


Case Report

Physical Effects of Hippotherapy on Balance and Gross Motor Function of a Child with Cerebral Palsy

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Abstract

Introduction: Hippotherapy is a therapeutic approach using the movement of the horse, administered by trained health professionals. The purpose of this study was to evaluate the effects of hippotherapy on balance and gross motor function of children with CP.

Case Description: A subject for this case study that was recruited from an inclusive school was 10 years old boy, with an athetoid type of cerebral palsy. He has a history of bilateral fluctuating muscle tone and tightness in both the upper limb and lower limb. The most common symptoms of the child were involuntary movement, tremors, poor posture, unsteadiness, twisting of the trunk, slow, writhing movements, abrupt movements, and language delay. His gross motor function was at Level II according to the GMFCS. During the trial, he didn't engage in any further forms of therapy or sports.

Design: This study employed a repeated-measures design with a pretest and post-test conducted using the Gross Motor Function Measure and Paediatric Balance Scale as outcome measures.

Intervention: The subject has participated in a 16 weeks hippo therapy program consisting of 30 minutes of riding 3 sessions per week. Stretching, strengthening, and balance exercises were included in each hippotherapy session.

Results: The results of the post-test demonstrated significant improvements in all the dimensions of the GMFM score. In PBS among 14 variables 8 variables had significant improvement.

Conclusion: The results of this case study showed that hippotherapy appears to have positive effects on gross motor function and balance in a child with CP.

Keywords: Hippotherapy, Cerebral Palsy, Postural Balance, Physical Therapy

Introduction

Hippotherapy is a therapeutic treatment approach that makes use of the movement of the horse under the supervision of a trained physiotherapist [1]. It is delivered by skilled healthcare professionals using an interdisciplinary team approach likely a physiotherapist, occupational therapist, or speech therapist [2]. The therapist concentrates on enhancing the patient's walking skills, posture, balance, muscle tone, and mobility during hippo therapy [3]. It improves pelvic, hip, and trunk mobility, and children's posture,

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balance, and coordination are enhanced [4]. The upper motor neuron is stimulated and given sensory input by a horse's rhythmic, repetitive movement. A horse's pelvic movement while walking is remarkably comparable to a human's [5]. Physiotherapy involves balance training in the treatment program, to help patients with their balance and gross motor skills [6]. The several therapeutic benefits of hippo therapy are now being recognized by physical therapists. Additionally, when a child with CP rides a horse, the horse's body heat improves blood circulation, reduces aberrant muscle tones, and relieves spastic muscles [5]. Spasticity, musculoskeletal issues, mobility abnormalities, and decreased pelvic motions in children with CP, as well as difficulties in movement and sitting posture [7], affect sensation, perception, cognition, and motor control [8].

With cerebral palsy, the balance issue and difficulties in gross motor function are frequently present [9]. Hippo therapy has been found in numerous studies to improve gross motor performance in children with CP [10]. Hippo therapy for children with CP has been shown to improve their gross motor skills [11]. It proved successful in helping CP patients with balance, postural alignment, function, and mobility [2, 12]. In 1960, therapeutic riding facilities started to appear in Europe, Canada, and the USA. The concept of "hippotherapy" became well-known when therapists in Germany, Switzerland, and Austria started using horses as therapeutic approaches [13].

Hippotherapy is a new concept in Bangladesh, especially for children with cerebral palsy, but another country was established many years. In our country horse riding is not available in study and practice. During covid-19 situation Centre for the Rehabilitation of the Paralyzed (CRP) under William and Mary Taylor School (WMTS) was running this service for children with Cerebral Palsy. As a consequence, the researcher selected this topic. The current aim of the study was to evaluate the effects of hippotherapy on balance and gross motor function of children with CP.

Case Presentation

Case history

The child chosen for this study was 10 years old boy, with an athetoid type of cerebral palsy. He attended an inclusive school where he participated in a regular special education program. He has a history of bilateral fluctuating muscle tone in both the upper limb and lower limb. He has adductor muscles, hamstring, and achilles tendon tightness. According to the Gross Motor Function Classification System, his gross motor function was at Level II. He didn't have any serious medical issues or take any medications throughout this investigation. During the trial, the child was functional, did not need any assistive devices, and did not engage in any further forms of therapy or sports. He did not take any

hippo therapy intervention previously. The most common symptoms of the child were involuntary movement, tremors, poor posture, unsteadiness, twisting of the trunk, slow, writhing movements, abrupt movements, and language delay.

Method and Material

The study was conducted in the inclusive school named "William & Marie Taylor School" of CRP. Hippo therapy was conducted in CRP outdoor ground for several rounds for completing the target task. A single subject with a repeated-measures design was utilized for the evaluation of the outcome. A purposive sampling technique was applied considering the inclusion and exclusion criteria. Only single participant was selected who matched the criteria, especially those who are medically diagnosed with cerebral palsy without major complications likely uncontrolled seizures. The research was carried out between October 2021 and January 2022. The study was started after the acceptance of the protocol; following which data collection was started after getting consent and the study period was over after the submission of the final report.

Eligibility Criteria for Case

Inclusion criteria enrolled in the facility's riding program has a medical diagnosis of cerebral palsy, no medical complications such as uncontrolled seizures have the functional ability to sit and stand-alone or with support, having consent from parents or guardians, the child can follow simple directions and the child ages between 3 and 12 years. Exclusion criteria are as follows severe behavioral and cognitive problems; the child has had orthopedic or neurologic surgery previously and has a fever or infection at the time of the initial evaluation.

Data collection tools

This case study compared the scores of the Gross Motor Function Measure (GMFM) and Paediatric Balance Scale (PBS) before and after 16 weeks of horse riding sessions. The child's capacity to perform motor tasks like rolling, crawling, sitting, standing, walking, and running, using stairs and jumping was assessed by GMFM. A four-point ordinal scale of measurement is used to assess each item [14].

The PBS was used to assess balance. These 14 items, criterion-referenced measure evaluates the functional balance in everyday tasks [15]. Each item was scored on the criterion based on a 0 to 4-point scale. The items evaluated the functional tasks that kids must complete to safely and independently operate in the home, classroom, or community. This scale has also been validated for children with CP [16].

Data collection procedure

The child was accompanied by his parents on each occasion and participated in all sessions. The riding took place in CRP outdoor riding area. The same horse was used for

each session and was provided with all facilities. The horse had been used in the treatment purpose of special children of the CRP paediatric unit and WMTS. The subject was accompanied by one therapist, one child mother/caregiver in two side walkers, and a horse keeper. Riding was carried out with the use of a lightweight saddle to facilitate independence with handling and to promote a closer connection between horse and rider. The horse was led around the CRP outdoors by an experienced horse keeper at a walking pace while the child followed the commands of the instructor. The child was encouraged to utilize the reins and to provide verbal cues to the horse such as “Bahadur”, “Move on” and “Stand up”.

The half an hour session began with the horse and rider completing several large circles around the CRP outdoors and changing directions at least once. Before starting the session 10 minutes warm-up was completed. The acquired data's quality and reliability were confirmed again. Appropriate statistical analysis, calculation, and tests were carried out to relate variables according to the objectives of the study.



Figure 1: Effort to ride on the horse after warm-up.



Figure 2: Conducting hippo therapy session.

Hippotherapy Intervention

Time: The intervention was provided for a 30 minutes session of 3 times/week for 16 weeks.

Training progression: All exercises has a range from simple to complex.

Aim: To improve balance and gross motor function as well as improve self-confidence.

Phases: In hippo therapy intervention completed 3 phages as follows:

I. Firstly started all motions while the horse is still.

II. Secondly, all motions were done while the horse is moving forward slowly.

III. After that move first from left to right when the horse is walking on a big round stepping.

Exercises Intervention

1. Explain the plan to the entire team including the children and mothers.
2. Riding on the horse and making every effort to sit up straight.
3. Making head movements: rotating head to left, then to right, arms up, looking up and down.
4. Feeling the horse's head, between the horse's ears: first right, then left hand, then both hands.
5. Feeling the horse's back, as far as possible to its tail: first one hand, then the other hand.
6. Make trunk rotations with arms close to the body and arms widespread left-right.
7. Reaching practice for interesting objects forward and sideways.
8. Lying prone on the neck of the horse and lying back on the trunk of the horse.
9. Make words or sentences about the horse regarding body parts or how to live and what the horse is like to do or loves to eat.
10. Singing together with children's song: "head, shoulders, knee and toe" and so on while sitting on the horse and at the same time touching those body parts.

Results

All sets of GMFM scores were analyzed and compared to identify any changes in gross motor function. The pretest was conducted on the day before the initiation of the first scheduled riding session; the post-test was conducted upon the completion of the 16 weeks of horse riding sessions. The results of the post-test demonstrated significant

Table 1: Evaluation of Gross Motor Function Measure (GMFM-88) score

S/L	Dimension	Baseline Score (at 1 st session)	Final core (after 16 weeks)	Score differences
01	Lying & Rolling (17 x 3 = 51)	16	23	7
02	Sitting (17 x 3 = 51)	18	24	6
03	Crawling & Kneeling (14 x 3 = 42)	17	28	11
04	Standing (13 x 3 = 39)	11	13	2
05	Walking, Running & Jumping (24 x 3 = 72)	14	21	7

Table 2: Pediatric Balance Scale (PBS) score before and after interventions

S/L	Area of examination	Pretest score	Post-test score	Difference
01	Sitting to standing	1	3	2
02	Standing to sitting	1	3	2
03	Transfers	2	2	0
04	Standing unsupported	3	4	1
05	Sitting unsupported	1	2	1
06	Standing with eyes closed	1	3	2
07	Standing with feet together	0	1	1
08	Standing with one foot in front	0	2	2
09	Standing on one foot.	1	1	0
10	Turning 360 degrees.	0	0	0
11	Turning to look behind.	0	1	1
12	Retrieving object from floor.	1	1	0
13	Placing alternate foot on stool.	1	1	0
14	Reaching forward with outstretched arm.	2	2	0
	Total score (56)	14	26	12

improvements in all the dimensions of the GMFM score. In category A among 17 items 7 items had significant changes and 10 items had noticed no changes. In category B among 20 items 8 items had significant changes and 12 items had noticed unchanged. In category C among 14 items 11 items had significant changes and 3 items had noticed no differences. In category D among 13 items 4 items had significant changes and 9 items had noticed no differences. In categories E among 17 items 7 items had significant changes and 10 items had noticed no differences. Categories C named crawling and kneeling observed more significant changes whereas categories E named walking, running, and jumping observed less significant changes after completing 4 months of hippo therapy sessions.

In PBS among 14 variables 8 variables had significant improvement. Among 8 variables 4 variables like sitting to standing, standing to sitting, standing with eyes closed, and standing with one foot in front had superior improvement.

Among 8 variables 4 variables like standing with feet together, turning to look behind, sitting unsupported, and standing unsupported had moderate improvement. Variables transfers, standing on one foot, turning 360 degrees, retrieving

objects from the floor, and placing alternate feet on a stool had no change after completing 16 weeks of hippo therapy sessions.

Discussion

This study chronicled the changes demonstrated by 10 years old boy with CP and the direct effects of 16 weeks of hippo therapy on his gross motor skills and balance. Following intervention improvements are noticed in all categories of GMFM. Among the 5 categories kneeling and crawling, lying and rolling, and sitting had identified more changes whereas standing, walking, running, and jumping had noticed less change after intervention. After interventions of horse riding improvements were found in postural control, balance and coordination, and weight-shifting ability of the child. Postural control and muscle strengthening are two direct benefits that can be attributed to hippo therapy, thus adding strength gains to the flexibility improvements.

PBS is the modified version of the Berg Balance Scale (BBS) used to measure the balance ability in school going aged children. A study by Liao and Hwang (2003) found balance or postural stability in eye closed and swaying situations one leg

standing was strongly correlated with gross motor function [17]. Another study by Yi, Hwang, Kim and Kwon (2012) found that PBS scores have a high correlation with GMFS especially standing, walking, running, and jumping [18]. Along with physical findings in this clinical observation, the author and the child's parents reported subjective changes. The subject not only expressed excitement with riding, but the child's level of self-assurance and confidence appeared to increase with each passing week of horse riding, resulting in a decreased fear of overall movement.

Conclusion

The results of this case study showed a beneficial outcome of the horse riding program. A 16 weeks program consisting of half an hour of riding thrice weekly appeared to have positive. The outcome clearly demonstrated that hippotherapy is very much effective in most of the parameters of gross motor function and balance in children with cerebral palsy. Further research should be undertaken to help solidify more standard protocols for horse riding with children with cerebral palsy.

Compliance with Ethical Guidelines

This article paid attention to all ethical concepts.

Conflict of Interest

Authors declared that there was no competing interest.

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Author Contribution

All authors contributed to preparing write up, revising the article, and giving final approval of the version to be published. Authors consent to accept responsibility for all contents of the tasks.

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Ethical Approval

A subject for this case study was recruited from an inclusive school. Approval was obtained from the selected school and from the parent's willingness to participate in this study. The Child and his mother gave consent and agreed to participate in this observational case report study for 4 months. The mother also consented for his child and photograph to be published; his face is blocked out for anonymity.

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