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The impact of an organized physical activity program on the health indicators of students from different cultural groups in second chance school setting
El impacto de un programa de actividad física organizada en los indicadores de salud de los estudiantes de diferentes grupos culturales en el entorno escolar de segunda oportunidad

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Abstract. The primary objective of this research was to assess the impact of a structured physical activity program on the health indicators of adult students attending a multicultural Second Chance School (SCS). The study encompassed a total of 62 SCS students aged 19 to 57, who were divided into two groups: experimental and control. The intervention program consisted of two sessions per week spanning 20 weeks, with each session lasting 60 minutes. The exercise intensity ranged from 65% to 85% of HRmax and included various activities such as aerobics, weight exercises, dumbbell routines, and hiking. Measurements were taken at both the commencement and conclusion of the organized physical activity program. Specialized equipment, including a wall-mounted stadiometer, precision scales, a unique tape measure, an automated sphygmomanometer, and the DXA machine, was employed for data collection. Data analysis involved ANOVA variance analyses, descriptive statistics, and T-Tests utilizing the SPSS software. The results revealed a statistically significant primary influence attributed to the 'measurement' factor ($p<.001$) across all health indicators, except for total BMD and total BMC, when comparing the experimental and control groups. In terms of gender disparities, men exhibited higher measurements in body mass, fat-free mass, belly size, and blood pressure, while women displayed greater fat mass and total body fat. To conclude, the intervention program had a positive impact on improving the health indicators of adult SCS students. Future research endeavors should explore the implementation of Physical Activity programs in other SCSs throughout Greece.
Keywords: Adult Students; Health Indicators; Organized Physical Activity; Second Chance Schools

Resumen. El objetivo principal de esta investigación fue evaluar el impacto de un programa estructurado de actividad física en los indicadores de salud de los estudiantes adultos que asisten a una Escuela de Segunda Oportunidad multicultural. El estudio abarcó un total de 62 estudiantes de la Escuela de Segunda Oportunidad, con edades comprendidas entre los 19 y los 57 años, que se dividieron en dos grupos: experimental y de control. El programa de intervención consistió en dos sesiones semanales durante 20 semanas, con una duración de 60 minutos cada una. La intensidad del ejercicio osciló entre el 65% y el 85% de la HRmáx e incluyó diversas actividades como aeróbic, ejercicios con pesas, rutinas con mancuernas y senderismo. Las mediciones se realizaron tanto al inicio como al final del programa de actividad física organizada. Para la recogida de datos se utilizó equipo especializado, como un estadiómetro de pared, básculas de precisión, una cinta métrica única, un esfigmomanómetro automático y una máquina DXA. Los datos se analizaron mediante análisis de varianza ANOVA, estadística descriptiva y pruebas T con el programa informático SPSS. Los resultados revelaron una influencia primaria estadísticamente significativa atribuida al factor «medición» ($p<.001$) en todos los indicadores de salud, excepto en la BMD total y el BMC total, al comparar los grupos experimental y de control. En cuanto a las disparidades de género, los hombres mostraron mayores mediciones en masa corporal, masa libre de grasa, tamaño del vientre y presión arterial, mientras que las mujeres mostraron mayor masa grasa y grasa corporal total. En conclusión, el programa de intervención tuvo un impacto positivo en el mejoramiento de los indicadores de salud de los estudiantes adultos de la Escuela de Segunda Oportunidad. Futuros esfuerzos de investigación deberían explorar la implementación de programas de actividad física en otras Escuelas de Segunda Oportunidad a lo largo de Grecia.
Palabras clave: Estudiantes Adultos; Indicadores de Salud; Actividad Física Organizada; Escuelas de Segunda Oportunidad

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Introduction

Physical activity plays a crucial role in maintaining functional independence in humans, impacting overall health (Shulruf et al., 2020), and reducing the risk of various diseases. Moreover, it enhances individuals' functional abilities, mitigates the risk of injuries and falls (Andrieieva et al., 2019), and enhances overall quality of life (Brodani, 2015; Meungguk et al., 2020).

In recent decades, there has been a significant rise in the prevalence of chronic diseases such as obesity, diabetes mellitus, heart disease, and hypertension, which have reached epidemic proportions (Aguilar et al., 2021). Chronic diseases constitute a leading cause of premature mortality worldwide, affecting both developed and developing nations (Halpin et al., 2011; WHO, 2010). Several chronic conditions, including obesity, cardiovascular disease, and type II diabetes mellitus, are closely linked to physical inactivity. Long-term aerobic exercise has emerged as a valuable preventive measure against various chronic diseases (Sternlicht et al., 2013). Aerobic exercise contributes to weight management, induces changes in body mass composition, enhances lipid profiles, and improves insulin sensitivity (Park et al., 2003). Studies involving obese adults have revealed that aerobic capacity is as significant as Body Mass Index (BMI) in predicting mortality (Watts et al., 2005). Shigematsu and colleagues (2002) emphasize the favorable effects of aerobic exercise programs on balance and agility, thereby reducing the risk of falls among the elderly. Furthermore, aerobic exercise aids in lowering inflammation markers, enhancing blood pressure, and increasing insulin sensitivity (Ayubi et al., 2024; King et al., 2003; Park et al., 2003).

The increase in human life expectancy, coupled with modern lifestyles characterized by altered dietary habits and reduced physical activity, has led to the development of significant degenerative skeletal conditions, most notably osteoporosis. The substantial impact of osteoporosis on patients' quality of life and the considerable socioeconomic burden of its treatment underscore the urgent need for effective interventions against this disease.

In recent years, there has been a concerted effort to establish cost-effective, enjoyable, and efficacious methods for the prevention and restoration of optimal skeletal health. Mechanical loading of bones, which refers to how bones respond to mechanical stresses, plays a fundamental role in determining bone mineral content (BMC). Exercise is the primary mechanism through which mechanical loading of bones is achieved, and as such, ongoing research focuses on elucidating the specific forms of exercise that stimulate osteogenesis (Sinaki et al., 2002; Vuori, 2001).

Physical exercise has been demonstrated to play a crucial role in the rapid increase of BMC during puberty and the attainment of peak bone mineral density (BMD) by a woman's third decade of life (Heinonen et al., 2000). However, once skeletal maturation is complete, and women enter menopause, they experience progressive bone loss due to hormonal and metabolic changes associated with this phase of life (Riggs & Melton, 1995).

Organized physical activity programs that incorporate a blend of strength and aerobic exercises have been suggested as an optimal approach to stimulate bone anabolism. However, it is worth noting that the extent of their effectiveness in preventing and treating osteoporosis remains a subject that has not been comprehensively explored, leading to a lack of definitive conclusions on their impact (Kemmler et al., 2003; Milliken et al., 2003; Walker et al., 2000).

These combined exercise programs address the multifaceted needs of the modern middle-aged individual who often faces time constraints but seeks to achieve various objectives. These objectives encompass not only improving body composition but also enhancing strength, aerobic capacity, balance, and flexibility (Dugan et al., 2016; Jaywant, 2013).

In the international literature, an abundance of studies have explored organized physical activity programs that combine aerobic and strength training, assessing their influence on the health, physical fitness, and quality of life among individuals of varying age groups. These investigations incorporated resistance exercises employing body weight or additional equipment, in conjunction with aerobic regimens encompassing diverse training protocols and modalities such as walking, running, cycling, elliptical training, aerobic dancing, and zumba (Barranco-Ruiz, & Villa-Gonzalez, 2020; Karatrantou et al., 2017; Moker Bateman et al., 2014; Sillanpaa et al., 2009; Tsourlou et al., 2006).

The outcomes of these studies consistently demonstrated enhancements in body composition (Amaro Gahere et al., 2019; Davitt et al., 2014; Karatrantou et al., 2017; Michell et al., 2014; Pleticosic-Ramírez et al., 2024; Sillanpaa et al., 2009), improvements in lipid profiles (Ossanloo et al., 2012), and reductions in blood pressure (Karatrantou et al., 2017; Moker et al., 2014).

As per the guidelines outlined by the American College of Sports Medicine (ACSM) for the development of aerobic fitness, the recommended parameters for exercise intensity and frequency are as follows: Individuals should engage in high-intensity exercise at least three times per week or participate in moderate-intensity exercise on five separate occasions each week, with intensity ranging from 60-90% of HRmax. In terms of duration, the exercise program should span from 30 to 60 minutes per day, totaling 150 minutes per week for moderate-intensity aerobic activities. Alternatively, for high-intensity exercises, the recommended duration is 20 to 60 minutes per day, amounting to 75 minutes per week. These exercises should actively involve large muscle groups and should be performed in a continuous or intermittent manner, with the primary objective being the enhancement of cardiovascular and respiratory system function (Garber et al., 2011).

Concerning Second Chance Schools (SCSs) in Greece, they offer a junior-high school diploma and cater to adults who have attained a primary school diploma but haven't completed the compulsory nine-year education (Vekris, 2003). The SCS curriculum encompasses eight subjects: Greek Language, Mathematics, Computer Science, Environmental Education, Sciences, Social Education, English Language, and Aesthetic Education. Of the 25 weekly teaching hours, 20 are dedicated to these subjects, while the remaining 5 hours are allocated to Projects and consultancy services.

It is noteworthy that education and training have become essential for all citizens, with sports and physical activity contributing significantly to the enhancement of public health and cultural life (Panagiotidis, 1996). However, it's worth mentioning that the SCS curriculum lacks a structured physical activity course, similar to the Physical Education courses offered in Primary and Secondary Schools.

A distinctive characteristic of SCSs in the Greek Thrace region is the substantial presence of the Muslim Minority (MMT), consisting of three distinct ethnic groups with diverse linguistic traits, including individuals of Turkish origin/Turkish-speaking, Pomaks, and Roma descent (Troumpeta, 2001). The unique religious, linguistic, and ethnic elements of the Muslim minority set them apart from the Greek population, leading to the multicultural composition of SCSs in Greek Thrace.

The aforementioned observations have spurred the initiation of this study, which aims to investigate the effects of an organized physical activity program on the health indicators of students attending a multicultural SCS. The study considers variables such as gender (women, men) and cultural group (Christians, Turkish origin/Turkish-speaking MMT, Pomaks MMT, Roma MMT) (Panagiotidis, 1996; Troumpeta, 2001; Vekris, 2003).

Methods

Participants

The study comprised a cohort of 62 healthy adult students drawn from the Komotini SCS. Of this group, 32 individuals were male (51.6%), while 30 were female (48.4%). The age range of the participants spanned from 19 to 57 years, with a mean age of 38.76 and a standard deviation of 7.65.

Regarding the cultural background, 20 participants (32.3%) identified as of Turkish origin or Turkish-speaking, 16 (25.8%) as Christians, 17 (27.4%) as Pomaks, and 9 (14.5%) as Roma. Furthermore, a majority of 54 participants (87.1%) reported non-participation in any sports activities, while 8 individuals (12.9%) indicated their engagement in some form of structured exercise.

Measures

In the assessment of health indicators, the study employed specific instruments, including a wall-mounted stadiometer for height measurement, precision scales, specialized tape measures for various body regions, an automated sphygmomanometer for measuring blood pressure and resting heart rate, and a DXA machine for quantifying Bone Mineral Density (BMD) and Bone Mineral Content (BMC). Additionally, demographic information about the participants was collected through a questionnaire.

Procedure

Sample selection was contingent upon the voluntary participation of the students. To formalize their participation, all participants provided informed consent by signing an agreement that outlined the study's nature, experimental design, and the confidentiality measures governing personal data. Subsequently, the sample was randomly divided into two equal groups: the experimental group and the control group. It is worth noting that the study received ethical approval from the Research Ethics Committee of Democritus University of Thrace and was conducted during non-class hours.

Furthermore, based on the participants' responses, the sample was categorized into two primary groups: a) individuals identified as Christians of Greek origin, Greek citizens of Turkish origin or Turkish-speaking individuals within the Muslim Minority of Thrace (MMT), Greek Pomaks of MMT, and Greek Roma of MMT; and b) participants categorized by gender into men and women.

Study design

The study encompassed three key phases: initial measurements (1st measurement), the intervention program, and final measurements (2nd measurement). Initial measurements were conducted for all participants in both the experimental and control groups. The intervention program spanned 20 weeks, occurring twice a week, with each session lasting 60 minutes. The program encompassed three components:

a) Aerobic exercises combined with strength, flexibility, and balance exercises, targeting a heart rate range of 65-85% of Maximum Heart Rate (HRmax).

b) Resistance exercises, with intensity set at 60-80% of one-repetition maximum (1 RM).

c) Hiking combined with strength exercises using body weight, alongside moderate-intensity cooperative exercises (65-85% HRmax).

It is important to note that heart rate sensors were worn by the students throughout the exercise sessions to monitor and control the intensity. Subsequently, upon completion of the intervention program, the final measurements (2nd measurement) were conducted for the entire sample under stable conditions, employing the same measurement instruments as those used during the initial measurements (1st measurement).

Statistical analysis

Repeated measures variance analyses were conducted, involving a 4-way Repeated Measures ANOVA model with factors including "group," "cultural group," "gender," and "measurement" (2x4x2x2), with repeated measurements pertaining to the "measurement" factor. There were three independent factors: gender (women, men), group (experimental, control), and cultural group (Christians, individuals of Turkish origin/Turkish-speaking, Pomaks, Roma). The dependent variables encompassed each of the 13 health indicators, including Total mass, Body mass index, Waist size, Belly size, Hips size, Total body fat, Fat, Fat-free mass, Systolic blood pressure, Diastolic blood pressure, Resting heart rate, Total BMC (Bone Mineral Content), and Total BMD (Bone Mineral Density).

To discern variations between the samples in comparison to the initial measurements, independent samples t-test analyses were performed, stratified by cultural group (Christians, individuals of Turkish origin/Turkish-speaking, Pomaks, Roma), gender (women, men), and group (experimental, control).

Lastly, descriptive frequency analysis (frequencies) was employed to delineate the sample's characteristics. The predetermined significance level was set at $p<0.05$.

Results

Differences between groups

In terms of the initial measurements, the t-test analysis for independent samples revealed no statistically significant disparities between the experimental and control groups.

However, when examining the initial and final measurements, the participants in the experimental and control groups exhibited noteworthy differences in several health indicators. These included "Total mass" ($F(1.47) = 26.748$, $p<.001$, $\eta 2 = .363$), "BMI" ($F(1,47) = 23.783$, $p<.001$, $\eta 2 = .336$), "Waist size" ($F(1,47)= 66.206$, $p<.001$, $\eta 2 = .585$), "Belly size" ($F(1.47) = 69.60$, $p<.001$, $\eta 2= .597$), "Hips size" ($F(1,47) = 42,144$, $p<.001$, $\eta 2 = .473$), "Total body fat" ($F(1,47) = 145,985$, $p<.001$, $\eta 2 = .756$), "Fat" ($F(1,47) = 94,10$, $p<.001$, $\eta 2$

2024, Retos, 61, 953-961

= .667), "Fat-free" (F(1,47) = 11,713, p<.01, η2 = .200), "Systolic blood pressure" (F(1.47) = 95.502, p< 001, η2 = .670), "Diastolic blood pressure" (F(1,47) = 76,005, p< 001, η2 = .618), and "Resting heart rate" (F(1.47) = 75.902, p<.001, η2 = .618).

Regarding the factors "Total BMC" and "Total BMD," no statistically significant interaction was observed between the measurements (1st measurement, 2nd measurement) and the group (experimental group, control group) (p>.05).

Detailed information about the means and standard deviations is presented in Table 1.

Table 1.
Health indicators of adult students per group and measurement (mean ± SD).

Variables	Group	1st Measurement	2nd Measurement	Sig.
Total mass (kg)	E	81.30 ± 15.51	79.77 ± 15.24*	.004
	C	78.68 ± 14.63	80.92 ± 14.65	.000
Body mass index (BMI) (kg/m²)	E	28.11 ± 5.11	27,55 ± 4,71*	.005
	C	27.34 ± 4.88	28.11 ± 4.82	.000
Waist size (cm)	E	92.16 ± 13.61	88.39 ± 12.61*	.000
	C	90.77 ± 10.38	94.68 ± 10.28	.000
Belly size (cm)	E	100.89 ± 13.39	97.52 ± 12.77*	.000
	C	97.85 ± 11.61	101.48 ± 11.38	.000
Hips size (cm)	E	107,65 ± 11,10	104.76 ± 9.44*	.000
	C	106.44 ± 11.03	108.74 ± 10.51	.000
Total body fat (%)	E	39.80 ± 10.64	37.02 ± 10.64*	.000
	C	37.87 ± 11.36	39.60 ± 11.06	.000
Fat (kg)	E	31.61 ± 10.89	28,78 ± 10,15*	.000
	C	29.36 ± 11.94	31,33 ± 11,81	.000
Fat free (kg)	E	49.64 ± 10.93	51.00 ± 11.48*	.000
	C	49.30 ± 10.76	49.56 ± 10.92	.244
Systolic blood pressure (mmHg)	E	121.94 ± 5.63	115,19 ± 5,47*	.000
	C	121,10 ± 5,65	121,16 ± 6,00	.612
Diastolic blood pressure (mmHg)	E	76.35 ± 5.62	71.42 ± 5.48*	.000
	C	75.29 ± 5.39	75.74 ± 5.72	.421
Resting heart rate (HRrest) (bpm)	E	74.74 ± 4.72	69.87 ± 4.22*	.000
	C	73,48 ± 4,90	73.65 ± 4.91	.955
Total BMC (g)	E	2934.81 ± 477.91	2942.74 ± 483.12	.474
	C	2867.61 ± 455.85	2862.54 ± 445.50	.635
Total BMD (g/cm²)	E	1.200 ± 0.095	1.201 ± 0.094	.395
	C	1,198 ± 0,06	1,195 ± 0,0,67	.323

Note: *p<.001 Differences between experimental and control group in the 2nd measurement. E = experimental group, C = control group.

Gender differences

Regarding the initial measurements, the t-test analyses for independent samples revealed statistically significant differences between women and men in 8 out of the 13 dependent variables (see Table 2).

Specifically, men demonstrated statistically higher scores than women in the following variables: "Total mass" (F(1.47) = 6.603, p<.05, η2 = .123), "Belly size" (F(1.47) = 6.935, p<.05, η2 = .129), "Fat-free" (F(1.47) = 119,758, p<.001, η2 = .718), "Total BMC" (F(1,47) = 11,273, p<.01, η2 = .193), "Systolic blood pressure" (F(1,47) = 8,545, p<.01, η2 = .154), and "Diastolic blood pressure" (F(1,47) = 4,156, p<.05, η2 = .081). Conversely, women scored significantly higher than men in the "Fat" (F(1,47) = 5,526, p<.05, η2 = .105) and "Total body fat" factors (F(1.47) = 37,784, p<.001, η2 = .446).

Statistically significant differences between men and women were not observed in the "Body mass index," "Waist size," "Hips size," "Total BMD," and "Resting heart rate (HRrest)" factors (p>.05). Table 2 provides a detailed presentation of the health indicators for adult students categorized by gender and measurement.

Table 2.
Health indicators of adult students per gender and measurement (mean ± SD).

Variables	Measurement	Men N(32)	Women N(30)	Sig.
Total mass (kg)	1st	84.83 ± 12.04	74.83 ± 16.31	.012
	2nd	85.30 ± 12.02	75.06 ± 15.88	.011
Body mass index (BMI) (kg/m²)	1st	27.31 ± 3.04	28,17 ± 6,45	.612
	2nd	27.46 ± 2.98	28.22 ± 6.11	.615
Waist size (cm)	1st	100,55 ± 9,87	98.12 ± 14.92	.509
	2nd	100.78 ± 10.19	98.13 ± 14.01	.531
Belly size (cm)	1st	95.83 ± 8.45	86.82 ± 13.58	.009
	2nd	95.98 ± 9.24	86.78 ± 12.59	.006
Hips size (cm)	1st	104.23 ± 6.97	107.50 ± 6.14	.093
	2nd	104.31 ± 7.26	109.35 ± 12.05	.089
Total body fat (%)	1st	32.01 ± 8.29	46.12 ± 8.54	.000
	2nd	31.28 ± 8.16	45.81 ± 7.96	.000
Fat (kg)	1st	26.77 ± 8.78	34,45 ± 12,60	.025
	2nd	26,30 ± 8,53	34,06 ± 12,01	.015
Fat free (kg)	1st	58.07 ± 6.64	40.30 ± 5.26	.000
	2nd	59.09 ± 6.96	40.88 ± 5.64	.000
Systolic blood pressure (mmHg)	1st	123.78 ± 5.05	119.10 ± 5.22	.003
	2nd	120.22 ± 5.50	116.00 ± 6.74	.008
Diastolic blood pressure (mmHg)	1st	77.50 ± 5.14	74.03 ± 5.36	.022
	2nd	75.28 ± 6.16	71.77 ± 5.26	.030
Resting heart rate (HRrest) (bpm)	1st	73.00 ± 4.84	75,30 ± 4,57	.097
	2nd	70.69 ± 4.88	72.90 ± 4.79	.066
Total BMC (g)	1st	3,091.91 ± 398.11	2,697.80 ± 448.66	.001
	2nd	3,088.91 ± 396.92	2,695.19 ± 446.95	.001
Total BMD (g/cm²)	1st	1.200 ± 0.0.80	1.198 ± 0.084	.853
	2nd	1,199 ± 0,080	1,197 ± 0,082	.886

Differences among cultural groups

The groups comprised of Christians, individuals of Turkish origin/Turkish-speaking, Pomaks, and Roma reported no statistically significant differences in the health indicators (p>.05).

Discussion

This study sought to examine the impact of a 20-week structured Physical Activity program on specific health indicators among students enrolled in a multicultural SCS, taking into account their diverse cultural backgrounds (including Christians, individuals of Turkish origin/Turkish-speaking, Pomaks, and Roma) and gender (comprising both women and men). It is noteworthy that, based on the available literature review, no similar investigation concerning this topic has been documented in Greece or Europe.

It is important to highlight that the research implementation phase coincided with a period of 8 weeks during which public health measures were instituted to mitigate the spread of the COVID-19 coronavirus. Consequently, the study initiated efforts to systematically document and analyze the effects of the organized Physical Activity program on the health indicators of SCS students under these exceptional circumstances. Furthermore, the study revealed that the majority of students were not engaged in any form of organized exercise or physical activity, consequently elevating their susceptibility to future health issues.

Initially, the survey findings indicated that the structured Physical Activity program produced multiple beneficial alterations in the health indicators of participating students. Specifically, at the conclusion of the 20-week program, there was a statistically significant reduction in body mass, BMI, waist/belly/hip measurements, body fat percentage, blood pressure, and resting heart rate. Simultaneously, a statistically significant increase in lean body mass was observed. Notably, the levels of Total Bone Mineral Density (BMD) and Total Bone Mineral Content (BMC) were maintained without a statistically significant increase.

These findings align with the prevailing body of research, which consistently reports favorable outcomes following the implementation of combined aerobic dance programs (operating at 70-90% of HRmax) and strength training. These benefits include reductions in body fat (Karatrantou et al., 2017; Kraemer et al., 2001; Mosher et al., 2005; Tsourlou et al., 2003), body mass (Jacubec et al., 2008; Karatrantou et al., 2017), and blood pressure (Karatrantou et al., 2017; Kraemer et al., 2001). Additionally, these interventions lead to increased lean body mass (Kravitz et al., 1997) and decreased resting heart rate (Jacubec et al., 2008; Kraemer et al., 2001; Mosher et al., 2005) in individuals across various age groups, including young, middle-aged, and elderly women and men.

Regarding bone mineral density (BMD) and bone mineral content (BMC), the outcomes of this study are consistent with the broader body of research. Most studies concur that interventions spanning up to six months, involving aerobic exercise and/or muscle strengthening, tend not to yield statistically significant increases in total BMD and total BMC among adult participants (Chilibeck et al., 1996; Fujimura et al., 1997; Hartman et al., 2007; Ballard et al., 2006; Ryan et al., 2004; Stewart et al., 2005).

In the control group, a statistically significant increase was observed in body mass, BMI, and waist/belly/hip size. This increase in body mass and waist/belly/hip size among control group students can likely be attributed to reduced physical activity resulting from the adoption of public health protection measures aimed at limiting the spread of the COVID-19 coronavirus. These measures coincided with the program's implementation period, lasting approximately two months. The restrictive social distancing measures and reduction in social contacts had adverse effects on individuals' physical activity behaviors, leading to a more sedentary lifestyle, which in turn contributed to the decline in physical health and well-being (Flores Olivares et al., 2024; Hammami et al., 2020). Lockdown policies inevitably hindered participation in organized physical activity programs (Stockwell et al., 2021).

These study results align with recent research findings that highlighted the pandemic's impact in restricting people's physical activity, resulting in a deterioration of their physical condition (Flanagan et al., 2021; Ribeiro de Lima, et al., 2021; Sidebottom et al., 2021).

Regarding the relationship between gender and the health indicators under study, it was observed that men had higher body mass, waist size, lean mass, BMC, systolic pressure, and diastolic pressure compared to women. Conversely, women exhibited a higher fat mass and a greater percentage of body fat than men. However, statistically significant differences between men and women were not detected in terms of BMI, belly size, hip size, BMD, and resting heart rate.

Regarding the impact of gender on health indicators, findings from various surveys are in concurrence (Courtright et al., 2013; Epstein et al., 2013; Glenmark, 1994). These surveys have consistently demonstrated gender-related disparities, with men generally exhibiting greater anthropometric stature and increased muscle mass (Miller et al., 1993). Consequently, men tend to possess a larger overall body size and greater bone mineral content (BMC) compared to women.

Furthermore, an extended study monitoring blood pressure in a sample of 4,993 adults (with a mean age of 38 years) over a 28-year duration revealed that, on average, men tend to have higher blood pressure levels than women (Cheng et al., 2012).

In contrast, women typically have a higher percentage of body fat than men, ranging from 9-12%, particularly in areas such as the breast, thigh, and hip (Palmer & Clegg, 2015). Pre-menopausal women often store more fat in the gluteal and thigh regions, whereas men tend to accumulate fat in the upper body and visceral spaces (Jensen, 2002).

Concerning the different cultural groups under examination, no statistically significant distinctions were observed among Christians, individuals of Turkish origin or Turkish-speaking backgrounds, Pomaks, and Roma. This lack of differentiation may be attributed to the shared educational, social, and economic status that all students within this cohort possess.

Moving on to the limitations of this study, several factors warrant consideration. Firstly, data collection occurred exclusively at the commencement and culmination of the intervention program, without accounting for potential detraining effects over time. This was necessitated by the fact that students enrolled in the SCS typically completed their studies and departed after the second year. Additionally, it is important to note that the study sample exclusively consisted of healthy students. Consequently, the findings cannot be confidently extrapolated to students with underlying health issues or distinct characteristics. Furthermore, the study did not incorporate control measures for the dietary habits of the students during the intervention program. While some information regarding the benefits of healthy eating and physical activity was disseminated, no direct dietary controls were imposed.

In light of these limitations, it is recommended that future research endeavors encompass a broader array of SCSs in Greece and explore the interplay between factors such as employment status, underlying medical conditions, and smoking habits with respect to students' engagement in organized physical activities.

Conclusions

The meticulously structured 20-week Physical Activity Program yielded statistically significant improvements in the majority of the assessed health indicators. However, it becomes evident that the duration of these interventions may not have been sufficiently extensive to effect changes in total BMC and BMD.

Notably, this study underscores that a well-organized and systematic intervention program can exert a substantial influence on enhancing health indicators, even in the absence of concurrent dietary interventions. Consequently, it becomes evident that organized Physical Activity programs can be implemented effectively, extending beyond the conventional purview of primary and secondary schools, particularly within SCSs. Such programs hold the potential to ameliorate the health and, consequently, the overall quality of life of the student population.

The notable absence of this specific demographic from structured exercise initiatives, compounded by the prevailing issue of "sedentary lifestyle" in contemporary society, underscores the compelling need for the consistent and methodical introduction of physical activity programs within SCSs.

These intervention programs within SCSs should be meticulously devised and efficiently structured to instill motivation and cultivate sustained engagement in organized physical exercise across the lifespan of adults. Consequently, the implementation of interventional Physical Activity programs within SCSs can be systematically overseen by qualified Physical Education Teachers, involving the incorporation of new curriculum courses.

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