

# The Effect of Hippotherapy on Balance and Coordination in Mentally Disabled Children

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## ABSTRACT

**Objective:** The development of psychomotor skills in individuals with mental disabilities progresses more slowly than their healthy peers. Therefore, it is very important for individuals with mental disabilities to do activities for the development of psychomotor skills. This study aims to examine the effects of hippotherapy training on balance and coordination skills in children with moderate and severe mental disabilities.

**Materials and Methods:** 40 students with moderate and severe mental disabilities, between the ages of 14-20, who continue their education in Erzurum Special Education Practice School, 3rd Grade, participated in the study. The participants were divided into two groups of 20 people as the hippotherapy group (HG) and the control group (CG). Before starting the study, the height and age of all students were recorded, and their body weights were measured with digital scales. Flamingo balance test to measure balance skills, balance board test, touch test to measure coordination skills, T agility test, and Illinois agility test and sit-and-reach test for flexibility skills were applied as a pre-test to the individuals. After the pre-tests were completed, 20 subjects in the hippotherapy group participated in the 20-minute hippotherapy training twice a week for 8 weeks at Atatürk University Hippotherapy and Olympic Equestrian Facilities. The control group did not participate in any application. The final tests of the subjects were carried out in the week after the hippotherapy training was completed.

**Results:** After eight weeks of hippotherapy, there was no significant change in the body composition of the subjects in moderate and severe levels in the hippotherapy group, yet positive significant changes were determined in balance, coordination, and flexibility skills. No significant changes occurred in the subjects in the control group.

**Conclusion:** As a result of the study, it was determined that hippotherapy positively affected balance, coordination, and flexibility skills in individuals with moderate and severe mental disabilities.

**Keywords:** Mental disability, hippotherapy, balance, coordination, flexibility

## INTRODUCTION

People have personal characteristics that make them different from each other. These personal differences are mainly due to physical, mental, and psychological characteristics. Sometimes the differences are seen as an organ deficiency or inability to fulfill any function. Disability, in general, is a situation where there is a physical or mental deficiency in any part of the individual that can occur in any period of pregnancy or after pregnancy. Due to these deficiencies, the individuals either cannot or partly can perform the roles that they have to fulfill in personal and social life. In the absence of independence in this way, disability occurs (1).

Hippotherapy is a method based on the similarities of the movement pattern of the walking of the horses and the human walking, which has been used as a treatment tool for the improvement of the mental and physical retardation of people with disabilities since the 1940s (2). The individuals who receive therapy during hippotherapy are active participants and they accompany the horse's rhythmic movements with the commands of the hippotherapy specialist. These movements made on the horse are symmetrical and continue as long as the horse moves (3). These rhythmic movements, combined with the horse's body temperature, give results that can improve the psychomotor skills of the individual receiving hippotherapy. To adapt to the horse's movements, individuals who receive hippotherapy have to actively use the nervous and musculoskeletal systems of the body (4). Therefore, in addition to the development of cognitive and affective skills, hippotherapy also improves the musculoskeletal systems and enables them to be transferred to other skills used in

daily life activities (5).

Limitations in psychomotor skills are a common feature in mentally disabled individuals in general, as inadequacy in brain development also affects motor function (6). Individuals with mental retardation are generally more passive in terms of physical activity than their peers with normal development (7). Injury-related falls are quite common in individuals with mental disabilities due to poor balance and coordination skills (8). Previous findings on individuals with mental disabilities support the view that functional abilities such as balance, coordination, flexibility, and strength are limited in these individuals compared to their normal peers (9). However, it has been claimed that motor characteristics such as strength can be improved significantly in individuals with mental disabilities with various exercise protocols (10, 11). Therefore, the goals of an exercise program to be created in individuals with mental disabilities should aim to develop psychomotor skills. One of the protocols aiming to develop motoric features is hippotherapy. It is assumed that hippotherapy exercises will also increase the balance, strength, flexibility, and coordination skills required for daily life activities of individuals with mental disabilities(5).

Determining the effects of hippotherapy on the balance, coordination, and flexibility skills of individuals with mental disabilities will be important in order to provide such individuals with their daily life activities more easily, to ensure hand-eye coordination in their education life, and to perform independent living skills on their own.

In this context, this study aims to investigate the effect of hippotherapy on balance and coordination skills in individuals with moderate and severe mental disabilities.

**MATERIAL AND METHOD**

**Study Population and Sample:** The population of the study consists of individuals with moderate and severe mental disabilities between the ages of 14-20 living in Erzurum. The sample of the study, on the other hand, consists of 34 male and 6 female students studying at Erzurum Special Education Practice School 3rd Grade in Palandöken district of Erzurum province. Ethics committee approval for the research was obtained on 26.04.2019 / 5 session of Atatürk University Faculty of Sport Sciences Ethics Committee. This study was supported within the scope of the Atatürk University Scientific Research Projects (Project No: 7421).

**Data Collection Instruments:** To determine the body composition of all subjects, age, height, and body weight measurements were made. The dependent variables in the study were flexibility measured by the sit-and-reach test (I), dynamic and static balance measured by the flamingo and balance board test (II), and coordination measured by the touch test, T Agility Test, and the Illinois Agility Test (III).

**Study Design:** After determining the sample group, the 40-person group was divided into two groups of 20, namely the hippotherapy group (HG) and the control group (CG). There were 17 boys and 3 girls in both the hippotherapy and control groups. To standardize the entire procedure, pre-tests were carried out three days before hippotherapy started, and post-tests were carried out within three days following the end of the application. The tests were applied for each subject included flexibility, touching, T Agility Test, Illinois Agility test, flamingo balance test, and balance board test, respectively. The tests were shown practically for the subjects to be able to comprehend and 1 trial was made before the measurements. Before the tests began, a 10-minute warm-up procedure and 5-minute rest intervals were given between each test. No verbal encouragement was given during the tests. The first and last tests were done and evaluated by the same people. CG was allowed to continue their daily life activities and not participate in any physical activity.

Hippotherapy exercises were performed at Atatürk University Hippotherapy and Olympic Equestrian Facilities, accompanied by the facility's hippotherapy experts and their assistants. Hippotherapy exercises were applied to the hippotherapy group (HG) in 20-minute sessions 2 days a week for 8 weeks. For individuals to participate in the training, before starting the training, hippotherapy was explained to the families, the families were informed about the positive and negative situations that may occur during the training and the risks that may occur, and a form was

taken from the families to accept these situations. Necessary safety precautions have been taken in hippotherapy applications. Subjects, wearing a helmet and a vest, carried out the application with two assistants. Before starting the hippotherapy application, the subjects were given warm-up exercises in the waiting room in the center, and then the individuals were taken to therapy in groups of four. During the therapy, the following steps were applied to the individuals, respectively:

- 1 Ability to balance sitting on a horse
- 2 Ability to stand and balance on a horse
- 3 Ability to give and take a ball with right hand on a horse
- 4 Ability to give and take a ball with the left hand on a horse
- 5 Ability to take the right foot back on a horse and hold it with the right hand
- 6 Ability to take the left foot back on a horse and hold it with the left hand
- 7 Ability to take both feet back on a horse and hold it with both hands.
- 8 Being able to throw the ball into the basketball hoop by balancing standing on the horse
- 9 Ability to hold a hoop with the right hand by balancing standing on a horse
- 10 Ability to hold a hoop with the left hand by balancing standing on a horse
- 11 Ability to hold a hoop with both hands by balancing standing on a horse
- 12 Leaning forward by releasing the reins
- 13 Leaning back by releasing the reins

**Data Analysis:** Mean and standard deviation (age, weight, stature) were used for the characterization of the sample used. Levene's test ( $p > 0.05$ ) and Shapiro-Wilk statistics ( $p > 0.05$ ) were used to confirm the homogeneity of the dependent variables. In order to establish the effect of the different interventions over the functional variables, a mixed ANOVA group model (HG, CG) x testing time (pre-test, post-test) was applied adopting a significance level of  $p < 0.05$ . Statistical analyses were performed using the SPSS version 25.

**RESULTS**

Table 1. Descriptive Characteristics of Subjects

|            | Hippotherapy Group (HG) | Control Group (CG) |
|------------|-------------------------|--------------------|
| Age(Year)  | 17,6 ± 1,38             | 17,1 ± 1,5         |
| Height(Cm) | 169,2 ± 8,4             | 163,4 ± 10,1       |
| Weight(Kg) | 58,5 ± 9,3              | 61,4 ± 13,5        |

Table 2. Comparison of Pre-Test and Post-Test for Control Group and Hippotherapy Group after 8-Week Hippotherapy Exercise Applications

|                                    |    | Pre            | Post           | t      | p     |
|------------------------------------|----|----------------|----------------|--------|-------|
| Touch Test (Second x 10)           | CG | 361.68 ± 79.34 | 363.35 ± 79.68 | -5,371 | ,000* |
|                                    | HG | 364.31 ± 79.19 | 272.45 ± 61.49 | 5,855  | ,000* |
| Illinois Agility Test (Seconds)    | CG | 28.47 ± 2.95   | 29.10 ± 3.22   | -1,227 | ,235  |
|                                    | HG | 28.29 ± 3.09   | 23.36 ± 3.09   | 12,24  | ,000* |
| T Agility Test (Seconds)           | CG | 15.99 ± 2.60   | 16.28 ± 2.67   | -6,122 | ,000* |
|                                    | HG | 16.13 ± 2.38   | 13.03 ± 2      | 10,852 | ,000* |
| Flamingo Balance Test (Total Drop) | CG | 11.60 ± 7.03   | 12.70 ± 6.39   | -3,688 | ,002* |
|                                    | HG | 11.30 ± 9.95   | 3.60 ± 3.64    | 4,83   | ,000* |
| Balance Board Test (Seconds)       | CG | 2.70 ± 1.02    | 2.47 ± .89     | 3,982  | ,001* |
|                                    | HG | 2.74 ± 2.24    | 8.42 ± 5.27    | -6,908 | ,000* |
| Sit-Reach Test Right Arm (Cm)      | CG | 11.35 ± 7.68   | 11.35 ± 7.46   | ,000   | 1.000 |
|                                    | HG | 12.55 ± 7      | 18.45 ± 8.55   | -5,229 | ,000* |
| Sit-Reach Test Left Arm (Cm)       | CG | 12 ± 8.76      | 11.85 ± 8.34   | ,900   | ,379  |
|                                    | HG | 12.05 ± 7.52   | 18.45 ± 8.85   | -4,471 | ,000* |

## DISCUSSION

Mentally disabled individuals generally have problems in the development of motor skills due to retardation in their mental functions. Solving these problems will make a positive contribution to the daily lives of mentally disabled individuals both physically and socially. The main purpose of this study is to reveal the effect of hippotherapy exercises on the balance and coordination characteristics of young people with moderate and severe mental disabilities. Considering the results of the study in general, it shows that hippotherapy practices have positive effects on the balance and coordination features of mentally disabled individuals and can be recommended for the development of balance and coordination. In this study, it was observed that there were positive improvements in the balance and coordination levels of the subjects in HG after eight weeks of hippotherapy exercise practices (Table 3.2.).

It has been determined that hippotherapy has positive effects on the static and dynamic balance levels of the subjects. The balance development of the subjects may be due to the similarity of the horse's gait biomechanics to that of the human during hippotherapy and the complex sensory-motor stimuli it presents with this similarity. On the other hand, it can also be thought due to the facts that the existence of different motivational elements, the formation of a sense of movement, the horse's adaptations to the oscillations in the front-back and right-left directions, the deficiencies in the proprioceptive systems giving strong responses of the horse to the gait, the development of the neuromuscular system and more focus on feedback.

It is important to develop balance in mentally handicapped individuals in order to prevent falls that cause physical and psychological negative effects. It is suggested that the use of balance improvement programs specific to individuals with mental disabilities will help prevent falls (12).

It was determined that hippotherapy had positive effects on the coordination skills of the subjects. The coordination development of the subjects can be considered to be caused by changes in balance and sense of movement in particular. In addition, the development of coordination levels, as stated in previous studies, may be affected by the development of muscle visual and auditory perceptions, the development of motion perception, the increase in the level of proprioceptive stimulation, the achievement of postural control, and the strengthening of the core-trunk connection (10, 13-16).

The development of biomotor abilities is interrelated and the development of one motor feature affects the development level of another motor feature. In this context, it can be thought that balance and coordination properties may be improved depending on the muscle strength, postural control, movement perception, strength, flexibility, and psychological characteristics developed in conjunction with hippotherapy.

In conclusion, hippotherapy applications can be used in individuals with CP, autism, Down Syndrome, and physical disabilities (2, 3, 17-19), it also has positive contributions to individuals with moderate and severe mental health problems physically and it is a recommended

practice for the movement development of individuals with mental disabilities.

## CONCLUSION

As a result of the study, it was determined that hippotherapy exercises will contribute positively to the development of balance, coordination, and flexibility skills of children with moderate and severe mental disabilities.

The results we obtained from our study are in line with the results of the studies conducted in the field of hippotherapy and reveal the positive contributions of hippotherapy to the balance, coordination, and flexibility skills of individuals with mental disabilities.

Considering the difficulties of working with people with moderate and severe mental disabilities, hippotherapy enables people with moderate and severe mental disabilities to participate in the activity in a fun way and makes a difficult educational process easier.

**Implications:** More comprehensive studies can be conducted with different disability groups and larger sample groups. More comprehensive studies can be carried out with different disability groups considering sociological and psychological factors. More comprehensive studies can be carried out with different times and skills.

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