



## RESEARCH ARTICLE

# The Impact of Aquatic Rehabilitation Exercises on Improving Motor Abilities In Spastic Paralysis Patients Aged (6-8) Years

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### Abstract

The researchers aim to address the rehabilitation of children with simple spastic cerebral palsy, emphasizing the importance of early intervention for faster and better rehabilitation. The study also aims to develop exercises and use an aquatic environment for the rehabilitation of children aged 6-8 years with simple spastic cerebral palsy, assessing the impact of aquatic exercises on the rehabilitation and motor abilities of this age group. The research sample, consisting of five individuals with simple spastic cerebral palsy, was purposively selected from the Happiness Institute for Physically Disabled Individuals in Baghdad. The researchers ensured homogeneity in variables such as height, weight, age, and severity of the condition to establish a common starting point for the intervention. The researchers condensed their findings into an aquatic therapy method, believing in the scientific and field capabilities of individuals, provided there is access to modern information, devices, and advanced means, conducting scientific experiments to enhance the effectiveness of the beneficiaries. The significance of the research lies in the rehabilitation of individuals with spastic cerebral palsy, aiming to save time and effort and increase motivation for faster, better, more advanced, and enjoyable rehabilitation for them. The designated place for treatment at the Happiness Institute for Physically Disabled Individuals with Simple Spastic Cerebral Palsy is for children aged 6-8 years, specifically males.

### Keywords

Aquatic Rehabilitation Exercises , Improving Motor Abilities , Spastic Paralysis Patients

## INTRODUCTION

The focus on childhood is of paramount importance, considering that a child is a being in need of care to perform daily and vital tasks. They can be involved in various activities through their interaction with the surrounding environment, play, movement, and participation with peers. Numerous diseases, including cerebral palsy, make the child unable to move naturally.

"Cerebral palsy" is a condition affecting children, a term referring to a child whose natural brain development is hindered due to incomplete growth or damage to cells in areas responsible for movement, posture, and balance during their natural growth phase (Obeid, 1999). The researchers reviewed several studies related to the

topic under investigation. For instance (Subhan, 2007) explored the relationship between cerebral palsy and the performance of certain motor skills in children, using a descriptive approach in his study. The study concluded that the muscle groups working in children were weak. Another study by (Ibrahim, 1999) focused on the impact of rehabilitation exercises using a space suit, revealing that the rehabilitation program increased muscle strength (Saleh, 2018) examined the effects of a rehabilitation program using an aquatic environment on improving some motor abilities in children with spastic cerebral palsy.

The researchers aim to address the rehabilitation of children with simple spastic cerebral palsy, emphasizing the importance of early intervention for faster and better

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rehabilitation. The study also aims to develop exercises and use an aquatic environment for the rehabilitation of children aged 6-8 years with simple spastic cerebral palsy, assessing the impact of aquatic exercises on the rehabilitation and motor abilities of this age group.

The researchers identified statistically significant differences between pre-test and post-test results for the research sample, indicating the effectiveness of the aquatic exercises in the rehabilitation process.

The research field included physically disabled children with simple spastic cerebral palsy, males aged 6-8 years, at the Happiness Institute for Physically Disabled Individuals in Baghdad. The temporal scope ranged from July 25, 2023, to October 1, 2023, and the spatial scope was the rehabilitation therapy hall at the Happiness Institute. The researchers employed an experimental method with a single-group pretest-posttest design, suitable for addressing the research problem. This approach was chosen based on the nature of the problem and its requirements (Ibrahim, 2000).

## MATERIALS AND METHODS

### Procedures

The research sample, consisting of five individuals with simple spastic cerebral palsy, was purposively selected from the Happiness Institute for Physically Disabled Individuals in Baghdad. The researchers ensured homogeneity in variables such as height, weight, age, and severity of the condition to establish a common starting point for the intervention.

This article's necessary ethics committee permissions were obtained with University of Baghdad College of Physical Education and Sports Sciences for Woman Ethics Committee Commission Date: 17.01.2024 Issue/Decision No: 2024/13. Regarding vulnerable groups, the authors took into account the needs and priorities of the groups/individuals in which the study was conducted, in accordance by Articles 19 and 20 of the WMA Declaration of Helsinki, and the situation that the study could not be carried out outside these groups and individuals was taken into account. "In this study, additional precautions

were taken by the researcher(s) to protect the volunteers."

**Table 1.** Shows the homogeneity of the sample in variables (height, weight, age, and severity of the condition).

Variable	Unit of Measurement	X	SD	Median	Skewness
Height	cm	130.4	29.53	130	0.081
Weight	kg	24.33	7.21	24	0.166
Age	years	7.75	1.18	8	0.421
Severity of Injury	All individuals in the sample of children with simple spastic cerebral palsy				
Mean (X), Standard Deviation (SD)					

Regarding the methods, tools, and equipment used in the research, they included Arabic and foreign sources, the internet, personal interviews, a medical scale, a Sony camera, Kinovea software for extracting joint motion media, a measuring tape, a swimming pool, and warm water.

**The tests used in the research are as follows**

### Flexibility

Measured using Kinovea software for the range of motion of the shoulder joint and rising from a seated position on a chair.

### Measurement

Calculated the time it takes to rise from the chair upon command.

### Balance

Conducted balance tests tailored to the sample of those with injuries, including walking a distance of 5 meters and measuring the number of steps by walking on a straight line on the ground, 10 cm wide, over a distance of 5 meters.

### Strength

Measured strength through grip strength, calculated in kilograms. The researchers conducted a pilot experiment on July 25, 2023, in the physical therapy hall to understand the workflow, the assisting team, the test procedures, and the rehabilitation program's progress.

The preliminary tests were conducted on July 27, 2023, at 10 AM in the rehabilitation hall at the Institute of Happiness in Baghdad. The main experiment was implemented on the research sample, applying aquatic rehabilitation exercises with progressive repetitions from easy to difficult, focusing on stability exercises in the initial units, followed by more challenging exercises involving changes in walking directions inside the water to improve balance. The post-tests were conducted on

October 1, 2023, at 10 AM in the Institute of Happiness for Physical Disabilities in Baghdad under the same conditions as the preliminary tests.

### Statistical Analysis

A statistical program was used in the statistical analysis of the data obtained. Arithmetic mean, standard deviation, frequency, minimum and maximum values were used in statistical

representations of the data. In the normality testing of the data, kurtosis and skewness values of  $\pm 1.5$  were taken into consideration. Independent Samples T-test were used in the analysis of normally distributed data.

## RESULTS

**Table 2.** shows the results of two tests (pre and post) for the range of motion test.

N.	Variables	Measurement Unit	Pre-Test		Post-Test		t Value	Error Level	Significance
			M	SD	M	SD			
1	Shoulder Range of Motion	Degrees	115.8	35	128.3	37.88	3.119	0.001	Significant
2	Rising from Seated Position on Chair	Seconds	5.2	1.81	4.22	1.55	4.310	0.026	Significant

**Table 3.** shows the results of two tests Pre-Test and Post-Test of strength and balance variables for the research sample.

N.	Variables	Measurement Unit	Pre-Test		Post-Test		t Value	Error Level	Significance
			M	SD	M	SD			
1	Strength	kg	3.22	0.18	5.83	1.77	3.088	0.001	Significant
2	Balance	Number of Steps	15.21	3.76	10.48	3.53	3.381	0.013	Significant

## DISCUSSION

As evident from Tables (2) and (3), which display the means, standard deviations, differences in means, differences in standard deviations, calculated t-values, and error levels for the pre-test and post-test of the experimental group in the shoulder range of motion, sit-to-stand, muscle strength, and balance tests for the research sample, significant differences are observed.

The researchers attribute these significant differences to the exercises designed and implemented within the aquatic environment, aiming to enhance the range of motion and balance. The exercises, involving balanced steps after several rehabilitation units applied to the sample, led to increased joint and muscle flexibility. The role of rehabilitation exercises goes beyond providing the range of motion for muscles, tendons, and ligaments. The diversity in exercise types stimulates nerve activity around the shoulder joint, a point emphasized by (Singer, 1982; Sadek, 2000) who highlights that aquatic exercises enhance functional device stimulation by raising the efficiency of neural and muscular work, aiding in muscle metabolic processes.

Moreover, walking with aquatic supports and performing ascending and descending movements in the water using existing aids, along with exercises involving rubber balls, contributed to improving grip strength (Samiha, 2010; Mufti, 1998). also emphasized the positive effects of aquatic exercises on muscle strength development. The physical properties of water greatly facilitated better performance of rehabilitation exercises. The researchers confirm that aquatic exercises harmonized with aquatic therapy, significantly contributing to strength development.

The aquatic rehabilitation exercises also contributed to muscle growth, and the researchers noted that each movement encountered specific core muscles. Regular rehabilitation exercises increased the activity of muscles around the joints by intensifying the difficulty of rehabilitation exercises. Every increase in difficulty, as mentioned by (Nasif, 1998), corresponds to an increase in the capacity of organic devices, ensuring their growth and development.

### Conclusions

Based on the results obtained, the researchers concluded: The rehabilitation program within the aquatic environment effectively

improves motor skills for individuals with spastic cerebral palsy in the research sample, the effectiveness of the aquatic rehabilitation program contributed to enhancing strength and balance through diversified exercises in the aquatic environment for the research sample.

### Recommendations

According to the conclusions, the researchers recommend: Raising awareness and promoting the culture of rehabilitation exercises among various community segments, emphasizing the necessity of engaging in rehabilitation exercises and avoiding surgical interventions as quick solutions, and using small brochures with diverse exercises for different injuries and distributing them within physical therapy centers .

### ACKNOWLEDMENT

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### Conflict of Interest

The author declare no conflict of interest.

### Ethics Committee

This study was performed by adhering to the Helsinki Declaration. ethics committee permissions were obtained with University of Baghdad College of Physical Education and Sports Sciences for Woman Ethics Committee Commission Date: 17.01.2024 Issue/Decision No: 2024/17

### Author Contributions

Planned by the authors: Study Design, SBH and SAH ; Data Collection, SBH and SAH; Statistical Analysis, SBH and SAH ; Data Interpretation, SBH and SAH ;Manuscript Preparation, SBH and SAH; Literature Search. All authors have read and agreed to the published version of the manuscript

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## Appendix: Aquatic Rehabilitation Exercises

### 1- Seated Chair Exercises:

In a seated position on a chair, the therapist moves each finger individually, then brings the fingers together in a bending, stretching, and rotating motion.

### 2- Seated Chair Foot Exercises:

While seated on a chair, the therapist moves the right injured foot in bending, stretching, and rotating motions, repeating the process on the other foot.

### 3- Underwater Seated Chair Exercises:

Seated on a chair in the water, the therapist moves the right leg of the patient from the knee joint upwards and then lowers it downwards, repeating the process on the other leg.

### 4- Pool Standing Exercises:

In a pool, the patient walks two steps forward and then returns two steps backward, followed by five steps forward with the assistance of the therapist.

### 5- Seated Chair with Small Ball in the Pool:

Seated on a chair in the pool with a small ball beneath the injured patient's feet, the patient rolls the ball forward.

### 6- Pool Walking with Handle Support:

Walking inside the pool, the patient takes five steps forward while holding onto the pool's edge.

### 7- Assisted Pool Walking:

Walking inside the pool, the patient takes two steps forward, then returns two steps backward, followed by five steps forward with the assistance of the therapist.

### 8- Seated Chair Assistance in the Pool:

Seated on a chair in the pool, the patient, with the therapist's assistance, stands up and then sits back down on the chair.

### 9- Seated Chair Assistance with Wheeling:

Seated on a chair in the pool, the patient, with the therapist's assistance, pushes the chair handle while standing up.

### 10- Side Walking in the Pool:

Inside the pool, the patient walks two steps to the left, then returns to the starting position with the therapist's assistance.

### 11- Side Walking in the Pool (Other Side):

Inside the pool, the patient walks two steps to the right, then returns to the starting position with the therapist's assistance.

### 12- Seated Chair with Small Ball on Thighs:

Seated on a chair in the pool with a small ball on the injured patient's thighs, the patient lifts and lowers the ball to a comfortable level with the assistance of the therapist.