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A proposed sports program to develop some elements of health-related physical fitness in children with Down syndrome

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Abstract:

The study aims to identify the effectiveness of an adapted sports program for the development of some elements in the health-related physical fitness in children with Down syndrome (10–13 years). We used the experimental method according to the design of one group on a sample of 10 children with Down syndrome who were chosen intentionally from the Psychological and Pedagogical Center of Oued Rhiou in the state of Relizane.

The study concluded that the proposed sports program has a positive effect on the development of some elements of some elements in the health-related physical fitness in children with Down syndrome.

Keywords: Athletic program; Health-related physical fitness, Down Syndrome

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1. INTRODUCTION

Mental disability is one of the most serious childhood problems, as it is a medical, hereditary, and psychological problem (عبده, ابراهيم محمد يوسف، 2018، صفحة 125), where the degree of progress and development of nations is measured by the extent of their interest in the category in various fields, especially in sports.

Down syndrome is among the intellectual disabilities, which is one of the most common and easily recognizable syndromes (الزريقـات ابراهيم، 2011). It is among the disabilities that have to be taken care of because of the effects caused from the total dependence of the patients of their parents (لويزة فرشـان، 2015) Thus individuals with disabilities – especially ones with mental disabilities – are among the groups that studies and sciences have been most interested in recently due to their widespread presence in societies.

Practicing sports activities is one of the noble goals to integrate them into the surrounding community and environment. Because, the disabled can also succeed effectively in a joint sport with healthy athletes, and thus with the community. (رياض اســامة، 2000). Like other countries; Algeria established a set of rights and privileges for this category through the law of protection for persons with disabilities (02-09), that includes the right of employment to ensure their financial and social stability. On the other hand, sports for the disabled - whether mentally or physically, are the best means to re-integrate fast these individuals in the community (ابراهيم، مروان عبد المجيد، 2014). Also, physical and sports activity is of increasing importance because of its benefits on the general health of the body, and this is confirmed by a study done by “Larouche” in 1992. Which means that lack of exercise leads to diseases, especially cardiovascular problems, obesity, and osteoporosis.

2. The problem

The number of people with Down syndrome is between 01 per 1,000 to 01 per 1,100 live births worldwide (العبدلي، انور، 2019). These numbers of cases made researchers think of alleviating them and try reducing the issues of their parents' dependency, especially from the health point of view, because they suffer from several diseases as a result of their lack of movement, which made them vulnerable to several complications such as diabetes, heart disease and obesity.

Sports are one of the most important ways in the field of special education **(Badriya, AL_HADABI And All, 2021, p. 256)** according to "Gallue" is one of the educational trends that aims to achieve the integration and development of the child with Down syndrome, according to a study conducted by (محمـد, جرورو;، 2018). In addition, it develops the ability to acquire self-care skills, which negates the hypothesis that they cannot comprehend the content of the training programs designed for them (شوشاني, العبيدي ، عز الدين، 2020، صفحة 52)

As a study by "Hamdan Khaled" indicated that for physical education plays a pivotal role in the gain of body strength and agility (خالد, حمدان;، 2018)

A number of previous studies have referred to it as the study of **(BORDJA, SUAREZ VILLADAT Et Al, 2020, p. 06)** that aimed to implement a 36-week swimming program, with an average of 3 sessions per week, with a duration of 50 minutes per session, deducting that the program is sufficient to reduce the BMI of adolescents with Down Syndrome. Another study by (خالد, حمدان;، 2018) concluded that their proposed program has a positive impact on the development of motor competence in terms of general motor and adaptive behavior of a child with Down syndrome. Additionally, **(ROCIO, IZQUIERDO-GOMEZ And All, 2015, p. 430)** compared the percentage of fat and its effect on fitness of adolescents with Down Syndrome where they concluded that those with Down syndrome have a lower level of physical fitness compared to their non-affected peers.

Through the state-of-the-art studies, the researchers thought working on experiences and studies that dealt with this aspect of research.

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From what has been mentioned therefore, and based on “to the best of the researchers’ knowledge”, children with Down syndrome urgently need adapted sports programs to develop their health-related physical fitness. Which means that the adapted motor activities have an effective role in developing and improving the physical fitness and motor skills of a child with DS. With reference to previous researches. Our research aims to design an adapted training program and understand its effects on the development of the level of physical fitness elements related to health in children with DS age from 10 to 13 years old. So, we ask these questions

Does the proposed sports program have a positive effect in improving the health-related fitness of children with Down syndrome? Where other partially related questions are asked:

- Are there statistically significant differences between the pre and posttests in the physical structure of the thickness of the skin folds in the triceps brachii area?

- Are there statistically significant differences between the pre and posttests in the physical composition of the thickness of the skin folds in the area under the scapula?

- Are there any statistically significant differences between the pre and posttests in musculoskeletal strength?

- Are there statistically significant differences between the pre and posttests in the articulatory flexibility?

- Are there statistically significant differences between the pre and posttests in body mass index?

3. Hypotheses

3.1 The general hypothesis

The proposed sports program has a positive effect in improving some elements of health-related physical fitness in children with DS.

3.2 Secondary hypotheses

- There are statistically significant differences between the pre and posttests in favor of the pretest experimental group, in the physical structure of the thickness of the skin folds for both of the triceps brachii muscle and the area under the scapula.

- There are statistically significant differences between the pre and posttests in favor of the post test for the experimental group in musculoskeletal strength.

- There are statistically significant differences in the pre and posttests in favor of the post test of the experimental group in articulatory flexibility.

- There are statistically significant differences between the pre- and post-tests in favor of the experimental group's pre-test in body mass index BMI.

4. Methods and tools

4.1 The approach

The researchers used the experimental method on a deliberately chosen single group by conducting pre and posttests.

4.2 The study samples

The study community is of children with Down syndrome who are adherent of the psychological and pedagogical centers of the districts of Mazouna and Oued Rhiou, in the state of Relizane. They were 50 children, according to the official statistics of the two centers from 2021, and their ages range from 6 to 17 years.

The study sample consisted of 10 male children with Down syndrome whose chronological age ranged between 10-13 years and their mental age from 03-05 years from the Psycho-pedagogical Center of the Department of Oued Rhiou in the state of Relizane. All of them were chosen by the intentional method according to the following conditions:

- All of sample individuals have DS, with moderate mental disability
- The sample members are free from other auxiliary disabilities that hinder them from applying the program, such as epilepsy and incurable heart disease.
- The sample's individuals belong to families from middle class, according to the information collected from their documents.

4.3 Characteristics of the study sample

- The sample represents the category of children with DS who are present in the pedagogical and psychological center of the district of Oued Rhiou in the state of Relizane, with an average age of 12.62 years. They were chosen by the intentionally due to the minimal number of cases.
- The results of the study are determined by the validity and reliability of the tools used in it.
- The general characteristics of the proposed sports program, which aimed to improve some elements of health-related physical fitness, which was applied during 10 weeks and included 30 training units.

- The study adopted the statistical method.
- The study period is determined from the first day of conducting the survey, which began a week before the beginning of the implementation of the proposed program, i.e., on January 03rd, 2021 and until January 08th, 2021. The field application took place from the January 11th ,2021 to April 4th, 2021. Therefore, the possibility of generalizing the results of this study depends on the aforementioned limits.

4.4 Field of research

- **Human domain:** The study sample included 10 children with DS aged from 9 to 13 years.
- **Time domain:** The training program was implemented from 01/11/2021 to 04/04/2021.
- **Spatial domain:** The training program was implemented in the gymnasium of the psychological and pedagogical center for the mentally disabled in the district of Oued Rhiou in the state of Relizane.

4.5 Study tools

The proposed program, medical and various measuring devices, statistical means, and the staff.

5. The survey

The tests of health-related physical fitness were applied to a sample of the study population and outside the main sample, which numbered 05 individuals. The results resulted in the appropriateness and validity of the tests applied to the sample. Studying.

5.1 Validity of the health-related fitness tests:

The researchers prepared a questionnaire to collect the experts' opinions about the elements of health-related physical fitness to be developed for the children.

It was directed to five doctors and experts from various disciplines, including: physical activity training, measurement and evaluation, and adapted physical activity from Hassiba Ben Bouali University of Chlef, in order to express their opinion on these tests and the conditions for their performance.

The experts unanimously agreed on the characteristics and features of the sample members, the appropriateness of these tests to measure what they were developed for, and their suitability to the study sample.

5.2 Validity of the health-related tests:

The stability coefficient of the fitness tests related to the health targeted in the study was calculated by applying and re-applying them test retest and with a time difference of one week from the date of conducting the first test on a sample of the study population and outside the main sample, consisting of 05 children with Down syndrome, to find the correlation coefficient between the first and second applications, and the stability indications of the tests were extracted.

6. Results and Discussions

6.1 Analysis and interpretation of the first and second hypotheses:

There are statistically significant differences between the pre and post tests for the experimental sample in favor of the pretest for the physical structure of the thickness of skin folds in the areas of the scapula and triceps brachii muscle.

Statistical data were processed using the t-test for differences, and the results are shown in the table as follows:

Table 1. Shows the results of the t-test to indicate the differences between the pre and posttests with the experimental sample of body composition

Muscle Area	Test	$\bar{x}$	σ	T value	Freedom	Significance
Skin fold thickness under the shoulder	Pre	14.43	1.93	6.59	9	0.01 significant at 0.01
	Post	10.30	0.67			
Skin fold thickness triceps brachii muscle	Pre	13.96	2.15	2.76	9	0.02 significant at 0.05
	Post	11.70	0.67			

As “Table 1” shows the value of significance of the body composition of the skin thickness under the shoulder is a statistically significant value between the pretest and posttest, and in favor of the pretest. Considering that the arithmetic mean in the pre-test (14.43) is greater than the arithmetic means in the post-test (10.30)

and this indicates the existence of statistically significant differences in favor of the pretest of the thickness of the skin folds of the area under the scapula.

As for the thickness of the skin folds of the triceps brachii muscle, It is shown in the "Table 1" that a value of significance is at 0.02, which is statistically significant between the two tests in favor of the pretest, because the arithmetic mean of the experimental sample in the pretest (13.96) is greater than the value of the arithmetic mean of the posttest (11.70), and therefore we accept the alternative hypothesis that says there are statistically significant differences between the two tests and in favor of a pre-test for body composition in the thickness of the skin folds of the triceps brachii muscle.

Scientists explain the previously mentioned results that practicing physical activity to the recommended extent for children with DS especially those suffering from obesity, contributes to an acceptable way in losing weight, reducing obesity and improving and restoring their physical fitness. **(خوجة، عادل، 2011، صـــفحة 31)** Where the concept has been proven by a study of **(سها، علي حسبن، 2016، صفحة 155)** and another one by **(زراولـة، علي واخرون، 2018)**. Thus, A training program that is based on well-studied scientific foundations has a positive impact on the general health of the disabled individual **(سها، علي حسبن، 2016)** , (JOE, GARAM And AlL, 2018, p. 175)

Our study also agrees with the studies of both **(خالد, حمدان;، 2018)** and **(الشيخ، يعقوب، 2018 - 2019)**. Such the results confirmed that standardized training units are highly effective on the health-related components of physical fitness for children with DS.

6.2 Analysis and interpretation of the third hypothesis

There are statistically significant differences between the pre and posttests in favor of the posttest in the muscular strength of the grip strength, where the

statistical data was processed using the T-test, and the results were indicated as follows:

Table 2. shows the results of the t-test to indicate the differences between the pre- and post-test of the sample

Test	Count	$\overline{x}$	σ	T-value	Freedom	Significance
Pretest	10	20.00	0.00	2.36	9	Significant 0.04 at 0.05
Posttest	10	20.96	1.28			

6.3 Analysis and interpretation of the fourth hypothesis

There are statistically significant differences between the pre and **posttests** of the experimental sample and in favor of the post test of articulatory flexibility, where the statistical data was processed using the "t" test, and the results were as follows:

Table 3. Shows the results of the t-test for the significance of the differences between the pre- and post-test of the experimental sample in the articulatory

	Count	$\overline{x}$	σ	T-value	Freedom	Significance
Pretest	10	17.98	1.20	3.25	9	Significant 0.04 at 0.05
Posttest	10	20.96	1.28			

It turns out through the results of "Table 3", the significant value of the significance level is equal to 0.00, which is a statistically significant value between the pre- and post-tests and in favor of the post-test, because the arithmetic mean of

the experimental sample for the post-test (20.96) is greater than the value of the arithmetic mean of the experimental sample for the pre-test (17.98). Therefore, we accept the alternative hypothesis saying that there are statistically significant differences between the pre and posttests and in favor of the post test of joint flexibility of children with DS. The specialists explained that motor activities are the best way to improve physical growth and the health fitness of people with disabilities (الزريقات ابراهيم، 2011). Such that the study of "Maryam Arab and Badr Al-Damkhi" has confirmed that the athletic program for children helps in developing the elements of physical fitness in a balanced manner, which increases fun and excitement to practice the activities. (مريم، عرب، 2020، صفحة 73)

Another study by **(J.ORDINEZ, FRANSISCO And All, 2006, p. CR 417)** confirmed that movement programs directed to children have proven highly efficient in the development of the elements of physical health-related fitness in children with DS, and this was proven too by the study of Carlos Matamiro et al. in 2013, whose results confirmed the reliability of a physical fitness tests battery for children with DS. **(CARLOS, MA TEJERO-GONZALEZ, 2013, p. 3222)**

6.4 Analysis and interpretation of the fifth hypothesis:

There are statistically significant differences between pre and posttests, in favor of the pretest in body mass index BMI, where the data was processed using the T-test and the results were as follows:

Table 4. Shows the results of the t-test to indicate the differences between the pre-test and the post-test of the experimental sample in body mass index BMI.

	Count	$\bar{x}$	σ	T-value	Freedom	Significance
Pretest	10	23.52	2.71	3.52	9	Significant 0.00 at 0.05
Posttest	10	19.30	2.19			

It is evident from the results of “Table 4” that the significant value is equal to 0.00, which is statistically significant between the two tests, the pre-test and the post-test, in favor of the pre-test, because the arithmetic mean of the pre-test (23.52 is greater than the value of the arithmetic mean of the post-test (19.30) for the experimental sample so that the value the BMI has decreased which a positive result. Accordingly, we accept that there are statistically significant differences between the two test and in favor of the pretest in the BMI for children with Down syndrome which means that the hypothesis is valid.

The results of our study agreed with what was confirmed by "Ibrahim, 1997". In a way that physical education helps in gaining good physical fitness. As well as it agrees with the studies of "Manuel Rossetti Rodriguez, 2006" and "Andriolo et al., 2009". Also another study by **(SOFIEN, RGAIEG And All, 2013, p. 1042)** claimed that aerobic exercise has a significant impact on reducing obesity in children with Down syndrome (ابراهيم، مروان عبد المجيد، 2014) , **(Asir, JOHN SAMUEL And ALL, 2021, pp. 125 - 126)**

6.5 Discussing the general hypothesis

Since the partial hypotheses of the study were achieved, it means that the general hypothesis was also achieved, and therefore the proposed sports program has a positive impact on the development of health-related physical fitness elements for children with Down syndrome.

7. Results

There are statistically significant differences between the pre and post-test in the physical structure of the thickness of the skin folds in the subscapular region, in favor of the pre-test.

There are statistically significant differences between the pre and post-test in the physical structure of the thickness of the skin folds of the triceps brachii muscle, in favor of the pre-test

There are statistically significant differences between the pre and post-test in the muscular strength of the grip strength and in favor of the post test.

There are statistically significant differences between the pre and the post-test in favor of the post-test of joint flexibility for children with Down syndrome.

There are statistically significant differences between the pre and the post-test in favor of the pre-test in body mass index BMI for children with Down syndrome.

8. CONCLUSION

The modified physical and motor activities are of great and effective importance, especially for the category of people with mental disabilities especially children with Down syndrome, because of the latter's role in improving and developing the level of physical fitness related to their health, which helps them to achieve personal independence, this is what prompted us to search for the effect of the proposed adapted training program on the development of their physical fitness, by suggesting a training program of 32 sessions applied at a rate of three sessions per week in the state of Relizane, so that the results showed the effectiveness and positive impact on the level of health-related fitness for children with Down, and therefore, we recommend:

- Work to intensify research on the category of Down syndrome, in order to help this important group of society to increase their physical activity.
- Encouraging parents to involve their children in adapted movement programs because of its positive impact on their physical fitness.
- Working on expanding the research sample to the largest number, while suggesting adapted programs to improve and develop their level of physical fitness related to health.

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