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# STUDY ON THE CARDIORESPIRATORY FITNESSOF YOUNG STUDENTS AFTER THE PANDEMIC PERIOD

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**Abstract**

*Aim***.** The aim of the study was to highlight the physical condition status of young male students after the pandemic period, in the first year after online courses versus the second year.

*Methods of research*. The research methods used in this paper were: scientific documentation, Paired Samples t - test, statistical mathematics and graphical method.Aerobic (cardiorespiratory) capacity or aerobic fitness was assessed by the 2-Km Walk Test, which is very effective for measuring this parameter. The research was carried out on the football field, in the open air within the UPB Complex, the initial testing was carried out in November 2021, as soon as the university courses physically started, and the final testing took place in November 2022.

*Results.* The average aerobic fitness index of the students is lower in the initial testing (after the online courses) compared to the final testing.

*Conclusions.* We can conclude that the pandemic period led to an awareness of the acute need for exercise among young people as a means of combating the "technostress" generated by exclusively online courses.

*Keywords*:physical condition, 2-Km Walk Test, young people, COVID-19 pandemic

## Introduction

Not long ago it was considered that the practice of physical exercise was a marginal component of the quality of life, but recently it has been demonstrated that there are positive correlations between the practice of physical activities and the quality of life, this fact having beneficial effects in the medium and long term on the individual. The quality of life significantly depends on the options, the values, the effort that the individual makes to eliminate from his life those components that negatively affec this life and to identify those components and resources that improve his quality of life. (Christ, 2015) Cardiorespiratory fitness refers to the capacity of the circulatory and respiratory systems to supply oxygentoskeletal musclemitochondria for energy production needed during physical activity. (Ross, 2016, Carpersen, 1985). A goodlevel of cardiorespiratory fitness increases the concentration of hemoglobin, the VO2 max, improves the supply of oxygen and nutrients, decreases the submaximal heart rate, the submaximal respiratory rate and the resting blood pressure (Bompa, 2014). During aerobic exercise the number of capillaries increases allowing the exercising muscleto perform more efficiently (Reuteur, 2012). Raghuveer, 2020, states that in youth, CRF is a predictor of a number of health indicators, including cardio metabolic health, (Lang, 2018, Ortega, 2008) premature cardiovascular disease, (Högström, 2014) academic achievement (Santana, 2017) and mental health. (Ortega, 2008, Lubans, 2016).

Tomkinson, 2017, states that in adults, CRF is strongly and independently associated with cardiovascular and all-cause mortality and morbidity, (Myers, 2002, Galati, 2003) stroke, (Lee, 2002) cancer, (Sawada, 2014) diabetes and many other risk factors and comorbidities. (Katzmarzyk, 2005) Although CRF is as sessed at times in certain youth such as those with congenital heart disease, asthma, and cystic fibrosis, assessment of CRF has a broaderrange of applications. CRF is an objective measure of health that can be tracked over time and compared across populations (Ross, 2016, Tomkinson, 2017). Duringthe Covid-19 pandemic, when courses were hold online, Romanian education was affected.

According to the official statistics provided by the Ministry of Education, in Romania, 65,000 children were left out of school hours because they did not have the necessary resources to access online education. However, in Romanian universities, the student drop out rate decreased during 2020–2021. (David, 2022) During this period, students felt the negative effect of the Covid-19 pandemic, they faced nervousness, anxiety, stress, boredom, lack of concentration or sleepdisorders. (Cotoranu, 2021) Starting from November 2021, certain universities in Romania have started to switch from online to face-to-face education, this being done on the basis of university autonomy. The field of study was also a very important determinant for such a decision. For example, in some fields of study, e.g., economics, law, etc., where laboratories/practicallessons are less utilized, the online and hybrid education systems were used for a larger period. (David, 2022) Silviu Dumitrescu, 2014, claims that properly dosed aerobic exercises improve intellectual performance (improves brain irrigation), increase bone density, fights depression, facilitate gastrointestinal transit, promote quality sleep, normalize blood fats. All the ideas mentioned above have convinced us that the development and improvement of

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CRF must become a major objective in the approach to physical education lessons. The concern of as many specialists in the field of physical education as possible is necessary to make young people responsible for increasing the indicators of the quality of life, health status, lifestyle, physical condition and aerobic exercise capacity, as well as the aesthetic aspect of the body. It is necessary to capitalize on the experiences specific to the students' age and to find specific ways and situations of action in order to formattitudes and habits favorable to the practice of physical exercises through our life, in orderto maintain an increased level of quality of life in the current economic-social context. (Christ, 2015).

**Methods**

*Research Aim*

Through this study, we wanted to highlight the level of aerobic exercise capacity of male students from the Polytechnic University of Bucharest, after the pandemic period, in which online courses were held, compared to the one obtained after a year, in which the courses were conducted face to face.

The following objectives were established, in order to fulfill the purpose of the research:

- Information and documentation regarding aerobic exercise capacity;
- evaluation of the level of aerobic exercise capacity of the students;
- implementation and application of the proposed/aerobic programs in physical education lessons;
- analysis of the results obtained.

In carrying out the research, the following tasks were pursued:

- establishing the sample of subjects;
- organizing and carrying out tests in order to determine the level of aerobic exercise capacity of the subjects;
- ordering and grouping of data in order to process them through statistical-mathematical methods;
- analysis and interpretation of the obtained data;
- formulating the conclusions of the study.

*Research Methods*

The research methods used in this study were the following: scientific documentation, the direct observation method, the test method, the statistical-mathematical method, the bilateral dependent t-test and the graphic method. In order to establish the level of the aerobic exercise capacity of the students, the 2 km walking test was applied. This test is recommended to be performed by healthy people, who are between 20 and 65 years old and who aim to improve their health by doing cardio training, but who do not want to run.

To perform the test, the pulse is measured, as well as the time achieved after completing the 2 km. During the test, walking should be fast, but not jogging or running. (https:/sporttherapie.ro/testari/analiza-metabolica-aeroscan/)

After the test, based on the results obtained and the anthropometric indices (age, sex, height, weight), the VO2max is calculated, using, for men, the following formula: VO2max= 184.9 - 4.65 x t – 0.22 x V – 1.05 x G/I2 where:

t - the time obtained
HR – heart rate
V – age
G – weight
Q – height

*Subjects and Location*

The study was carried out on a sample of 247 malestudentsfromthe Politehnica University of Bucharest, youngpeopleaged between 20-22 years. The venue wasthesportsbase of the Politehnica University of Bucharest. Before the start of the study, the students were presented with the method of conducting and the particularities of the investigation carried out. We note that the students were healthy and voluntarily participated in this. Measurements were carried out in accordance with ethical standards of the Declaration of Helsinki and ethical standards in sport andexercisescienceresearch (Harriss&Atkinson, 2015).

*Research Design*

This study took place between November 2021 and November 2022, during physical education and sports lessons. We specify that until November 2021, due to the COVID-19 pandemic, courses at the Politehnica University of Bucharest were held exclusively online. Recording the results at the initial testing is carried out over two weeks, in November 2021, when the students were in their first year of study, and the recording of the results obtained in the second test was also carried out over two weeks, in November 2022, when the students they were in their second year of study. In order to carry out the 2 km walking test, it was considered that the ground should be flat, without unevenness, thususing the football field, next to the gym. The distance of 2 km was measured, the start point, the finish point and how many laps this distance represents was determined. The testing of the subjects began with the collection of anthropometric data, after which the 2 km walking test was performed. The students were presented with all the information regarding the 2 km distance, as well as how to measure their heart rate after completing the 2 km. In the interval of one year, between the two tests, in the physical education lessons, specific means from athletics, gymnastics, basketball and football were used; it shoul d also be mentioned that the students had one EFS lesson per week, with the possibility to optionally participate

in other EFS lessons or individually, the average time allocated to CRF development being between 120/180 min per week.

The Fitness Index (FI) is a score based on test performance and has the following scale:
below 70 = poor
FI 70/89 = below-average
FI 90/110 = average
FI 111/130 = good
FI above 130 = verygood FI

**Results**

Following the research, the results obtained in the two tests, by the 247 students who participated in the 2 km walk test, were analyzed and interpreted, the purpose of the test being to determine the fitness index that indicates the status of aerobic capacity. Its calculation is based on the anthropometric data and the values recorded at the end of the test – time and heart rate.

Table 1.Statistical indicators

| | Index Physical form 2022 | Index Physical form 2021 |
|---|---|---|
| Mean | 119.07 | 96.91 |
| Median | 120.00 | 101.00 |
| Std. Deviation | 17.939 | 19.490 |
| Minimum | 57 | 33 |
| Maximum | 155 | 125 |
| Range | 98 | 92 |

In table 1 as well as in figure 1, it can be seen that the average physical fitness index increased, at the testing carried out in 2022, by 22.16 units compared to the initial testing carried out in 2021, which is equivalent to an average progress, from an average to good physical fitness index. In graph no. 1 the two average values of the physical form index are shown.

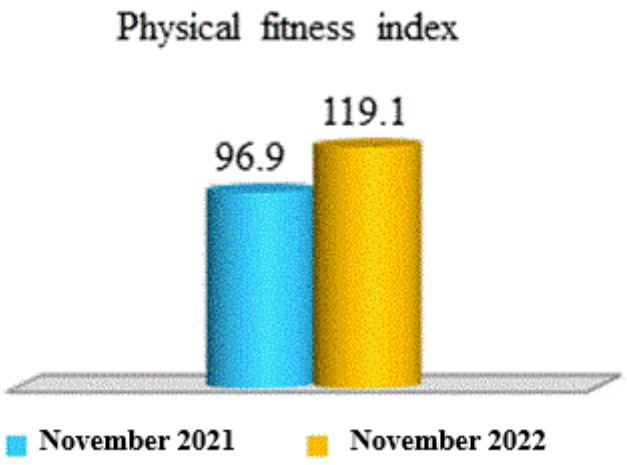


Figure 1.Average values of the physical fitness index in November 2021 (after online courses) versus November 2022

According to the results of the bilateral t-test, the value of the significance threshold $p<0.05<0.01$ (p = Sig. (2-tailed). It turns out that there are statistically significant differences between the two average indices of physical form. In other words, there are significant differences between the status - the aerobic exercise capacity of young students following online courses and that after the pandemic (physical courses).

Table 2. Paired Samples Test

| Physical fitness index | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| 2022 – 2021 | 22.16 | 14.68 | 2.19 | 17.74 | 26.57 | 10.12 | 44 | <0.01 |

**Conclusions**

The use of the specific means of physical education and sport, in the framework of physical education lessons, can contribute to the positive evolution of physical development as well as to the increase of the level of aerobic exercise capacity. Following the assessment of the fitness index that indicates the status of aerobic exercise capacity, an increase of 22.16, at the level of the arithmetic mean, at the final test in November 2022 compared to the level recorded at the initial test, in November 2021, was found, which equates to with average progress, from an average to a good physical fitness index. Taking into account that until November 2021, the courses took place only in online format, we consider that the obtained values denote the fact that the students managed to preserve their physical condition at an average level. Making students aware of the level of aerobic exercise capacity can be one of the ways that can lead to increasing their motivation both for more active participation in physical education classes and for independent practice of other forms of physical activities in their free time.

Thus, through education and self-education, young people must be aware and understand the beneficial influences resulting from the constant practice of physical activities, of any type, for the appearance of optimal immediate and long-term effects on their body.

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