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Evaluating the Results of the Implementation of an Exercise Program on the Physical Condition for Learners of a Multicultural Second Chance School

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Abstract The purpose of the study was to assess the impact of an organized exercise program based on selected fitness indicators on adult learners in a multicultural environment of a Second Chance School (SCS). 62 learners from the SCS of Komotini (19-57 years) participated in the study, where they were equally divided into two groups (experimental, control). The intervention program was implemented for 5 months (2 times/week) with an intensity of 65%-85% of the HRmax. Each exercise session lasted 60 minutes and included aerobic exercise and muscular strengthening. Measurements were performed at the beginning and end of the intervention, and "ALPHA-FIT Test Battery for Adults Aged 18-69" tests were used, as well as the "Sit-Ups in 30 sec" and "Sit and Reach" tests. For statistical processing of the data, descriptive statistics, analyses of variance ANOVA and T-Tests were used using the SPSS program. The analysis of the data showed that a statistically significant major influence of the measurement factor ($p<.001$) in all tests between the two groups (experimental, control) was observed in fitness indicators. Gender differences were found, with men performing better in dynamic tests than women, and women performing better in flexibility than men. In conclusion, the intervention program has significantly improved the Physical Condition of learners in the multicultural SCS of Komotini. Finally, further research is proposed with interventions of exercise programs in more than one SCS to examine the degree of participation and any positive changes that will occur in the fitness in a larger sample.

Keywords Physical Fitness, Adult Learners, Second Chance Schools, Exercise Program, Physical Condition

1. Introduction

The term "fitness" refers to the ability to move the body and is related to the level of abilities and skills associated with the characteristics that humans have and their ability to perform physical activity effectively [1,2].

In recent decades, there has been a rapid increase in the rate of various chronic diseases, such as obesity, diabetes mellitus, heart disease, hypertension etc., which tend to reach epidemic proportions. Chronic diseases are major causes of morbidity and premature mortality worldwide, both in developed and developing countries [3,4]. Modern lifestyle, gradual abandonment of the Mediterranean diet model, but, mainly, the lack of physical activity and exercise, are some of the factors most likely linked to the increased occurrence of chronic diseases [3- 6]. It is now commonly accepted that exercise is inextricably linked to the physical and mental health of a person and it is the most appropriate means of preventing and restoring chronic diseases [7].

The benefits of exercise, according to the international literature, are evident in various population groups, such as children and adolescents, adults, and the elderly [8]. With the advancement of age, and, in particular, from the age of 40 years onwards, there is a significant drop in human performance in all aspects of physical condition. However, with systemic exercise, this decline slows down [7]. It is important to stress that the fall in the performance of normal systems combined with reduced physical activity, observed with advancing age, is more evident in women. In women, especially during the pre-menopausal, menopausal and postmenopausal periods, there are significant hormonal changes (estrogen decrease) [9], which explain various changes observed both in body (increase in body mass and, mainly, body fat, decrease in muscle mass and bone density, etc.) and in mental health (increase in depression, anxiety and stress, decrease in self-confidence) women's health [9,10]. However, systematic exercise during the premenopausal, menopausal and post-menopausal periods brings multiple positive benefits to both the physical and mental health of women [11,12].

Guidelines on exercise issued by the American Department of Health and Human Services [13] for adults state that any activity offers significant benefits. In more detail, adults should exercise at least 3-5 times/week. An integrated exercise program for middle-aged persons should include activities to improve the cardiopulmonary system, strengthening exercises, exercises to improve flexibility, as well as coordination abilities.

In recent decades, the interest of researchers has focused on the implementation of combinatorial exercise programs aimed at both more effective and more multifaceted development of fitness and the reduction of exercise time [14-16]. According to the research of Kraemer and his collaborators [17], an aerobic dance program in combination with resistance exercises for the upper and lower limbs has better results in terms of improving the physical condition of the learners. In the international literature, there are studies that used aerobic dance in combination with weight-strengthening exercises [18,19] and resistance or auxiliary instruments [20,21] with the aim of both improving aerobic ability and strength.

Regarding SCSs, they were established in the context specified by the declared principles of the European Union, providing a certificate equivalent to a secondary school diploma. They target adults above 18 years old who have not completed the compulsory nine-year education and have a primary school diploma [22]. The courses being taught are Greek Language, Mathematics, English Language, Information Technology, Social Education, Environmental Education, Physical Sciences and Cultural - Aesthetic Education. The weekly program consists of 25 weekly teaching hours. The innovation of the SVSs consists in forming consultancy services, including a Career Adviser and an Educational Psychologist.

A special feature of the SCSs in the region of Thrace is that they are attended by a large number of learners from the local Muslim Minority. The Muslim minority of Thrace consists of three different groups with different ethnicities and linguistic characteristics, Pomaks, Turkish-speaking/Turkish origin, and Roma [23]. The particular ethnic, religious and linguistic characteristics of the Muslim minority are not contained in the major elements of Greek culture [24]. Thus, the SCSs of Thrace operate in a multicultural school environment.

It is particularly important to mention that although exercise for all citizens is a necessity and physical and sporting activity contribute to cultural life and health protection, a course similar to Physical Education (as found in typical primary and secondary schools) is absent from the curriculum of the SCS.

The above findings led to the development of the current research, the purpose of which was to examine the impact of an organized exercise program based on fitness indicators of adult learners in a multicultural second-chance school environment according to the cultural group (Christians, Pomaks MMT, Turkish-speaking/Turkish origin MMT, Roma MMT) and gender (men, women).

2. Materials and Methods

2.1. Participants

The survey included 62 adult learners of the SCS of Komotini, of whom only 8 (12.9%) stated that they participated in some kind of systematic exercise, while the remaining 54 (87.1%) did not (table 1).

Table 1. Demographic Characteristics

		Frequency	*Percent*
Gender	Men	32	51.6
	Women	30	48.4
Cultural Group	Christians	16	25.8
	Turkish-speaking citizens/Turkish origin	20	32.3
	Pomaks	17	27.4
	Roma	9	14.5
Exercise	Yes	8	12.9
	No	54	87.1
		Mean	S.D.
Age		38.76	7.649

2.2. Measurements

In the beginning, the demographic characteristics of the learners were recorded. The tests “Hand grip”, “Figure-of-eight run”, “Jump-and-reach”, “Modified push-up”, “One-leg stand”, “Shoulder-neck mobility”, “2Km Walk Test” of

the "ALPHA-FIT Test Battery for Adults Aged 18-69" beam, as well as the tests "Sit-Ups in 30 sec." and "Sit and Reach" were used to assess their fitness. Moreover, the VO2max was calculated separately for men and women based on the time of the 2" Km Walk Test" test, heart rate, weight, height and age of the ALPHA-FIT Test Battery.

2.3. Procedure

The research was carried out with the permission of the Research Ethics Committee of the Democritus University of Thrace. The learners were informed by the researcher about the anonymity of their participation, the research and their voluntary participation in it. They were also informed that their data would only be used in the particular research. Afterward, the questionnaire with demographic characteristics was given, the necessary instructions on how to fill it out were orally given and it was completed in the researcher's presence.

According to the responses provided by the participants, the sample was divided into four groups according to the cultural group [Christians (Greeks)], Pomaks (Greek Pomaks of MMT), Turkish-speaking/Turkish origin (Greek Turkish-speaking/Turkish origin of MMT), Roma (Greek Roma of MMT), and two groups according to gender (men, women).

2.4. Study Design

The sample was randomly divided into 2 equal groups; the individuals in the experimental group who followed the intervention program and the individuals in the control group who did not follow an intervention program. Initial measurements (pre-test) were made on the entire sample (experimental group, control group). The intervention program was implemented 2 times a week for 60 minutes at a time, lasted 5 months and included: a) group exercise programs in a room (aerobics, resistance bands, exercise balls, dumbbells, etc.), b) exercise in a gym area with resistance exercises in the range of 60% to 80% of one-repetition maximum (1 RM) and c) outdoor exercise (hiking) combined with strengthening using body weight and team cooperation exercises of the medium intensity of 65% to 85% of maximum heart rate (HRmax). The intensity of the exercise was controlled by a heart rate sensor, which was worn before the start of the exercise. The final measurements (post-test) for all (experimental group, control group) were carried out after the end of the intervention program, under stable conditions. The instruments of measurement were the same as the instruments of the initial measurements.

2.5. Data Analysis

In the beginning, t-test analyzes were performed for independent samples to identify differences between the samples compared to the initial measurements, based on the group (experimental group, control group), cultural group (Christians, Pomaks, Turkish-speaking/Turkish origin, Roma), and gender (women, men) respectively.

Afterward, variance analyses were used regarding four factors, one of which was repetitive (4 Way Anova), with independent factors; "gender" (women, men), "group" (experimental group, control group), "cultural group" (Christians, Pomaks, Turkish-speaking/Turkish origin, Roma), with repeated measurements on the factor "measurement". Each of the 10 measurements of the physical indicators (hand grip, figure-of-eight run, jump-and-reach, modified push-up, one-leg stand, shoulder-neck mobility, 2Km walk test, VO2max, sit-ups in 30 sec, sit and reach and) was a dependent factor.

The frequencies were used to describe the characteristics of the sample and the $p<0.05$ was defined as the level of significance.

3. Results

3.1. Differences between Experimental and Control Group

Table 2 presents the effect of the exercise program on physical condition.

The experimental and control group participants reported significant differences in hand grip $F(1,47)=126,444$, $p<.001$, $\eta 2=.729$, figure-of-eight run $F(1,47)=227,749$, $p<.001$, $\eta 2=.829$, Jump-and-reach $F(1,47)=165,031$, $p<.001$, $\eta 2=.778$, modified push-up $F(1,47)=128,006$, $p<.001$, $\eta 2=.731$, one-leg stand $F(1,47)=64,759$, $p<.001$, $\eta 2=.579$, shoulder-neck mobility $F(1,47)=56,414$, $p<.001$, $\eta 2=.546$, 2Km walk test $F(1,47)=380,732$, $p<.001$, $\eta 2= .890$, VO2max $F(1,47)=342,970$, $p<.001$, $\eta 2=.879$, sit-ups in 30s $F(1,47)=108,869$, $p<.001$, $\eta 2=.698$, and sit and reach $F(1,47)=265,009$, $p<.001$, $\eta 2=.849$ before and after the exercise program.

Table 2. Fitness Indicators of Adult Learners per Group and Measurement

	Pre-test		*Post-test*		*p value*
	M	**SD**	**M**	**SD**	
Hand grip (kg)					
experimental group	42.54	11.09	47.78*	112.52	.000
control group	41.84	10.95	41.03	11.23	.075
Figure of eight run (s)					
experimental group	7.36	0.72	6.53*	0.72	.000
control group	7.34	0.79	7.48	0.72	.004
Jump and reach (cm)					
experimental group	25.15	4.76	30.00*	5.15	.000
control group	24.87	5.10	23.53	5.16	.001
Modified push-up (Reps)					
experimental group	5.39	3.06	8.97*	3.69	.000
control group	5.29	2.80	4.58	2.32	.021
One-leg stand (s)					
experimental group	38.71	13.67	53.77*	10.14	.000
control group	37.45	14.92	35.84	15.89	.244
Shoulder-neck mobility					
experimental group	5.35	1.50	6.71*	1.68	.000
control group	5.35	1.58	5.16	1.61	.244
2Km Walk Test (min)					
experimental group	17.71	1.16	16.77*	1.04	.000
control group	17.42	1.15	17.81	1.13	.000
VO2max (ml ·min-1 ƙg-1)					
experimental group	30.25	6.11	34.72*	5.81	.000
control group	31.76	6.01	29.48	5.65	.000
Sit-Ups in 30 sec (Reps)					
experimental group	9.58	3.80	16.65*	5.77	.000
control group	9.00	3.69	9.06	4.51	.500
Sit and Reach (cm)					
experimental group	2.84	3.18	13.19*	4.65	.000
control group	3.58	3.18	3.32	4.13	.648

Note: *p<.001 Differences between experimental and control group in the post-test.

3.2. Differenced between Men and Women

Table 3 presents the fitness indicators of adult learners per gender and measurement.

Men performed statistically significantly better than women in hand grip F(1,47)=66,487, p<.001, η2=.586, figure-of-eight run F(1,47)=42,892, p<.001, η2=.477, jump-and-reach F(1,47)=85,237, p<.001, η2= .645, modified push-up F(1,47)=38,129, p<.001, η2=.448, 2km walk test F(1,47)=69,952, p<.001, η2=.598, VO2max F(1,47)=14,687, p<.001, η2= .238, and sit-ups in 30 sec F(1,47)=29,054, p<.001, η2=.382.

On the other hand, women scored statistically significantly better than men in shoulder-neck mobility F(1,47)=6,937, p<.05, η2= .129, and sit and reach F(1,47)=23,672, p<.001, η2=.335.

However, one-leg stand (p>.05) did not report any significant differences between men and women.

Table 3. Fitness Indicators of Adult Learners per Gender and Measurement

	Men N(32)		*Women N(30)*		*p value*
	M	**SD**	**M**	**SD**	
Hand grip (kg)					
Pre-test	50.27	7.41	33.56	6.62	.000
Post-test	53.12	8.76	35.11	7.85	.000
Figure of eight run (s)					
Pre-test	6.86	0.42	7.88	0.66	.000
Post-test	6.52	0.65	7.52	0.75	.000
Jump and reach (cm)					
Pre-test	28.70	2.17	21.07	3.78	.000
Post-test	30.64	4.23	22.63	4.90	.000
Modified push-up (Reps)					
Pre-test	7.06	2.49	3.50	2.10	.000
Post-test	9.00	3.21	4.40	2.88	.000
One-leg stand (s)					
Pre-test	40.06	14.24	35.97	14.10	.260
Post-test	47.09	16.62	42.37	15.24	.249
Shoulder-neck mobility					
Pre-test	4.94	1.34	5.80	1.61	.025
Post-test	5.44	1.63	6.47	1.87	.024
2Km Walk Test (min)					
Pre-test	16.70	0.60	18.49	0.84	.000
Post-test	16.48	0.72	18.15	0.98	.000
VO2max (ml ·min-1 ·kg-1)					
Pre-test	33.93	5.36	27.88	5.18	.000
Post-test	35.00	5.74	29.01	5.30	.000
Sit-Ups in 30 sec (Reps)					
Pre-test	11.44	3.06	7.00	2.95	.000
Post-test	15.81	6.20	9.70	5.00	.000
Sit and Reach (cm)					
Pre-test	1.66	2.85	4.87	2.66	.000
Post-test	6.19	6.23	10.47	6.39	.010

3.3. Differences between Cultural Groups

The Christians, Pomaks, Turkish-speaking/Turkish origin and Roma group reported no significant differences in the fitness indicators ($p>.05$).

4. Discussion

This research investigated the influence of an organized 5-month exercise program on the Physical Condition of learners in the multicultural environment of the SCS of Komotini according to gender (men, women) and cultural group (Christians, Pomaks, Turkish-speaking/Turkish origin, Roma) they belong. A review of the literature did not find any similar research on this subject either in Greece or in any other European country. In addition, it is one of the investigations that coincided with the restrictive measures and the quarantine against COVID-19 during its implementation phase. Therefore, an initial attempt was made to capture the results of the impact of an organized exercise program on the physical condition of the learners in the school area of SCSs.

It was also found that this population group of SCS learners, in large part, is not involved in any kind of systematic exercise, thus increasing the likelihood of various multi-systemic diseases occurring in the near future. Also, according to ALPHA-FIT Test Battery for Adults aged 18-69, derived from two Finnish population studies and carried out by the UKK Institute [25], the physical condition of SCS learners can be characterized by low to moderate, as their performance in the pre-tests is ranked in the lowest level in terms of performance in the "modified push-up", "jump-and-reach" and "2Km walk test" tests and the average level in the "shoulder-neck mobility", "one-leg stand" and "figure-of-eight run" tests.

Initially, the results of the survey showed that the organized exercise program caused multiple positive adjustments in the physical condition of the learners participating in it. In particular, at the end of the 5-month program, a statistically significant increase in shoulder-neck mobility, femoral muscle flexibility, static balance, vertical jump, maximum isometric handgrip force, lower limb agility and muscle strength, aerobic ability and resistance to abdominal muscle strength and breast muscle strength were observed. These results are in full accordance with the research done so far regarding the positive effect of exercise programs on the physical condition of adults [26-31].

In contrast, for the control group learners, a decrease in the vertical jump, lower limb mobility and muscle strength, aerobic ability, and resistance to the strength of the breast muscles were observed. The deterioration of the physical condition of the control group learners is likely due to restrictive measures against the COVID-19 pandemic that coincided with the implementation period of the intervention program for more than two months. These results are in line with recent surveys indicating that the pandemic restricted people, significantly reducing their physical activity and their ability to participate in organized exercise programs, thus creating conditions for deterioration of their physical condition [32- 35].

More specifically, in the online survey of Flanagan and his partners [32] conducted in April 2020 and answered by 7,753 adults in the United States, Australia, Canada, Ireland and the United Kingdom, information was gathered on eating behaviors, physical activity and mental health. All questions were presented as "before" and "after" the COVID-19 pandemic. A total of 7,753 participants were included. 32.2% of the sample were subjects with normal weight, 32.1% were overweight and 34.0% were obese. During the pandemic, sedentary behaviors increased, while time devoted to physical activity decreased. Weight gain was reported in 27.5% of the total sample and obesity was reported in 33.4% of the participants. The COVID-19 pandemic has had significant health effects, well beyond the virus itself. Government restrictive measures along with the fear of infection by the virus significantly affected lifestyle behaviors in parallel with the decline of mental health [32].

Moreover, the impact of COVID-19 on physical activity worldwide, based on data from millions of users of smart step measurement watches from Fitbit [36] and Garmin [37], indicates that nearly all countries experienced a statistically significant decrease in the average number of steps compared to the same period a year ago. The severity of the decrease in steps varied from country to country, with the United States showing a 12% decrease in the number of steps and European countries showing a more dramatic change, ranging from a 7% to 38% decrease in the number of steps during the week ending March 22, 2020 [36].

Moving on to the relationship between gender and the parameters of fitness studied, according to the results men performed better in dynamic tests than women, and women performed better in flexibility than men. Only in the test of static balance were there no statistically significant differences. For the effect of gender on physical fitness performance, the results of a series of studies [38-40] agree that gender differences exist, as the majority of men have greater anthropometric stature than women, more muscle mass [41] and thus greater physical strength. Also, women have been shown to have about 70%-75% of the strength of the lower body and 40%-60% of the strength of the upper body strength than men, with the ratio being affected by the measurement used, age and training condition [42]. Generally, moderately trained women have maximum oxygen uptake levels ($\dot{V}O2max$) that are 15%-30% lower than moderately trained men in absolute ($L \cdot min^{-1}$) and about 10% lower in relative ($mL \cdot kg^{-1} - min1$) values of maximum oxygen uptake [43]. In contrast, women have been found to have greater flexibility than men [44, 45], while both sexes do not differ significantly in the balance test [38].

With regard to the cultural group, no significant differences were found between Christians, Pomaks, Turkish-speaking/Turkish origin and Roma, which is probably explained by the fact that all learners belong to the same socio-economic and educational level.

At this point, it is important to note that no side effects due to the organized exercise program, such as muscle-tendon injuries, unwanted hemodynamic reactions (abnormal responses of blood pressure or heart rate), or severe fatigue, were observed in the survey. This demonstrates that the thorough evaluation of the cardiovascular function of participants prior to their involvement in exercise programs and during their participation in them, their systematic supervision, the proper design and the observance of fundamental training principles, such as the principle of progressive increase of the burden levels, make physical education programs effective but also safe for learners.

It should also be noted that this survey had some limitations; one of the limitations is that the data were collected before and after the implementation of the intervention program, without re-evaluation of the data after a period of learners' abstention from any form of

physical exercise (detraining period). This was difficult because the second-grade learners would finish their studies and leave school. Although the main purpose of the study was the effect of exercise on the physical fitness of the learners, the recording of changes that may occur due to abstinence from physical exercise would be particularly interesting. Moreover, the sample of this study was a group of healthy adult learners and, therefore, the generalization of the results of this study to individuals with different characteristics cannot be safely performed. Finally, during the research, there was no control of the dietary habits of the learners, but only information about the benefits of exercise and physical activity as well as information about healthy diet.

In the future, it is proposed to carry out research in other SCSs throughout Greece, as well as to investigate the relationship between factors such as smoking, underlying diseases, working conditions or the type of work and learners' physical fitness.

5. Conclusions

The 5-month exercise program significantly improved all fitness indicators evaluated. In particular, it was found that systematic and properly designed training can make a decisive contribution to improving the physical condition of SCS learners, even if this change in behavior is not accompanied by appropriate dietary interventions. Therefore, it seems that exercise programs can be applied effectively in SCSs as well, with the aim of improving the physical condition and, thus, the health of learners.

The observed poor physical condition and the abstention of the particular population from the physical education programs, as well as the low activity which is a disease of modern societies, make it imperative to implement appropriate exercise programs in the SCSs.

Exercise programs should be designed in such a way as to focus both on the development of organized activities suitable for adults and on the motivation of all learners to adopt lifelong physical activity behaviors.

Traineeships could be implemented systematically by introducing exercise-related courses in the SCS curriculum, i.e. similar to the Physical Education course, as taught at typical primary and secondary schools, aiming at adopting physical activity habits.

Finally, for future research, it is proposed to carry out surveys in more SCSs across Greece in order to make a comparative study, as well as to investigate the relationship of factors such as smoking, underlying conditions, working/employment status or the type of work with attitudes of trainees towards exercise.

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