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EFFECTS OF PHYSICAL THERAPY TREATMENT IN CHILDREN WITH ATHETOID CEREBRAL PALSY

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ABSTRACT

Objective: To find the effectiveness of physical therapy treatment in the form of treadmill training, stationary cycling training, sit to stand exercises, knee walking and walking with minimum support.

Study Design: Quasi experimental study.

Place and Duration of Study: Setting of study was a special school in Pakistan. Therapy was carried out two days in a week for 12 months; the duration of single session was 2 hours, from Nov 2013 to Nov 2014.

Material and Methods: Study was conducted on children with athetoid cerebral palsy, visiting for physical therapy treatment in a special school with physical therapy rehabilitation center. Seven children with inclusion and exclusion criteria were selected for therapy and informed consent was taken from parents. Interventions were treadmill training, stationary cycling training, sit to stand exercises, knee walking and walking with minimum assistant. Outcome measurement tools were gross motor functional measure (GMFM-88), walking distance, 01 minute walk test and 6 minutes walk test. Pre treatment measurements were taken on gross motor functional measure (GMFM-88, walking distance, 1 minute walk test and 6 minutes walk test and measurements were repeated after 1 year on same scales.

Results: Pre treatment score on gross motor functional measure was 49.36 ± 30.79 and after 12 months was 69.78 ± 25.55. Pre-intervention standing mean time was 10 ± 5 sec with minimum support without losing balance and post intervention standing time was 10 ± 4 minutes without losing balance and without support. Pre intervention walking distance was 2 ± 1 steps in 6 minutes walk test and also in one minute walk test, with minimum support without losing balance and post intervention walking distance was 100 ± 12 steps in 6 minutes walk test and 20 ± 8 steps in 1 minute walk test without losing balance and without support.

Conclusion: Treadmill, Stationary cycling with adjustable seat and resistance, strengthening exercises with manual resistance, Functional training, quadriceps build up training, standing activity and walking training activity in combination have significant effects on gross motor function measure, trunk stability, standing time and walking distance in children with athetoid cerebral palsy.

Keywords: Cerebral palsy, Functional training, Parents, Stationary cycling, Strengthening, Treadmill.

INTRODUCTION

Cerebral palsy is a condition characterized by problems in movement and posture due to a lesions in immature brain[1]. Children with cerebral palsy present with faulty postures and problems in motor movements along with oral motor, speech and hearing problems[2]. Cerebral palsy is a major cause of disability in children[3]. Prevalence of cerebral palsy is 2.11 in 1000 live births in total population[4]. This is a non prog-ressive lesion in brain; However symptoms of cerebral palsy may be progressive with time, for example developing wrong patterns of movements and synergies[5]. Cerebral palsy can be categorized into spastic, athetoid, ataxic, low tone and mixed[4]. Children with spastic cerebral palsy have increased tone in muscles and there is spasticity in one group of muscles. In spastic cerebral palsy there is deficiency of gamma amino butyric acid (GABA), that has inhibitory effects on lower motor neurons[6]. Due to lesion in upper motor, there is deficiency of GABA that can lead to spasticity and increased tone in muscles[7]. In athetoid cerebral palsy, there are involuntary movements in hands and facial muscles and also there is fluctuating tone in muscles[5]. Immaturity and hypoxic brain

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injury is considered a leading cause in cerebral palsy, other causes may be traumatic brain injury, neonatal infections, pregnancy disorders and exposure to radiations[8]. Physical therapy interventions that we can use for the management of cerebral palsy are neuro developmental techniques, strength training, functional training, constrain induced movement therapy, body supported treadmill training and conductive education[9]. In cerebral palsy there is a lesion in immature brain. For the control of movements and patterns of the body, brain has motor areas. These motor areas control the movements of muscles. By practice and repetition of activity, brain can be trained with specific patterns and skills that can help the children with cerebral palsy to control their body[10]. Children with cerebral palsy have persistent reflexes that are not integrated due to brain lesion[11]. Reflexes in early age of life play vital role in the development of tone, posture and skills. Newborns are under the influence of neonatal reflexes during six months of life. After 6 months most of the reflexes start to integrate and body starts to control movements. In cerebral palsy reflexes are not absent and persist that causes delay in milestone development and also body can learn wrong patterns due to reflex activity in abnormal brain. If physiotherapy treatments are given that stop the reflex activity then children can learn skills and movements, which can help their activity of daily life. In this study we used a combination of physical therapy interventions to improve the motor activity of children with athetoid cerebral palsy. Objective of the study was to find the effectiveness of physical therapy treatment in the form of treadmill training, stationary cycling training, sit to stand exercises, knee walking and walking with minimum support. Interventions that were included in this physical therapy treatment were treadmill training, stationary cycling training, sit to stand exercises, knee walking and walking with minimum support. These interventions can be performed by parents. If these interventions were effective in improving the gross motor and functional skills, we trained the parents to continue these protocols at home. It reduce the cost of treatments and parents provided physical therapy exercise plan at home. It further increased adherence to exercise in these children. Use of treadmill in this study was modified from body supported treadmill training. We modified our use of intervention in that sense, we provided manual support, and assistance was removed as children were able to walk without support. In a recent study it was concluded that body weight support treadmill training had significant effect in changes in spine of children with cerebral palsy that helped to improve gross motor function in children with cerebral palsy[12]. Second intervention in our study was use of stationary cycle in children with cerebral palsy. Previous studies concluded that stationary cycling activity increases the speed of gait, improves the cardiopulmonary endurance, increases the limb strength, increases quality of life and induces happiness in children with cerebral palsy[13-19]. A number of studies also support the effectiveness of strengthening exercises with manual resistance on motor function and mobility in children with cerebral palsy[20-22]. A number of interventions can be selected that can be used by parents of children with cerebral palsy. Regular training of these interventions at home can improve motor function and mobility in children with cerebral palsy. In this study we selected some interventions and used them in combinations. In combination therapy a longer session was required to provide an exercise plan. In this study we use a session of two hours.

PATIENTS AND METHODS

A quasi experimental study was conducted on children with athetoid cerebral palsy, visiting for physical therapy treatment in special school, from November 2013 to November 2014. Seven children with inclusion and exclusion criteria were selected for therapy. A convenient sampling technique was used to select the sample. Study was conducted on children that were already taking the treatment sessions. Total number of children was 15. Out of 15, we selected 7 children who fulfilled the inclusion and exclusion criteria. Sample size was not calculated by any calculating

procedure. Therapy was carried out two days in a week for 12 months; the duration of single session was 2 hours. Interventions were treadmill training, stationary cycling training, sit to stand exercises, knee walking and walking with minimum support. Outcome measurement tools were gross motor functional measure (GMFM-88), walking distance, 01 minute walk test and 6 minutes walk test. Pre treatment measurements were taken on gross motor functional measure (GMFM-88), walking distance, 1 minute walk test and 6 minutes walk test and measurements were repeated after 1 year on same scales. Pre treatment and post treatment scores on GMFM-88 were measured in mean with standard deviation and compared with wilcoxon signed rank test with 0.05 significant level. Inclusion criteria were children with athetoid cerebral palsy, age between 10 and 12 years, already have sitting and kneeling control and standing with support.

INTERVENTION:

Intervention	Methodology	Intensity	Volume	Frequency	Duration
Treadmill	Intervention started with minimal support and with the time support is removed for independent walking in treadmill	Start with minimal resistance to progress with maximum safe resistance	Starting time was minimal that child could tolerate and progression was made from 10 to 15 minutes	02 sessions per week	12 months
Stationary cycling with adjustable seat and resistance.	Intervention started with minimal support to run cycle and with the time support is removed for independent cycling.	Start with minimal resistance to progress with maximum safe resistance.	Starting time was minimal that child could tolerate and progression was made from 10 to 15 minutes	02 sessions per week	12 months
Strengthening exercises with manual resistance	Movements according to action of group of muscles and functional patterns	Start with minimal resistance to progress with maximum safe resistance	15 repetitions on key joints, shoulder, elbow, spine, hip, knee, ankle	02 sessions per week	12 months
Functional training	Key transitions like sitting to side sitting, side to cross sitting, sitting to kneeling, kneeling to standing with minimal support	Start with minimal support to progress without support	10 minutes	02 session per week	12 months
Quadriceps build up training	Sit to stand on stool with stabilizing distal joints of legs providing minimal assistance to independent standing	Start with minimal support to progress without support	10 repetitions with 03 sets	02 sessions per week	12 months
Standing activity	Child was given a challenge to stand for maximum time without losing balance and do not fall. With time child was involved with activity like throwing ball, holding and releasing objects and building ring tower.	Start with minimal support to progress without support	Minimum time to time that child can tolerate	02 sessions per week	12 months
Walking training activity	Start with parallel bar to progress without support.	Start with minimal support to progress without support	Minimum time to time that child can tolerate	02 sessions per week	12 months

Exclusion criteria were children with contracture and deformity on joint, previous surgery of joint and muscle and mental retardation.

RESULTS

Seven children, 71.42% male and 28.57% female with athetoid type cerebral palsy were selected. Mean age of children were 9 ± 3 years. Pretreatment score on gross motor functional measure was 49.36 ± 30.79 and after 12 months was 69.78 ± 25.55 (table-I, graph-1). Pre intervention standing mean time was 10 ± 5 sec with minimum support without losing balance and post intervention standing time was 10 ± 4 minutes without losing balance and without support. Pre-intervention walking distance was 2 ± 1 steps in 6 minutes walk test and also in one minute walk test, with minimum support without losing balance and post intervention walking distance was 100 ± 12 steps in 6 minutes walk test and 20 ± 8 steps in 1 minutes walk test without losing balance and without support. Post intervention standing and walking improved significantly. Pre-intervention GMFM score was compared with wilcoxon signed rank test and show that (0.008) there was significant change between pre treatment and post treatment (table-II).

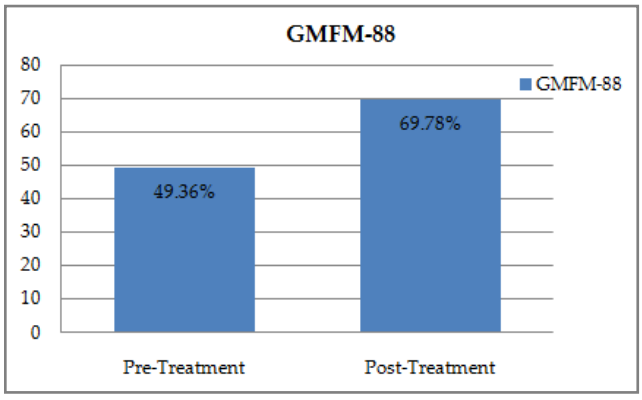

Figure: Pre and post score on gross motor and functional measure.

DISCUSSION

In this study treatment sessions were provided only two days in a week. Efficacy of treatments can be increased if numbers of sessions are increased in a week. In this study the duration of single session was two hours, if same interventions are used with intensive protocols (a session of longer duration) then there will be more effectiveness of treatment. Study supports the results of previous studies in which the interventions like treadmill, stationary cycling with adjustable seat and resistance, strengthening exercises with manual resistance, functional training, quadriceps build up training, standing activity and walking training activity were used[2,9,10,12,13,15-19,22]. This study can be repeated with bigger sample size, more treatment sessions and with intensive physical therapy protocol. This protocol can be used in a specific cerebral palsy rehabilitation center. By using treadmill, stationary cycle and other interventions we can also reduce the cost of treatment as these interventions need only one time investment and

Table-I: Pre and post measurements on outcome measurements scale.

		Pre-Treatment	Post-Treatment
GMFM-88		49.36 ± 30.79	69.78 ± 25.55
Standing Time		10 ± 05 seconds	10 ± 04 minutes
Walking Distance	06 minutes Walk test	02 ± 01 steps	100 ± 12 steps
	01 minute walk test	02 ± 01 steps	20 ± 08 steps

Table-II: Related samples wilcoxon signed rank test statistics.

Total N	7
Test statistics	28.000
Standard error	5.292
Standardized test statistics	2.646
Asymptotic Sig.	0.008

many children can benefit from this. Moreover these interventions can be used by parents to train their children at home and thus children will receive physical therapy services at their door step. This study also can be repeated in comparison, for example, with same treatments the efficacy of treatment with parents and physiotherapist can be compared. If there is no significant difference in two expertise (parents and therapist), then parents can take part in rehabilitation efficiently. This protocol can also be repeated with spastic cerebral palsy or in combination of spastic and athetoid cerebral palsy. Duration of single session was 2 hours, so children with cerebral palsy can be involved in therapy session for longer duration, it will train their brain more efficiently and with more adaptations and more neuropalstic brain.

CONCLUSION

Treadmill, Stationary cycling with adjustable seat and resistance, strengthening exercises with manual resistance, Functional training, quadriceps build up training, standing activity and walking training activity in combination have significant effects on gross motor function measure, trunk stability, standing time and walking distance in children with athetoid cerebral palsy.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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