



EFFECT OF AN 8 WEEKS OF PHYSICAL FITNESS PROGRAM TO IMPROVE THE LEVEL OF PHYSICAL FITNESS ELEMENTS ASSOCIATED WITH HEALTH IN GIRLS ADOLESCENTS

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Abstract:

Purpose: The aim of this study was to identify the effect of physical fitness program to improve the level of some health-related fitness elements in girls adolescents. **Methods:** Twenty adolescent girls volunteers (16.42 ± 0.28 years) participated in the study and were divided into two equal groups, 10 were assigned to the intervention group (IG) and 10 in a control group (CG). The participants in (IG) completed a 30-60 minute training session 3 times per week for 8 weeks at moderate intensity for the first 4 weeks and high intensity for the last 4 weeks. Performance on the 20-meter shuttle run test, Push-up, Curl-Up, Sit and Reach flexibility, were assessed at baseline and post-intervention. **Results:** At post measurement, Health-related fitness was higher ($p < 0.05$) in (IG) than in (CG) for cardiorespiratory fitness, muscular strength, muscular endurance and flexibility. Over 8 weeks, the between-group analysis revealed that training program had a large beneficial effect. **Conclusion:** The results indicate that an eight-week physical fitness program was effective in enhancing cardiorespiratory fitness, muscular strength, muscular endurance and flexibility among Algerian secondary school girls.

Keywords: physical fitness program, physical fitness elements associated with health, girls adolescents

1. Introduction

Recent studies indicate that the physical exercises nowadays practiced by man have considerably diminished, compared to what they used to be, because of the changes in the practice of the good physical habits, notably the exercise of the physical activities

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during leisure time. Television, the Internet, video games and smart phones have become direct causes of modern human renunciation of sports activities. This has led to many diseases related to the lack of movement (no communicable diseases) which according to the report published by the World Health Organization in 2008, were responsible for 60% of all expected deaths in the world and 80% of deaths caused by such diseases were in countries low and middle income. (Who, 2008).

Experiments and scientific research have proved the negative impact of the physical inactivity associated with contemporary lifestyle and their connection with many diseases such as cardiovascular disease, obesity high blood pressure, anxiety and other diseases. (Castelli D.M., et al, 2008), (Gert A. Nielsen, 2003)

Recent scientific studies and health organizations (such as the American College of Sports Medicine) emphasize the importance of regularity in exercising physical activities and their benefits for psychological and organic human health. (Linda S. Pescatello, 2014), (Catley M.J. et al, 2013), (Mark S. Tremblay et al 2010).

Strong evidence proved that higher levels of cardio respiratory fitness in childhood and adolescence are associated with a healthier cardiovascular profile later in life. Muscular strength improvements from childhood to adolescence are negatively associated with changes in overall adiposity (Ruiz JR, Castro-Pinero J, Artero EG, 2009). FB Ortega believes that maintaining an appropriate level of fitness allows a person to deal with emergencies, reduce the risk of illness and injury, work effectively, participate, and enjoy physical activities (sports, leisure and entertainment).

High level of health-related fitness maintains health and prevents diseases and problems of idleness at all ages (FB Ortega et al, 2008). But despite these potential health benefits, many studies show that children and adolescents are often physically inactive (Faigenbaum & Mediate, 2006), and that the state of aerobic fitness and other health-related fitness among schoolchildren is not very satisfactory (Shabeshan Rengasamy, 2012).

The decline in the level of physical activity during adolescence tends to be more exaggerated among girls. (Rowland, Thomas W., 1999) Therefore, interest in the exercise of physical and sports activities within educational institutions has increased in order to improve the level of fitness, In this regard Meghann Lloyd Rachel C. Colley, Mark S. point out that Schools may play an important role by identifying children with low physical fitness and by promoting positive health behaviors such as encouraging children to be active (American Academy of Pediatrics, 2000).

That's why schools, being important institutions for the promotion of physical activity, have in recent years been called upon to expand their efforts to increase the opportunities of young people to be involved in the physical activity (Ortega FB, Ruiz J.R., Castillo M.J., Sjöström M., 2008) (Michael W. Beets, 2009).

In this regard, the Centers for Disease Control recommends daily quality physical education from kindergarten through grade (American Academy of Pediatrics, 2000), (William B. Strong, 2005).

Due to the lack of studies on the subject of fitness related to health in the Algerian school environment, especially among adolescents, this study provides preliminary evidence of the importance of training programs based on physical exercise and sports for 8 weeks in improving the health-related elements of secondary school female students.

2. Objectives

The main objective of this study is to identify the effect of physical activity for 8 weeks in improving the level of certain health-related fitness components (respiratory fitness, muscular strength, muscular endurance and flexibility) among secondary school female students.

3. Material and Methods

3.1. Participants

Twenty volunteer secondary school first year (literature and philosophy) students (16.42 ± 0.28 years) from Al-Ramka, Relizane, took part in this study. They were divided into two equal groups, 10 were assigned to the intervention group (IG) and 10 in a control group (CG).

The average weight and length for the (CG) and (IG) was 70.20 ± 4.98 kg, 01.69 ± 0.06 m, 69.00 ± 4.98 kg and 1.70 ± 0.05 m respectively.

Before starting the program on the sample of the research, the consent of the parents of the students was taken. The medical examination was then conducted by the doctor of the educational institution, in order to ensure their safety.

3.2. Physical fitness program

The researchers began with applying the suggested Physical fitness program to develop some elements of fitness related to health (respiratory fitness, muscular strength, muscular endurance and flexibility) on the experimental sample from 16.01.2017 to 10.03.2017. Physical exercise and sport games (aerobic activities to improve respiratory fitness and muscle strengthening exercises to enhance muscle groups and flexibility exercises) were used in the main part of the training module. The number of training units was 24, distributed over 8 weeks and at a rate of 03 units per week, and the period of the training unit lasts 30 - 60 minutes divided into three parts. At each training session, warm up exercises lasted for 10 minutes, followed by 20 to 45 minutes workout (included physical exercises and sports games) and 05 minutes cool-down consisting of light activities and stretching.

Exercise intensity progressed from moderate intensity for the first 4 weeks and high intensity for the last 4 weeks, a summary of the training program is in Table 1. In order to improve the level of fitness elements associated with health in the research sample, it was necessary to follow a standardized scientific approach in training to

obtain the best results and the least injuries and take into account three factors that affect the amount of benefit from physical training as follows: the health-related fitness level of (IG) before the training, the intensity of physical training, and the duration and frequency of training. Therefore, we have adopted in the programming of exercises for the development of health-related fitness elements for high school students in terms of quantity and quality required of physical activity on the guidelines applicable to adolescent health-related fitness development, according to the American National Association of Sport and Physical Education (Suzan Ayers, Mary Jo Sariscsany, 2011).

It should be noted that the (CG) did not exercise any physical activity during the period of application of the (IG) of the program except for the physical education quota determined by the Ministry of National Education for two hours per week.

Moreover, all students of (IG) completed the development-training program.

3.3. Health-Related Physical Fitness Testing

To measure the health-related fitness elements of the study sample, we use four tests: the 20-Meter Shuttle Run (Pacer test), push-up, curl-up, sit and Reach (Fitnessgram, 1999), (Gustavo Marçal Gonçalves da Silva, 2012).

For predicting VO₂ max from the Pacer test, we used the formula:

$$VO_{2max} = 32.57 + 0.27 (\text{laps}) + 3.25 (\text{gender}) + 0.03* (\text{age}). \text{ (Elena A. Boiarskaia, 2011)}$$

Include number of laps completed and gender (0 for girls, 1 for boys).

To determine the equivalence of the two groups (CG), (IG) the researchers relied on the results of T test for equivalence between the two groups in the pre-measurement. The results indicated that there were no statistically significant ($p < 0.05$) differences between the two groups in all the research variables (cardiorespiratory fitness, muscular strength, muscular endurance and flexibility), which confirmed the equality of the two groups. After the implementation of the training program, the post-measurements of the (CG), (IG) were taken.

Table 1: Summary of physical fitness program

Type of physical activity	Frequency	Intensity	Time	Type
Aerobic Fitness	Three days per week	Moderate (1-4 week) activity. Vigorous (5-8 week) activity.	30–60 min activity in a single session	Play, games, sports, recreation, brisk walking, jogging, basketball, volleyball, handball, soccer.
				Major muscle groups, two exercise per muscle or muscle group : Partners as Resistance: Elbow, Flex, and Extend. Partners as Resistance: Knee Flex. Rubber Cord Standing Chest Press. Rubber Cord. Dumbbell chest fly.

Muscular Strength and Endurance	Two days per week	Moderate (1-4) week Vigorous (5-8) week	20–30 min, Three sets, 6–15 reps.	Dumbbell Shoulder Press. Biceps curl performed on with free weights. Front and back lunges. Medicine ball chest pass and shuffle. Medicine ball chest throw. Medicine ball zigzag throw. Medicine ball sit up and throw. Medicine ball forward overhead throw. Medicine ball scoop throw. Medicine ball back roll. Abdominal crunch. Trunk twist. Single-leg back raise. Chest raise and clap.
Flexibility	Three days per week and after a warm-up	Slow elongation of the muscle to the point of mild discomfort and back off slightly	Two to four stretches per muscle or muscle group. Hold each stretch for 10 to 30 seconds	Head look. Quadriceps stretch holding ankle. Everted hurdler’s stretch. Single-knee lunge. Extended one-leg stretch or back-saver sit and reach. Bent-knee curl-up. Knee-to-chest stretch. Belly push-up.

3.4. Statistical analysis

The normality distribution and Homogeneity of Variance were checked, respectively, with the Shapiro–Wilk and the Levene tests.

The mean, standard deviation, and improvement rates were also calculated. Paired sample T test to indicate the differences between the pre and the post-measurements of the two groups in all the variables under study.

An independent sample T test to indicate the differences in the post-measurement between the (CG) and (IG) in all variables under study. Cohen’s d was calculated to identify the effect size of training program after 08 weeks intervention (Lakens Daniel, 2013).

The significance level was set at $p < 0.05$, and all analyses were conducted using the Statistical Package for Social Sciences version 23 (SPSS Inc., Chicago, IL, USA).

4. Results

Table 2: Within groups comparisons of health-related fitness of adolescent girls

Health-related fitness components and tests	Groups	Pre-test	Post-test	T	Δ changes (%)	P value
		Mean±SD	Mean±SD			
Cardiorespiratory fitness VO2max (mL.kg ⁻¹ .min ⁻¹)	Control	35.83±0.64	36.53 ±0.59	7.005	1.95	0.000
	Intervention	36.26±0.94	38.23±1.00	9.784	5.43	0.000
Muscular Strength Push - Up (Number)	Control	04.70±3.97	06.70±3.62	3.000	42.55	0.015
	Intervention	05.80±1.68	10.90±1.91	16.218	87.93	0.000

Muscular Endurance	Control	07.90±3.31	09.60±2.71	4.295	21.52	0.002
Curl-Up (Number)	Intervention	09.10±2.28	15.30±2.26	17.270	68.13	0.000
Flexibility Right leg	Control	11.30±2.83	15.40±5.05	3.374	36.28	0.008
Sit and Reach (cm)	Intervention	14.30±2.35	22.70±2.35	19.678	58.74	0.000
Flexibility Left leg	Control	12.70±4.21	14.00±5.43	1.984	10.24	0.083
Sit and Reach (cm)	Intervention	13.30±2.49	21.20±3.19	12.016	59.40	0.000

p < 0.05

Table 3: Between groups comparisons of health-related fitness of adolescent girls

Health-related fitness components and Tests	Control	Intervention	T	P value	ES	Magnitude
	N=10	N=10				
	Post –test	Post-test				
	Mean±SD	Mean±SD				
Cardiorespiratory fitness VO2max (mL.kg ⁻¹ .min ⁻¹)	36.53±0.59	38.23±1.00	4.604	0.000	2.070	L
Muscular Strength Push - Up (Number)	6.70±3.62	10.90±1.91	3.243	0.005	1.450	L
Muscular Endurance Curl-Up(Number)	9.60±2.71	15.30±2.26	5.098	0.000	2.280	L
Flexibility Right leg Sit and Reach (cm)	15.40±5.05	22.70±2.35	4.135	0.001	1.849	L
Flexibility Left leg Sit and Reach (cm)	14.00±5.43	21.20 ±3.19	3.612	0.002	1.615	L

p < 0.05, significant difference between the 2 groups.

Abbreviations: ES = effect size; L = large

Table 2 presents the within-group changes between the baseline and eight weeks in the health-related fitness measures of students, in (IG) and (CG), the students showed significant improvement at the level of significance (p < 0.05) in all outcome measures (cardiorespiratory fitness, muscular strength, muscular endurance and flexibility) from baseline to week eight. However, for most of the study outcomes the amount of change between the baseline and post intervention measures in the (CG) was smaller relative to that of (IG), where we find that the variables cardiorespiratory fitness, muscular strength, muscular endurance and flexibility right leg, flexibility left leg Improved rates of (CG) and (IG) respectively: (01.95 – 05.43 and 42.55 - 87.93 and 21.52 - 68.13 and 36.28 - 58.74 and 10.24 - 59.40) %.

The results indicated that there were no statistically significant differences between the post and pre measurements of the (CG) in the Flexibility Left leg test.

Table 3 shows statistically significant differences at (p < 0.05) between the values of the (IG) averages and the (CG) group's averages in all the variables under study for the benefit of the (IG):

- 20-Meter Shuttle Run test. The (IG) had significantly greater gains in cardiorespiratory fitness compared to the (CG) [T = 4.604; p = 0.000; ES = 2.070].
- Push - Up test. The (IG) had significantly greater gains in muscular strength compared to the (CG) [T = 3.243; p = 0.005; ES = 1.450].

- Curl-Up test. The (IG) had significantly greater gains in muscular endurance compared to the (CG) [T =5.098; p = 0.000; ES = 2.280].
- Sit and reach test right leg. The (IG) had significantly greater gains in flexibility compared to the (CG) [T =4.135; p = 0.001; ES = 1.849].
- Sit and reach test left leg. The (IG) had significantly greater gains in flexibility compared to the (CG) [T =3.612; p = 0.002; ES = 1.615].

They are significant values, and indicate that a large proportion of the differences are attributable to the training program.

5. Discussion

The aim of the present study was to analyze the effects of eight weeks of physical fitness program in girls adolescents. The results of the present study revealed that indicate that an eight-week physical fitness program was effective in enhancing cardiorespiratory fitness, muscular strength, muscular endurance and flexibility among Algerian secondary school girls.

These results, however, are similar to most results available in literature from studies that investigated possible modifications on cardiorespiratory fitness, muscular strength, muscular endurance and flexibility by short periods (<12 weeks). (Faigenbaum & Mediate, 2006), (Shabeshan Rengasamy, 2012), (Amri Hammami et al, 2018)

In Table 2, the researchers show that the improvement rates achieved by the (IG), in the study variables far outweigh the control group's achievements. The nature and contents of the training program of the (IG) members have had a significant impact in making this differential.

The results showed in (table 3) that there were statistically significant differences at the level of significance ($p < 0.05$) between the pre and post measurements for the benefit of the post measurement in the study variables.

To identify the differences between the two post measurements of the intervention and control groups, the researchers conducted a T test for independent sample T test and Calculation of Effect size through Cohen's d effect size for the differences in application between the mean values of the two research groups as shown in (Table 3).

Where (Cohen 1977) sees that the effect that explains (15% or more) of the total variance of any independent variable on dependent variables is a great influence (Fuad Abu Hatab, 1991), The results were consistent with the study of (Faigenbaum & Mediate, 2006), also with the study of (Shabeshan Rengasamy, 2012). Except muscle strength's variable, in this latest study, the result was not significant compared with the current study.

The results of the (IG) members exposed to the suggested training program were much better than those of the (CG) in all variables. The researchers believe that the reason for this is due to the nature and contents of the training program, that was subjected to the members of the (IG) based on the scientific basis and on taking into

account the specificity of the age and the principles of modern sports training in the development of physical attributes (cardio respiratory fitness, muscular strength, muscular endurance and flexibility). In this regard, M.L Pollock and al. (1998) point out that the combination of frequency, intensity, and duration of chronic exercise has been found to be effective for producing a training effect. The interaction of these factors provides the overload stimulus. In general, the lower the stimulus, then the lower the training effect, and the greater the stimulus, the greater the effect.

As a result of specificity of training and the need for maintaining muscular strength and endurance, and flexibility of the major muscle groups, a well-rounded training program including aerobic and resistance training, and flexibility exercises is recommended (M. L. Pollock and al, 1998).

Moreover, the program adopted by the ministry of national education has limited positive effects on physiological and physical variables. It is based mainly on the development of motor skills of sports activities without focusing on the development of health-related fitness elements, in this regard Ward 1999 refers, the secondary level programs are based on sports activities and therefore these activities must be modified by adjusting the spaces and the number of individuals in each activity, which leads to the development of physical fitness associated with skill and health together (Ward, B., 1998).

Physical activity in educational institutions is very limited as it is limited to one quota per week. It is not sufficient for the development of health-related fitness. This is confirmed by international and local studies, that show the low impact of physical education on students at least in terms of health (Beets M.W., Pitetti K.H., 2005). While studies show that it is essential for school-age youth participate daily in moderate to strong physical activity for 60 minutes or more (William b. strong, 2005).

Besides, teenagers spend most of their time in either at school, studying, or watching television and playing computer games, and those who spend their time in front of television or computer games have proven to be less active than others (Mufti Hammad, 2010), and the abandonment of the family to play a large role in encouraging their children to exercise in physical leisure time and focus on the side of the educational achievement through private lessons directly contributed to the poor level of fitness.

Emmanuel van Praagh 2008 in this regard points out there are several factors that play an important role in encouraging individuals to exercise, including cultural factors (the culture of the parents) (Emmanuel van Praagh, 2008).

6. Conclusion

This study provides preliminary evidence that the 8-week physical fitness program has significantly improved the health-related fitness of secondary school students. Physical and sports activities should be applied continuously in all Algerian secondary schools

so as to reduce and why not prevent the risk of the spread of diseases associated with physical inactivity, especially among female teenagers.

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