A REHABILITATION PROGRAM PROPOSED FOR STRENGTH AND BALANCE EXERCISES AND ITS IMPACT ON SITTING AND STANDING SKILLS OF CHILDREN WITH FLACCID CEREBRAL PALSY

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Abstract A body of studies highlighted the role of exercise and training in helping children with Flaccid Cerebral Palsy to perform daily movements. These exercises strengthen the muscles responsible of movement and increase the muscle tone. Moreover, flexibility exercises restore the range of motion of joints and extend the restricted muscles, ligaments and tendons, supporting children in sitting and standing as well as other movements such as crawling and walking.

As a therapist at the Cerebral Palsy Rehabilitation Center for Children, the researcher observed, as a research problem, children's inability to sit and stand as a result of weakened muscle and imbalance in agonist and antagonist muscles, in addition to lack of flexibility as a result of ligaments and tendons shortness.

Hence, the study aims to identify the relationship between strength and balance and their impact on the sitting and standing skill in children with cerebral palsy, and to identify the strength and balance development and their impact on the sitting and standing skills in children with cerebral palsy.

The researcher uses the experimental method to tackle the research problem using a single group method.

The research sample includes (12) children aging (2-4) years of the Specialized Rehabilitation Center of Patients with Cerebral Palsy and Walking Difficulty. All members of the sample suffer from the flaccid or soft type.

The results indicate that the more child with adequate strength are more capable of performing the basic movement skills such as sitting and standing. In addition, children possessing balance, are more able to sit and stand stably, and that regular exercises based on scientific foundations lead to building muscle strength.

Keyword
Rehabilitation –Flaccid - Cerebral –Palsy

1 Introduction

1.1 Background and Research Significance

The world development in terms of inventions, chemical research, and the quality breakthroughs that have accompanied modern advancement in technology, have affected human beings and their growth, especially children. Such inventions or effects include radiation, vibrations, pollution, and factories or war waste, and epidemics. These have caused many diseases and birth defects, including cerebral palsy.

Cerebral palsy (CP) is a non-contagious disease that directly affects the brain, movement, and speech, leading to muscle weaknesses, such as flaccidity or excessive contraction. The injury varies from one child to another, and it may be either hemifacial or total. It occurs either congenital or due to accidents, brain damage, or mother

infection with during pregnancy, such as insufficient access of oxygen or other causes or after-birth diseases. (11-14)

Cerebral palsy is simply defined as a set of disorders that affect an individual's ability to move, muscle tension, or body position. It occurs as a result of damage to the brain before its complete development, often before birth. It is most common in children, and its impact on body functions varies. It affects sight, causing problems with vision, hearing, or even speech, changes in the curvature of the spine, and joint problems. (20)

Studies have stressed the role of exercise and training in bringing affected group back to performing basic daily movements. Furthermore, exercises improve the strength of muscles responsible of movement and increase muscle tone. In addition, flexibility exercises restore the range of motion of the joints and stretch the muscles, ligaments and tendons.

The significance of the current research is valued in providing rehabilitative exercises that could help affected children practice daily life movements so that the child is able to sit and stand preparing them to perform further movements such as crawling and walking.

1.2 Research Problem

After observation, as a therapist at the Cerebral Palsy Rehabilitation Center for Children, the researcher noticed children's inability to sit and stand due to lack of muscle strength and balance in the agonistic and antagonist muscles. Moreover, lack of flexibility was observed owing to shortness of the ligaments and tendons.

Therefore, the researcher sought to understand the role of strength and balance exercises to rehabilitate children with cerebral palsy to assist them perform daily movements.

The research problem lies in the following question: Is it possible to practice daily life skills for patients with cerebral palsy?

1.3 Aims of study:

The study aims to:

1. Identify the correlation between strength and balance and their impact on the sitting and standing skills of children with cerebral palsy.

2. Identify and examine the impact of improvement in strength and balance on the sitting and standing skills of children with cerebral palsy.

3. Identify the effect of strength and balance exercises and their impact on the sitting and standing skills of children with cerebral palsy.

1.4 Research hypotheses

1. There is a correlation between strength, balance, and sitting and standing skills for children with cerebral palsy.

2. There is a significant difference between the pre-test and post-test of the strength and balance characteristics of children with cerebral palsy.

3. There is a difference between the pre- and post-measurements of the sitting and standing skills in favor of the post-test.

1-5 Research scopes:

1-5-1 The human scope: children with cerebral palsy

1-5-2 Time frame: from 11/11/2021 to 8/5/2022

1-5-3 Spatial scope: Specialized Rehabilitation Center of Patients with Cerebral Palsy and Walking Difficulty in Diwaniyah.

2- Research methodology and field procedures:

2-1 Research methodology:

In this study, the experimental method is used to solve the research problem using a single group method. The experimental method is the most efficient method to solve problems via scientific procedures. It is also the only method that can genuinely test the hypotheses of cause or effect relations. (108:31)

2.2 Research sample:

Twelve children of (1-4) years old in the Specialized Rehabilitation Center of Patients with Cerebral Palsy and Walking Difficulty were selected purposively. All members of the sample suffer from the flaccid or soft type.

2.3 Homogeneity variables:

Table (1)

The arithmetic mean, standard deviation, and coefficient of variation for the dependent variables

#	Variables	Measure Unit	Mean	SD	Variation Coefficient
1	Age	Year	2.54	0.17	6.69
2	Height	CM	89	2.745	3.08
3	Weight	KG	10.9	1.67	15.32

Article I.   2.4 Field procedures

2.4.1 Tests Used

One- Strength

- Test 1

1. Name of test: Assisted sit-ups (Figure 1)

2. Purpose of test:

A - Body posture improvement: If the abdominal muscles are weak, the person may suffer from Scoliosis (hunchback) because of lack a muscular system to support straight posture. However, when muscles are strong, the standing becomes more straight and a person may even appear taller.

B-Building practical strength: Simple activities such as shoe tying or pick something up from ground may be considered difficult tasks for a person with weak midsection. These movements require strong abdominal muscles, and exercises help to strengthen and support them.

C- Balance improvement: Balance is not limited only to standing on one leg or walking on a tight rope; rather, it is related to the daily tasks and situations, such as walking on an uneven surface, or riding a bicycle on a rough road. Strong abdominal muscles help the person to deal with these situations, without falling, hence, avoiding disasters(12) .

3. Tools:

A- A mattress

B- Assistant

(2)

T- Rubber rope
D- Dynamometer device
4. Test description:
Extending the entire body on a medical bed, stabilizing legs, and securing the supporting elastic rope around the patient's shoulder girdle to partially support the patient sit up.
5. Measurement method: dynamometer.
- Test 2:
1. Test name: Semi-back arch. Figure (2)
2. Purpose of test: (29)
A- Strengthening the lower back
B- Strengthening the muscles around the spine
T- Strengthening the sides
3. Tools:
A- Assistant
B- Dynamometer device
C- Belt
4. Test description:
By standing, stabilizing the legs as the back goes up and down
5. Measurement method: dynamometer.
- Test 3:
1. Test name: Squatting. Figure (3)
2. Purpose of test: (12)
A- It targets all muscles of the body
B- Increases strength and body weight
C- It helps improve balance
D- It helps in the secretion of testosterone in the body
3. Tools:
A- Assistant
B- Dynamometer device
C- Belt
4. Description of test: Positioning on the dynamometer and holding the chi[...] e knee, and then sitting down and getting up.
5. Method of measurement: dynamometer.
Two: Balance
- Test 1:
1. Test name: Convex Board Sitting Balance. Figure (4)
2. Purpose of the test:
A- Helping the child with balanced sitting
B- Strengthening the muscles of the sides
3. Tools:
 A- A board with a convex floor
B- Hard cushion
4. Description of the test: Place the cushion on the board, the child sits on the cushion, and moves the board right and left.

Assisted Sit Up Test

re (2)
ack arch

Co[...]alance

5. Measurement method: seconds.

Test 2:
1. Test name: Assisted standing balance. Figure (5)
1. Purpose of the test:
A- Teaching the child to stand with balance
B- Self-reliance and control over body parts
2. Tools:
A- Hard cushion
B- Assistant
3. Description of test: The assistant positions the hard cushion on his
legs, stands the child on it, and begins moving the cushion up, right and left.
4. Measurement method: seconds
Three-Skills:
- Skill one:
1. Test name: Sitting
2. Purpose of the test:
A- Evaluating sitting skill
3. Tools:
A- Mattress
B- Assistant
4. Test description: Crossed leg sitting (11)
5. Measurement method: The videos were shown to experts and specialists*. Skill performance was evaluated on a scale of 10 points, see indexes**.

2.4.2 Scientific foundations of tests:

To ensure correct measurement, the researcher should verify the scientific coefficients of the pre-tests. For this purpose, the researcher found the coefficients of validity, reliability, and objectivity for the tests that were nominated.

• Test Validity: "A test is valid when it measures the purpose for which it was developed" (53:21). There are types of validity. The researcher chose face validity. "This type of validity indicates the general appearance of the test as a means of mental measurement and is valid in physical and skill tests." (26:32)

• Test Reliability: It expresses "a test that gives approximant results or the same results if it is repeated more than once and under the same conditions" (55:11)

Table (2): Showing the reliability and objectivity coefficients of the applied tests

#	Test name	Validity coefficient	Objectivity coefficient
1	Assisted Sit Ups	0.87	0.87

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* See index (2)

** See index (3)

| 2 | Semi-Back Arch | 0.81 | 0.85 |
| 3 | Squatting | 0.82 | 0.85 |

The researcher calculated the reliability coefficient for the nominated tests on the sample subjects of (12) children attending the Specialized Rehabilitation Center of Patients with Cerebral Palsy and Walking Difficulty on (11/16/2021). Then the same skill tests were repeated after (three months) on (1/16). /2022), Table (2).

• Test Objectivity: A test is objective if "the results of the test are not affected by the subjectivity or bias of the examiner, and that the examinee obtains a certain score when more than one examiner grade the test" (53:30). The researcher found objectivity for each test by finding the simple correlation coefficient (Pearson), where two experts were used when performing the test, Table (2.

2.4.3 Pre-test:

The pre-test was conducted individually on 11/16/2021, in other words, the test was administered to the first patient on 1/16/2021 and the last patient on 2/1/2022.

2-4-4 Qualifying curriculum/exercises:

Strength and balance exercises* were applied individually according to the date the patient joined the Specialized Rehabilitation Center of Patients with Cerebral Palsy and Walking Difficulty. The exercises continued to be applied for a period of (three months) at a rate of 6 units per week, from one hour to an hour and a half.

2-4-5 Post-test:

The post-test was applied under the same conditions of the pre-test starting on 1/16/2022.

2-5 Statistical methods used in the study: (28: 127-290)

The researcher used the SPSS statistical package

3- Analysis and discussion of results

In this chapter, the researcher presents, analyzes and discuss the results of the pre-tests and post-tests. The chapter also reviews the collecting the specialists' scores to evaluate the skill performance, the pre-tests and post-tests, as well as the results of the pre- and post-videography.

3.1 Presentation and analysis of results:

3.1.1 Presentation and analysis of the correlation between strength and balance with the sitting skill:

Table (3): Showing the correlation between sitting, physical attributes (strength - balance) and level of significance

Skills	Physical attributes	Pearson Correlation Coefficient (r)	Significance level	Result
	Abdominal muscles strength	0.943	0.001	Significant
	Dorsal muscles strength	0.921	0.000	Significant
	Balance	0.987	0.000	Significant
	Strength	Article III. *0.965*	Article II. *0.000*	Significant

	Power	0.986	0.000	Significant

Table (3) demonstrates that the correlation coefficient between sitting and the abdominal muscle strength is (0.943), which is a significant correlation between the two variables. Likewise, the correlation coefficient of sitting with the strength of the dorsal muscles was (0.921), which is a significant correlation. This means that the appropriate strength of movement muscles leads to better sitting.

As for the correlation between sitting and balance, the correlation coefficient was (0.987), which is significant. This means that an individual possessing the characteristics of balance increases the chance of obtaining stable sitting. The correlation coefficient (r) between standing and muscular strength is (0.965), which is a significant. This means that the appropriate strength of movement

muscles leads to better standing. As for the correlation of standing with balance, the correlation coefficient is (0.986). The relationship is highly significant, which indicates that the more the individual possessed the characteristics of balance, the more balanced his standing was.

3-1-2 Presentation and analysis of the pre- and post-test for strength and balance:
Table (5) shows the arithmetic means, standard deviations, and t-test value for the tests used

Test	Measure unit	Pre-test		Post-test		t-test	Significance level	results
Assisted Sit up	kg	2.463	1.032	15.328	2.467	12.375	0.000	Significant
Semi Back Arch	kg	3.271	1.125	12.463	2.432	10.159	0.000	Significant

Squatting	kg	5.692	2.05	18.911	4.351	8.647	0.000	Significant
Sitting balance	sec	3.2	1.3	205	2.72	9.270	0.000	Significant
Standing balance	sec	0	0	45.6	1.30	20.301	0.000	Significant

Skill	Measure unit	Pre-test		Post-test		t-test	Significance level	results
Standing	sec	3	0.643	7	0.703	6.437	0.000	Significant
Sitting	sec	0	0	6	1.027	8.839	0.000	Significant

Table (5) shows that the difference value of the arithmetic means for the sit-up test is (12.375), which is significant at a level of (0.000). This means that there is a significant difference between the pre-test and the post-test in favor of the post-test. The difference value of the arithmetic means for the semi-back arch test is (10.159), which is significant at a level (0.000). This means that there is a significant difference between the pre- and post-tests in favor of the post-test. The difference value of the arithmetic means for the squatting test is (8.647), which is significant at the level (0.000). This means that there is a significant difference between the pre-tests and post-tests in favor of the post-test. The difference value of the arithmetic means for the sitting balance test is (9.270), which is significant at the level (0.000). This means that there is a significant difference between the pre-tests and post-tests in favor of the post-test. The difference value of the arithmetic means for the standing balance test is (20.301), which is significant at the level (0.000). This means that there is a significant difference between the pre-tests and post-tests in favor of the post-test.

3-1- 3 Presentation and analysis of the pre-test and post-test for the sitting and standing skills:

Table (6) shows the arithmetic mean and standard deviation of the pre-tests and post-tests for the sitting skill and the standing skill, the difference value of the arithmetic means, and the level of significance.

Table (6) shows that the advancement is significant in the sitting skill. The pre-test arithmetic mean was (3) and the post-test mean is (7). The development is considerable, and the value of the test of differences (t-test) was up to (6.437), which is significant at a level of (0.000). This means that there is a vast difference between the pre-tests and post-tests, in favor of the posttest. The development is clear in standing, where the pre-test result was (0) and the post-test was (6), indicating a significant development, and the value of the test of differences (t-test) reached (8.839), which is significant at a level of (0.000). The result shows overcoming increment in self-confidence over the fear characteristic among patients via exercises used in the program.

3.2 Discussion of the results:

After presenting and analyzing the results of the pre- and post-tests of physical characteristics, and sitting and standing performance, it was indicated that the stronger muscles the child has in the midsection or torso (abdomen - back), the more the they will be able to perform the sitting and standing skills with more balance and stability. The researcher agrees with Mufti Ibrahim Hammad that muscular strength is considered an important part related to children's health. It is one of the most important elements influencing the physical performance of children during their daily lives. It is also considered one of the most important influencing elements in their acquisition of motion abilities enhancing the performance and development of these abilities.

Moreover, children who are characterized by high levels of strength of muscle muscles have higher chances of adapting to different life conditions. (19:15-16)

When conducting the pre-tests for strength, balance, and skill performance, the values were low. This weakness was the main reason for the child's inability to perform basic movements, which prompted parents to enroll their children in the Specialized Rehabilitation Center of Patients with Cerebral Palsy and Walking Difficulty in order to obtain the appropriate strength and balance enabling them to sit and stand. The center relies on exercises based on scientific foundations, such as gradating the exercise from easy to difficult, from fixed resistance to moving resistance, in addition to balance exercises of both types (fixed and mobile). This was clearly demonstrated in the post-tests of strength tests, which in turn affected the performance of the sitting and standing skills. There is a considerable difference between the pre-test and the post-test. Hence, there was a noticeable weakness in the pre-test seen in the child's inability to balance, sit, or stand. The strength in the pre-test was (2-5). After training over a period of three months, at a rate of six units per week, for one hour to an hour and a half, with suitable exercises for the condition of each patient, while gradually increasing the intensity of the exercises, and changing the course every month, the difference became significant in the post-test, and the arithmetic mean for strength reached (12-18).

The current results agree with (Abdullah Hussein Al-Ami) that individuals who are characterized by muscular strength can record high degrees of physical ability. In general, it is concluded that muscular strength enhances the health condition of the ordinary person and the athlete. Hence, developing strength accelerates the development of basic skills and physical characteristics and helps to strengthen bones, ligaments and muscle fibers and reduce osteoporosis. It also gains physical fitness and develops motion ability and is considered an essential for individuals. It also gives individuals a decent appearance, a fit body and reduces injuries while performing skills (18:129-130). Muscular strength is considered an essential factor of physical fitness and may be used as a preventive treatment against congenital and physical deformities and defects. This is in line with McCloy who proved that muscular strength is considered an essential element in motion ability. Moreover, strength is crucial for athletic physical activity. It has an effective role in performing life skills. Muscular strength gains boys and girls a cohesive physique in all their basic movements.(1)

4 -Conclusions and recommendations

4.1 Conclusions:

1. Strength enables a child to perform basic life skills, such as sitting and standing.
2. Whenever a child possesses balance, he is able to sit and stand stably.
3. Regular exercises based on scientific foundations lead to building muscle strength.
4. Various balance exercises (fixed and mobile) lead to the development of the child's performance of sitting and standing.
5. The child's acquisition of the skills of sitting and standing gives the child confidence to perform other skills, such as walking.

4.2 Recommendations:

1. The necessity of adopting the exercises prepared by the center for children who suffer from problems sitting and standing.
2. The necessity of developing strength and balance for other types of cerebral palsy.
3. The need for families to pay attention to muscular strength because it is the basis for performing all basic life skills.
4. The need for people to pay attention to the mobile balance rather than limiting to the fixed balance.
5. The necessity of conducting similar studies on other physical characteristics and identifying their impact on the performance of children with cerebral palsy.

References

1. Abdullah Hussein Al-Lami(2010),Sports training for students of colleges of physical education, Al-Qadisiyah University, Dar Al-Bayda for Printing and Design,.
2. Mufti Ibrahim Hammad. Foundations of Developing Muscular Strength with Resistance for Children in the Primary and Middle Schools, Cairo, Amoun Press.
3. Olfat Al-Shafi'i. (2013). Cerebral Palsy Disability, Assiut University.
4. Khairuddin Ahmed Owais. (1999). Scientific Research Guide, Cairo, Dar Al-Fikr Al-Arabi.
5. Raysan Khuraibit Majeed. (1995). Applications in Physiology and Sports Training, Baghdad, Nour Printing Office.
6. Saad Mohsen Ismail. (1996). The effect of training methods to develop the explosive power of the legs and arms on the accuracy of long-range shooting by jumping high in handball, doctoral thesis, College of Physical Education, University of Baghdad.
7. C. Al-Arabi Abdel-Razzaq. (2019). Research submitted as part of the requirements for obtaining a master's degree, proposed therapeutic exercises in the aquatic environment to improve motor coordination and balance in a person with cerebral palsy.
8. Abdel Hamid. (2001). Physical and motor education for normal children and those with disabilities.
9. Ali Al-Beik. Sports Training Planning, Alexandria, Dar Al-Ma'rifa University.
10. Kamal Jamil Al-Rabadi. (2001). Sports training for the twenty-first century, Amman.
11. Muhammad Jassim Al-Yasiri. Principles of Educational Statistics, An Introduction to Descriptive and Inferential Statistics, Dar Al-Diyaa for Printing and Design, Najaf.
12. Muhammad Hassan Allawi. (1992). The Science of Sports Training, Cairo, Dar Al-Fikr .
13. Mohamed Mahmoud Abdel Dayem (et al.).(1993). Physical Training and Weight Training Programs, Cairo .
14. Mushtaq Abdul Redha Machi Sharara. (2016), Scientific Research , Zero One Printing and Advertising Press, Al-Qadisiyah.
15. Mustafa Hussein Bahi. (1999). Scientific and Practical Transactions between Theory and Practice, Al-Kitab Publishing Center .
16. Hara (translated by Abd Ali Nassif). (1990). Fundamentals of Training, Baghdad, Higher Education Press .