

The Effect of Weight Bearing Exercises on Spasticity in Spastic Diplegic Children

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Abstract

Introduction: Cerebral Palsy (CP) refers to the group of varied neurological conditions or disease or disease which alters the motor capacities, movements, tonicity of muscles & postural changes in a child. Spastic diplegic cerebral palsy impacts bilateral lower extremities causing troubles with gait stability & coordination. He or she performs awkward walking the reflex is heightened. A toddler with mild spastic diplegic may also stroll without an assistive tool for community travel on the other side intense spastic diplegic cp needs assistive tool to stroll household distance. Main concentration of this project is on Cerebral Palsy (spastic diplegia) children having increased muscle tone specially in lower limb as a major complain.

Methodology: 15 subjects were involved in the study aged from 1 to 10 years with a greater number of children falling GMFCS Level III and trained for weight bearing exercises, balance exercises, core exercises, positional exercises, walking exercises, modalities were also given to enhance the functioning of the muscle and worked to re-educate the muscles shows an increased result in the level of GMFCS from III to II. Modified Ashworth Scale was used to check the spasticity scoring present before and the rehabilitation program done for 6 weeks. Modified Time Up & Go Test was used to find out the functional capability and falling risks in children before and after the treatment.

Result: Data were collected based on spasticity level scored by using Modified Ashworth Scale (MAS) scoring (pre and post treatment for 6 weeks) and Modified Time Up & Go Test (MTUGT) scoring (pre and post treatment for 6 weeks) with respect to GMFCS levels improvements in each subject. Participants were having increased number of falls while walking for few meters ranges from 20-27s, [Mean (SD)= 23.06±1.34] as their baseline assessment; there was decreased number of falls and improved balance after the protocol followed ranges to 15-20s, [Mean (SD)= 16.87±1.50] after protocol followed for 6 weeks. Participants were having spasticity in their lower limbs which was scored by Modified Ashworth Scale reading 3 or 4, [Mean (SD)=3.33±0.49] as their baseline assessment; there was increase in muscle tone and some passive movements were difficulty while some show rigidity while performing flexion & extension. The scoring has been reduced to 1 or 2, [Mean (SD)= 2.33±0.50] after the rehab protocol.

Conclusion: The study will be able to identify the outcome measure of patient following weight bearing exercises.

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Through this we conclude that when we provide the positional exercises, weight bearing exercises, and walking exercises in the treatment to the patients. It helps them to improve their spasticity level.

Modalities were also used to initiate the muscles contraction and relaxation to re-educate the muscles to strengthen the muscles.

Keywords: Spasticity; diplegic; children; weight bearing; exercises; neuro-rehab.

Introduction

Cerebral Palsy (CP) refers to the group of varied neurological conditions or disease or disease which alters the motor capacities, movements, tonicity of muscles & postural changes in a child.¹ Cerebral Palsy, everlasting problems of movement & posture development causing pastime limitations which leads to noninnovative disturbance that passed of in developing mind.²

CP is “a group with endless disease having development disorders like movement problems and postural limitation, causing exertion, which attribute non-progressive disturbances being in developing fatal or infant brain.” It also hinders the capability on an individual to perform activities in a coordinated manner which also reflects the hinderance in the body function. CP can be spastic, dyskinetic and ataxia type leading to spastic muscles, uncontrolled movements, and poor balance co-ordination respectively.¹

Main concentration of this project is on CP (spastic) children having increased muscle tone specially in lower limb as a major complain. A toddler with mild spastic diplegic may also stroll without an assistive tool for community travel on the other side intense spastic diplegic cp needs assistive tool to stroll household distance.³

Spastic diplegic cp impacts bilateral lower extremities causing troubles with gait stability & coordination. He or she performs awkward walking the reflex is heightened. There are 3 types of classification based on affected limb. Spastic diplegic CP specially impact bilateral lower extremity causing troubles with get stability and coordination.²

There are a few ways to check the outcome measures which help us to find the stage of cerebral palsy: Gross Motor Function Classification (GMFCS) System, Modified Time Up and Go Test (MTUGT) and Modified Ashworth scale (MAS).⁴

1. Gross Motor Function Classification System (GMFCS) levels: it is a 5-level classification of children with disability of spastic diplegia based on the children current motor function abilities, limitations in gross functioning and check for need for assistance.⁴
2. Modified Timed Up & Go Test (MTUGT): used to check clinical performance-based measures of lower extremities functioning, mobility and falling risk.
3. Modified Ashworth Scale (MAS): the scale examines the tone of muscle, the individual which can also help us to know about limbs which are spastic.⁵

Need of the Study

The need of the study is to accept the effects of weight bearing exercises on spasticity. This study will help us to understand significance of weight bearing exercises in a particular area which can further inculcate in the rehabilitation for better results. Through this study we can assess the various effects of the weight bearing exercises MAS and MTUGT with respect to GMFCS level change after the exercises. Children were having issues while walking and transferring position from supine lying to sitting, sitting to standing, etc. we might also be looking for improvements in gait pattern as the exercises were included for weight bearing on lower limbs that help them to lower down the muscle tone which make the muscles released from contracted state.

AIM

To check the effects of weight bearing exercises on spasticity in child having spastic diplegia.

Objective

1. To study the effects of weight bearing exercises on spasticity by Modified Ashworth Scale (MAS) in spastic diplegic spastic children.

2. To study the effects of weight bearing exercises on spasticity by Modified Time Up & Go Test Scoring (MTUGT) in spastic diplegic children.
3. To study the effect of weight bearing exercises on spasticity based on motor functions by GMFCS Levels in spastic diplegic children.

3. Gross Motor Function Classification System (GMFCS)- classify motor function
4. Chair (back and arm cushioning)
5. Vestibular ball
6. Colorful pegs, markers
7. Body weight suspension treadmill
8. Couch, Stopwatch

Methodology

Study design: Experimental study

Study population: Cerebral Palsy Children (spastic CP)

Sample size: 15 participants

Place of data collection: The patients of Reborn Physiotherapy & Neuro Rehab Centre, Ghaziabad (UP) successfully participated.

Sampling method: Convenient Non-Probability Sampling

Selection criteria:

- Inclusion criteria:
 1. Diagnosed cases of spastic CP aged from 1 and 10years.¹
 2. Walking independently or with a walking aid.
 3. Able to follow visual commands.³
 4. Should not be taking any kind of pharmacological agents.
 5. GMFCS Levels I-III.⁷
- Exclusive criteria:
 6. Differential diagnosis like hemiplegia, DMD, dystonia.¹
 7. Children who cannot walk independently or at least with a walking aid.⁷
 8. Any types of orthopedic surgery on lower limb in last 12 months.¹⁰
 9. Surgery to be done during the period of study.
 10. Age group more than 10 years.¹⁰

Instrument required:

1. Modified Timed Up & Go Test
2. Modified Ashworth Scale -spasticity (hypertonicity)

Outcome Measure:

1. Modified Ashworth Scale⁸
2. Modified Time Up & Go Test⁹

Procedure:

To treat spastic cerebral palsy children, it requires a long-term treatment and medical care of various fields. The treatment, follow-up in following manner-

- (a) Balancing exercises: children of spastic CP have difficulty in balancing. To help them in balancing their own body, physiotherapist make them to perform various balancing exercises.

Exercises included like balance board or wobble board exercises, wedge exercises, vestibular ball exercises all these exercises for 5-15 minutes per day.

- (b) Weight bearing exercises: children are unable to take weight of their own body on their limbs which makes those parts of body weak. Children are made to take weight on their lower limbs by putting them in various positions and performing certain exercises.

Positions included like squatting that helps to weight bearing on the feet's, quadruped position which help them to take weight on their knees and hands. Single-leg standing and standing with/without support help them to weigh over whole body on their limbs for about 5-10minutes/day session.

- (c) Positioning exercises: exercises helping the children in achieving basic milestones positions which help in posture correction and strengthening of muscles.

Exercises also eliminate the gravity fear & maintaining the posture of the patient includes squatting, kneeling, half kneeling, side sitting,

prone on elbows, hand walking on treadmill, single leg standing & double leg standing for about 5 minutes/day session.

(d) Walking exercises: helping the children to initiate walking, with exercises like, treadmill walking, posterior walker walking, and walking with the minimal amount of external support in 5 minutes/day session.

(e) Coordination exercises: helping the children to build up their coordination and maintain the body in perfect anatomical posture.

Exercise included were Frenkel exercises, treadmill walking (for 1.5-2.2km/hours for 3 minutes a day), vestibular ball exercises all are combined and completed in 5-10 minutes/day.

(f) Core stability: exercises help the children in strengthening core muscles. These exercises include vestibular ball exercises, exercises of abdomen, supine to sitting, etc., for about 5minutes/day in a day session.

All exercises repeated for 2 days/week, 45-60 minutes session for 6 weeks.

Orthoses were given to maintain correct posture of limb and improve balance and movements. Such devices are braces, cast, splints, ankle foot orthoses, ankle foot knee orthoses.

Modalities were used to stimulate the muscles and initiate the movement by reeducating them.

Muscle stimulator was given over knee flexors and extensors at burst mode for 5 minutes per day to improve muscles contraction and relaxation movement.⁷

Vibrations were also provided for about

5minutes/day to the limbs & back muscles to give proprioception and reduce hyper sensory reflexes.

Myofascial therapies play a good role in increasing joint range of motion, provide flexibility to the muscles, also reduce tightness in them and by increases the velocity of therapy we can reduce flaccidity

Data-Analysis

The participants in research were given an informed consent form signed by parents, & responses were registered on MS-Excel sheet for review.

There were around 15 subjects included in the study meeting all the inclusive criteria. Exercises were conducted in equal intervals for each subject. Data were collected based on spasticity level scored by using MAS scoring (pre and post treatment for 6 weeks) and MTUGT scoring (pre and post treatment for 6 weeks) with respect to GMFCS levels improvements in each subject.⁸

The Shapiro-Wilks test used to check the normality levels, and provided with descriptive statistics, and paired t-tests were conducted with significance of $p < 0.05$ assumed.⁸

Result

There were around 15 subjects included in the study. Data were collected based on spasticity level scored by using Modified Ashworth Scale (MAS) scoring (pre and post treatment for 6 weeks) and Modified Time Up & Go Test (MTUGT) scoring (pre and post treatment for 6 weeks) with respect to GMFCS levels improvements in each subject.

Data collected was as follows:

Table 1: Data collected of subjects according to MAS & MTUGT (pre and post treatment).

	Gender	MAS		MTUGT (in seconds)	
		Pre- Treatment scoring(baseline)	Post-Treatment scoring	Pre-Treatment scoring(baseline)	Post-Treatment scoring
Mean:	Male: Female= 11:4, n=15	3.33	2.33	23.07	16.86

Table 2: Age and gender wise distribution of subjects.

Age(years)	Male	Female	Total
1-4	2	1	3
4-6	4	1	5
6-10	5	2	7
Total	11	4	15

Table 3: Distribution of subjects according to GMFC System levels

GMFCS levels	No. of subjects	Percentage (%)
Level I	3	20%
Level II	4	26.67%
Level III	8	53.34%
Total	15	100%

Table 4: MAS, MTUGT mean & SD value with respect to GMFCS levels.

Scales:	MAS		MTUGT		GMFCS Level	
	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment
Mean±SD	3.33±0.49	2.33±0.50	23.07±1.34	16.87±1.50	Level 3 (difficult walking leading maximum support but only for short distance, a more no. of falls is seen)	Level 2 (walking with mild assistance for a variable distance, a smaller number of falls are seen)
t-Value	1.325		2.236			
p-Value	0.024		0.040			

Discussion

This study was done to understand the effect of weight bearing exercises on spasticity in children's due to spastic diplegia, and to appreciate the outcomes we received from the data analysis.

This experimental study was conducted in Reborn Physiotherapy and Neuro Rehabilitation Centre, Ghaziabad, UP. As spasticity is very common problem faced by children with diplegia, therefore assessment should always be correct, and treatment should start at day 0 to give a good rehab in future.

In this study, spasticity changes were seen from pre-treatment to post-treatment scoring done by MAS with respect to change in gross motor functions are also observed. 15 subjects were involved in the study aged from 1 to 10 years with a greater number of children falling GMFCS Level III and trained for weight bearing exercises, balance exercises, core exercises, positional exercises, walking exercises, modalities were also given to enhance the functioning of the muscle and worked to re-educate the muscles shows an increased result in the level of GMFCS from III to II.⁷

Participants were having spasticity in their lower limbs which was scored as MAS 3 or 4, [Mean (SD)=3.33±0.49] as their baseline assessment; there was increased muscle tone, and some passive movements were difficulty while some show rigidity while performing flexion & extension.⁹ The scoring has been reduced to 1 or 2, [Mean (SD)= 2.33±0.50] after the rehab protocol which was followed for 6 weeks (refer to Table 4). There was reduced spasticity in their limbs which was leading to decreased level of gross motor function of the individual, making passive movement less rigid.³

Modified Time Up & Go Test is a tool used to check the mobility, balance, walking and standing. Scoring was done in pre-treatment and post-treatment to record the data for data analysis.

Participants were having spasticity and increased number of falls while walking for few meters ranges from 20-27s, [Mean (SD)= 23.06±1.34] as their baseline assessment; there was decreased number of falls and improved balance after the protocol followed 15-20s, [Mean (SD)= 16.87±1.50] for 6 weeks (refer to Table 4).¹⁰

Conclusion

CP is the group of the children with neurological conditions or disorders which alters the motor abilities, movements, muscle tone or posture of an infant/children. It also hinders the ability on an individual to perform activities in a coordinated manner which also the hinderance in body function.

More research should be conducted in this field especially with the growing technological, virtual reality which help to assist the patient and decreases load on therapist side as well giving them a mechanical advantage. We got a positive result for study however it would be better to have a larger population data so that we can have a better outcome and the validity of the study can be checked. The patients with CP spend their life suffering due to increased spasticity in the muscles.

The study will be able to identify the outcome measure of patient following weight bearing exercises.

Through this we conclude that when we provide the positional exercises, weight bearing exercises, and walking exercises in the treatment to the patients. It helps them to improve their spasticity level.

Modalities were also used to initiate the muscles contraction and relaxation to re-educate the muscles to strengthen the muscles.

Ethical Clearance: Institutional Ethical Committee of Amity University, Uttar Pradesh

Source of Funding: Self

Conflict of Interest: Nil

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