and function in children with CP.

Cycling is a fitness device which may induce positive speed related changes in neuromotor control and muscle physiology by promoting higher speeds of movement. It is an organized activity, a form of exercise beneficial in strengthening the muscles of lower body. The height of the seat and the position of participant results knee bent and leg extended with the foot resting at the bottom of the pedal. A reasonable reference point is to set it in the level with the seat.

II. AIM OF THE STUDY

To evaluate the efficacy of stationary bicycling intervention for children with spastic diplegia has significant improvement in gross motor function of standing and waking.

III. METHODOLOGY

Research Design: Randomized controlled design.

Study Type: Experimental Study.

Sample Method: Convenient Sampling.

Sample Size: 30 (Control Group – 15, Experiment Group – 15)

Study Setting: Spastic Society of Tamil Nadu, Taramani, Chennai.

Study Duration: Six weeks.

Inclusion Criteria:

- AGE of 8-15 years.
- Ability to follow simple verbal commands.
- Subjects with spasticity score 1 and 1+ in hip and knee extensors and ankle plantar flexors according to modified Ashworth scale.
- Ability to walk indoors.
- Good or fair selective voluntary control in lower limbs.

Exclusion Criteria:

- Any orthopedic surgery, neurological surgery or baclofen pump implantation.
- Botulinum toxin injection within preceding 3 months.
- Subjects with cardiac disease or uncontrolled seizures.
- Any injuries, deformities or contracture which prevents lower limb movements.
- Inability and unwillingness to perform the exercise.

Materials Required

1. Stationary cycle.
2. GMFM scoring Paper
3. Pen

IV. PROCEDURE

After complete Assessment, the selected subjects are explained about the method of Treatment to be given.

GROUP A (Control Group)

15 subjects are taken to group-A are offered with stationary cycling for 15 minutes for 3 days per week for 6 weeks. EXERCISE PROTOCOL includes warm up for 10 minutes includes stretching exercise for bilateral hip flexor, knee extensors and flexors and ankle plantar flexors. Then the subjects are allowed to do cycling with properly adjusted seat and foot position. Once the subject is able to cycle smoothly, then the therapist can increase resistance with rest intervals. The maximum resistance was recorded.

GROUP B (Experimental Group)

15 subjects are allocated to group-B are treated by conventional physiotherapy treatment for 3 days with Bobath techniques such as quadripod, kneeling, half kneeling and standing. Each position was maintained for 15-20 minutes. Passive stretching and Active stretching along with strengthening program was given for anti spastic muscles according to the muscle power and functional training.

Testing Tool

GROSS MOTOR FUNCTION MEASURE

V. RESULTS

COMPARISON OF PRE AND POST TEST VALUES OF GMFM-88 OF GROUP-A

GROUP A	PRE TEST		POST TEST		SIGNIFICANCE
	MEAN	SD	MEAN	SD	
GROUP B	53.7	17.341	70.33	11.13	0.000

According to GMFM-88 the pre-test and post-test mean values of group-A are 53.87 and 70.33 and group-B shows

55.47 and 59.53. The p value of group-A shows lesser than 0.01 and group-B shows 0.01.

The results of this study shows that the p value of group-B trained with conventional physiotherapy in GMFM-88 has significant improvement when compared with group-A trained with stationary bicycle.

VI. CONCLUSION

The study concludes that, there was a significant improvement in gross motor function of standing and walking in children with spastic diplegia in both groups. The results of this study shows that the p value of group-B trained with conventional physiotherapy in GMFM-88 has significant improvement when compared with group-A trained with stationary bicycle.

VII. LIMITATIONS AND RECOMMENDATIONS

Limitations:

- Small sample size.
- Long term effects are not monitored.
- Other improvement in motor performance was not monitored.

Recommendations:

- This study can be done with larger sample size.
- This study can be done with other types of CP.
- The effects of exercise can be compared between genders.

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